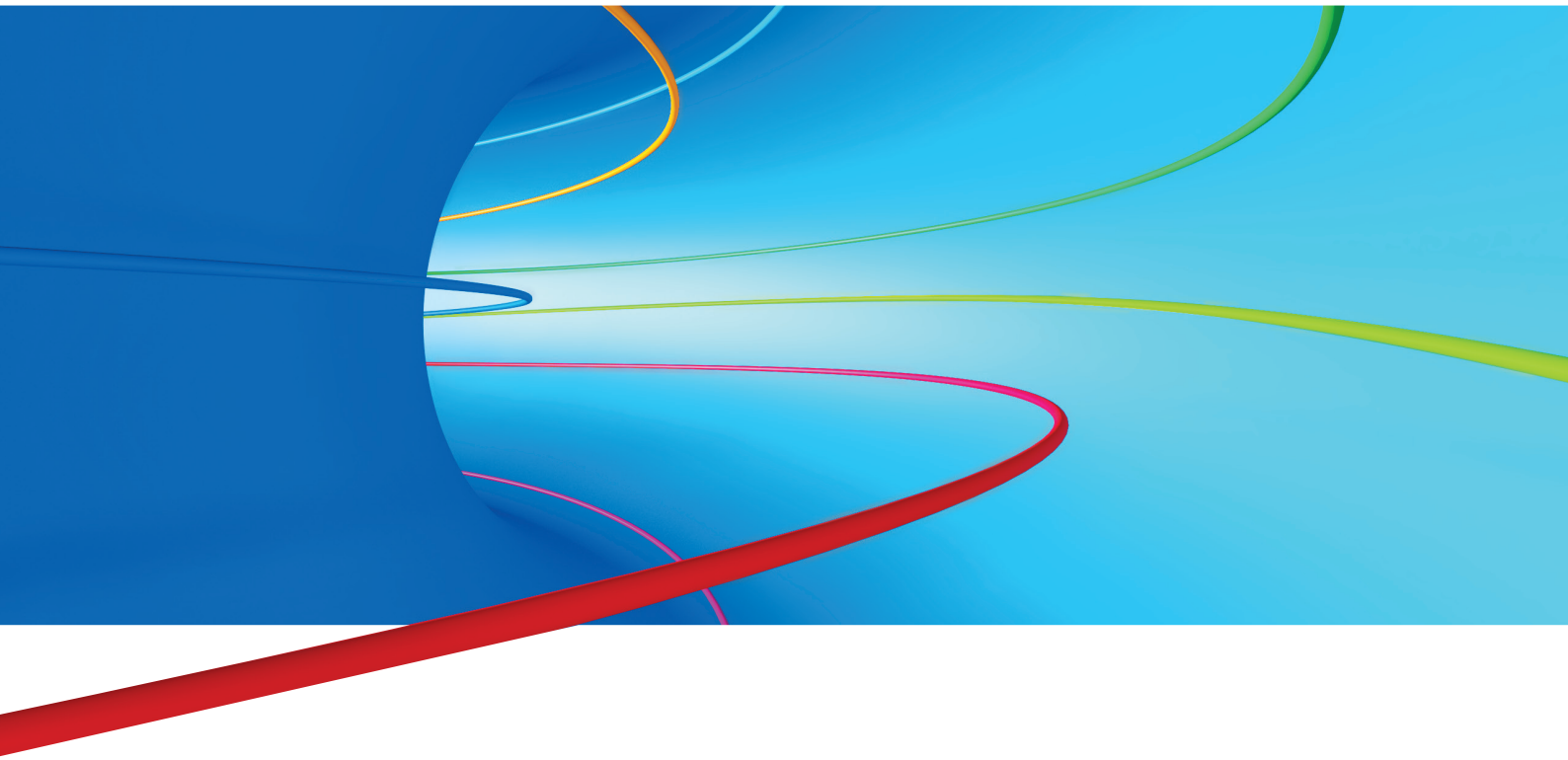
Nationaler IT Gipfel
München 2011

Pictures of the Future in a Digital World.
An international comparison of user perspectives.



MÜNCHNER KREIS Future Study, Volume IV

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Pictures of the Future in a Digital World.

An international comparison of user perspectives.

MÜNCHNER KREIS Future Study, Volume IV

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German Federal Ministry of Economics and Technology

Hans-Joachim Otto, MdB
Parliamentary State Secretary in the
German Federal Ministry of Economics and Technology

Foreword by the German Federal Ministry of Economics and Technology.

Information and communication technologies (ICT) accompany us in every step we make. It's practically impossible to imagine our workplaces or personal lives without ICT. This is creating both societal and economic opportunities for Germany. There is hardly any industry sector whose products and services have such a great impact on nearly every key industry in Germany as the ICT sector. ICT are the guarantee for growth and employment – today and in the future.

I am very pleased that this year's Future Study focuses on users for the first time. After all, the thoughts, experiences and fears of the people who will use future technologies are often considered far too late, or not at all, during their development. Opportunities for and barriers to the use of ICT and media innovations can be identified in advance. Moreover, with its international comparison, the study helps to identify the specific attitudes toward ICT in various countries and cultures, and consider this information in implementation and communication. This is particularly important for an export-oriented nation like Germany.

Upon reading the individual "pictures of the future", it becomes clear that innovations will no longer originate from a single industry, but rather have vast cross-industry potential. The results of the study emphasize which developments will characterize the ICT and media sectors in the coming years and how they can change society and the economy.

The long-term study "Prospects and Opportunities of Information and Communication Technologies and Media" is accompanying the national IT summit for the fourth time running. Once again, the actions recommended by the study provide valuable insights for a successful, responsible path to the digital future.

The results of the study were presented in a tangible manner at the Sixth National IT Summit in Munich on December 6, 2011: in a "future room". The pictures of the future are intended to provide impetus for dialog with visitors and readers of the study. I am also pleased that the same exhibition will be presented to the visitors of CeBIT in 2012.

The joint project "Prospects and Opportunities of Information and Communication Technologies and Media", by MÜNCHNER KREIS, EICT, Siemens, Deutsche Telekom, TNS Infratest, ZDF, the IT representative of the Bavarian State Government, Bird&Bird, Daimler, Deutsche Bank, Google, Sony, Technische Universität München, VDE (ITG), mc-quadrat, deep innovation and the German Federal Ministry for Economics and Technology is impressive proof of what can be achieved when several different organizations and companies from a wide range of areas join forces for a project.

I wish to thank the many project partners for their commitment and hope you gain new insights from reading the study.

IT Representative of the Bavarian State Government

State Secretary Franz Josef Pschierer
IT Representative of the Bavarian State Government,
MÜNCHNER KREIS e. V.

Information and communication technologies (ICT) are increasingly permeating every facet of our lives. Comprehensive networking will link private, professional and public areas together even more tightly, influencing both society and politics. In ten years or less, more than 95 percent of the adult population in Germany, Europe and the USA will actively and regularly use the Internet and its services. That is one of the central findings of the study. The greatest challenge in this will be to overcome the digital divide, i. e., to create access options, broadband service and skills independently of income, origin or location. It should be noted that development of the information society is not simply automatic, arising necessarily from the rapid technological advances and the easy access to knowledge that the Internet provides. The necessary regulatory framework must be defined and created quickly, because the still increasing penetration of ICT into all areas of professional and private life will be even more all-embracing in molding the information society of the future.

As such, it is important that MÜNCHNER KREIS, through its regular "Future Study", strives to gain insight into future developments, challenges and opportunities presented by ICT. Without this regular attempt to look into the future and have potential scenarios assessed by experts, targeted innovation is difficult, if not impossible. Moreover, this year's study focuses on the human factor, by asking future users of their opinions and estimations of the described future scenarios. Topics such as digital textbooks and the digital city service office will only be successful in future if they concentrate on their users and address their fears and expectations.

The mobile Internet, in particular, will be one of the major developments and challenges in the coming years. Aspects of IT security and privacy, in particular, need special attention from the user's perspective. The resulting tensions between openness and transparency on one side and security and the need for privacy on the other will continue to grow dynamically as the Internet evolves. In the future, this will require scientific and political solutions – the shaping of this future has already begun, and this study provides valuable impulses. Basic, fundamental decisions, such as those involving IT security or improving media skills among the population, are highly complex and have inherently long lead times. As such, they have to be initiated today to make an impact in the foreseeable future.

The resulting challenges for ICT will hardly solve themselves. A differentiated look at the different areas of life and future user behavior highlights where Germany might stand in future and identifies the international environment in which the country must gain position. Laying the proper groundwork and developing the inherent future potential of ICT and media will only be possible when science, business and politics work together, to help shape the future for the benefit of society.

In conclusion, I wish to thank MÜNCHNER KREIS, particularly the team responsible for the Future Study, for their committed work. Visualization of the results in the "future room" at the National IT Summit in Munich and at CeBIT 2012 will make it possible to present the forward-looking insights to an even wider audience in comprehensible form. Since our future will remain in a state of flux, it is essential that we continue to work on the foundation we have achieved by the previous studies, to provide a framework to assist business, politics and science in shaping this future. With this in mind, I already look forward to the insights from the next Future Study, which I am pleased to once again actively support.

MÜNCHNER KREIS

Prof. Dr. Dres. h.c. Arnold Picot
Chairman of the Board,
MÜNCHNER KREIS e. V.,
Ludwig-Maximilians-Universität München (top left)

Dr.-Ing. Reinhold E. Achatz
Vice-Chairman of the Board,
MÜNCHNER KREIS e. V.,
Siemens AG (top center)

Prof. Dr.-Ing. Jörg Eberspächer
Chairman of the Research Committee,
MÜNCHNER KREIS e. V.,
Technische Universität München (top right)

In the fourth phase of the long-term project "Prospects and Opportunities of Information and Communication Technologies (ICT) and Media", MÜNCHNER KREIS – a network of partners from science, business and politics – set a clear accent with a change of perspective. The focus this time was not the long-term perspectives of the information, communication and media worlds from an expert perspective, as in previous phases, but instead users and their personal assessments of typical, ICT-supported pictures of the future in typical life situations. This change of perspective makes it possible to "record the human response to new information and communication opportunities and take it into account in the system designs" – entirely in line with the targets of MÜNCHNER KREIS – identifying the opinions and preferences, as well as reservations and fears, of end users with regard to major aspects of the digital future. The assessment is not limited to a single nation – and that is the particular attraction of this year's study – but instead in an international comparison of six important countries. Germany and Sweden represent Europe, while the USA and Brazil represent the Americas and China and Korea Asia.

More than 7,200 people in these countries were questioned in a carefully prepared, Internet-based survey conducted in the summer of 2011. They were all asked for their personal opinions – not just on overreaching topics such as the protection of personal data, willingness to pay, user friendliness and trust in technology, but also on the 16 specific pictures of the future. These pictures reflect potential ICT-supported functions and services in the following basic life situations: learning, working, recreation, living, health, mobility and consumption.

This fourth Future Study provides compact statements about possible future functions from the user's perspective in an international comparison, providing assessments of possible usage and potential, as well as barriers and problems. This results in important evidence for the long-term opportunities, as well as usage and development perspectives, of future information and communication technologies and media in different regions of the world. At the same time, the different barriers perceived by international users become evident, enabling the derivation of potential activities from an entrepreneurial perspective and – in some cases – from the political perspective as well.

The previous phases of the Future Study are also interlinked – for the key topics and future trends identified in the previous studies formed the foundation for defining the life situations and developing the corresponding scenarios. In this regard, the current study meshes seamlessly with its predecessors, complementing it by contrasting the end user's perspective with that of the experts. Since it is ultimately the end users who will decide on the use and spread of future ICT in their daily lives, and thus on the success or failure of the new applications and concepts, valuable information can be gained for future perspectives and system designs in the area of new ICT and media – even if it remains difficult to anticipate, just like any attempt to peek into the future.

The study was carried out jointly by its editors MÜNCHNER KREIS, EICT, Siemens, Deutsche Telekom, TNS Infratest and ZDF and its partners the IT representative of the Bavarian State Government, Bird&Bird, Daimler, Deutsche Bank, Google, Sony, Technische Universität München and VDE (ITG). Creative support was provided by mc-quadrat and deep innovation. The German Federal Ministry of Economics and Technology supports the study as an official project of the Sixth National IT Summit.

"We wish to thank all those involved for their tremendous commitment and hope that the results provide informative insights – from the perspective of today's users – into future applications for the addressed life situations in an international context, which can be reflected in the designs of the future processes."

Deutsche Telekom

Dr. Heinrich Arnold
Head of Innovation Development,
Deutsche Telekom AG, T-Laboratories,
MÜNCHNER KREIS e. V.

IO

Foreword
Deutsche Telekom.

Every day, a multitude of ideas with the potential to change the world are born. Yet only a few of these ideas are suitable for a successful market launch. Identifying and implementing these specific ideas are the greatest challenges faced by innovation managers. Successful innovations that do not take customer needs into account are unthinkable; to the contrary: the success of innovations is increasingly dependent on user involvement in the development process.

In this context, I am very pleased that this year's Future Study took on the challenge of examining ideas and their acceptance by customers in more detail. The studies conducted by and with high-ranking experts in past years have helped to identify promising directions for future developments in the area of information and communication technologies (ICT). The 2011 Future Study now goes a step further and examines the value of the generated ideas and their perception as innovations from the consumer perspective. The aim was not to measure user acceptance of specific products or services. Instead, the future hypotheses and application scenarios developed by the experts were subjected to the litmus test of a consumer survey. To achieve this, the abstract technical concepts of a future world of ICT were first refined and transformed into "pictures of the future", which were then examined and verified together with end users.

As such, this fourth volume of the Future Study completes the circle of a theoretical and socio-technological examination of the future of ICT. The next, most important step must now be to utilize this information, to make informed decisions and determine the actions that will result in potentially more successful innovations. As reality unfolds, the accuracy of previously formulated statements and forecasts will be revealed. The change of perspective taken with this year's study shows that the involvement of users can make an important contribution toward verifying such statements and forecasts – thus playing a major role in determining the probability of their occurrence. Accordingly, this study supports innovation managers – in industry, science and politics – in seeing the big picture of the future of ICT, taking technological possibilities and actual customer needs into account, while at the same time underscoring the societal and economic responsibility of these players.

We wish to thank all those involved for their extraordinary efforts, which have resulted in this study, which will continue to determine our actions, as well. At the same time, we are proud to have contributed toward a study that not only deals with the subject of innovation, but was also carried out in an innovative, future-oriented manner itself.

ZDF

Dr. Bernhard Engel
Media Officer,
ZDF Media Research

Of all the activities people in Germany undertake, media consumption – at an average of 9 hours and 43 minutes daily – is by far the most relevant share of time spent; the picture is similar in other countries as well. The equipping of households with devices, services and software from the consumer electronics sector and high growth rates in digital media, production resources and advertising media are increasingly making media a relevant economic factor. Electronic media in particular are linked generally with information and communication technologies (ICT), as both drivers and users of new developments.

"Pictures of the Future in a Digital World. An international comparison of user perspectives." focused on the user perspective in its fourth phase. Questions in the media area concentrated on television and a future scenario entitled "my personal TV". This term groups together several different options for which some of the technology is already available, but has not yet reached a mass market. "My personal TV" is not an "innovation from scratch"; people already have television sets that they use and enjoy. Enhancements to television are welcome, but potential trade-offs are being anticipated and followed.

Because media serve human emotions, the end user perspective of this study is particularly relevant. Subjective assessments, lifestyle quality and communication about use are especially important in the media sector, differentiating it from the other areas covered in the study.

The visible convergence between information and communication technologies and digital media is creating new possibilities for television. With this convergence, the term "medium" is regaining some of its original meaning: a medium is an arbiter of content, and the same content can be transmitted by different arbiters. In the media business, this somewhat academically formulated situation is often circumscribed as the "uncoupling of content and dissemination platform". In the age of digital media, content can reach users in different locations, at different times and in differing levels of quality. Although the ICT behind its dissemination is getting more complex, it is becoming subjectively less perceivable to users: in fact, it is becoming transparent. This also shows that externally defined restrictions to specific platforms are very difficult for people to understand.

With IP-based use in particular, current key ICT issues are becoming benchmarks as to which of the technically possible options for "my personal TV" will ultimately be successful. Permanent access, secure identity, protection of privacy and support for navigation are crucial basic conditions for developments in the media area. This is in addition to the technical and social skills needed to use the technology efficiently, which play a particularly important role in the media area.

The study shows that there are strong differences between countries in their estimates as to whether people would use personal TV. In light of the global availability of hardware and services, this indicates that cultural differences are at work. Some are "braver" than others: Brazil and China are far ahead, while Germany and Sweden bring up the rear. This finding is relevant: above all, it means active steps are needed to improve the innovation culture in Germany.

This is just what the MÜNCHNER KREIS Future Study has been doing for the last four years: making an active contribution toward shaping the future. Once again, this year's results encourage us to discuss the future, anticipate possible development paths and establish benchmarks and connections between industry sectors. This is the reason why we supported the project this year as well and look forward to lively discussion of the results.

Information Technology Society within VDE

Prof. Dr.-Ing. Ingo Wolff
Chairman of the Information Technology Society within VDE (ITG), MÜNCHNER KREIS e. V.

Statement by the Information Technology Society within VDE.

The Information Technology Society within VDE (ITG) is an interdisciplinary scientific society within VDE e. V. (the not-for-profit Association for Electrical, Electronic and Information Technologies). With its committees of experts, consisting of more than 1,000 members from science and business, the ITG discusses the results of scientific research and ICT applications, holds conferences and authors studies and position papers.

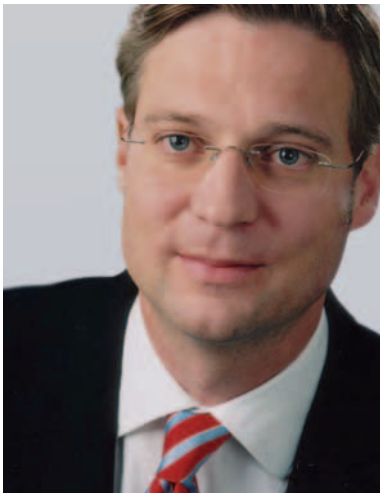
Current topics include the smart grid, the intelligent energy supply grid of the future, particularly from the perspective of the information and communication technologies (ICT) that it requires; the smart home with its necessary infrastructure and technical equipment; embedded systems, including sensor networks and the advancing computer-physical systems as a covert driver of innovation in business (in traffic management systems and driver assistance systems, for example) and security in information and communication networks and equipment.

The ITG and MÜNCHNER KREIS are two neutral, specialized societies whose mission is to further develop information and communication technologies and their applications. As such, the two societies have long enjoyed fruitful collaboration. It should therefore come as no surprise that the topics discussed in the study are prevalent at both societies; after all, they deal with the very same future developments that are debated at ITG events, sometimes together with MÜNCHNER KREIS.

The ITG has been an active partner of the project since it began in 2008; its experts have been tightly involved in authoring the studies. In the past four years, the expertise at the ITG and its large number of members have made a major contribution to the study's contents.

Particularly with regard to VDE future topics mentioned above – electromobility, traffic management, smart grid, smart home and smart building – the questions raised in the study in association with the 'anywhere' desk, the autonomous car / car on demand, the lifetime data safe and the home healthcare assistant – especially their impact on our daily lives and the controversial issues they imply, such as data security and privacy – play a major role.

In my opinion, we have created a highly interesting study once again this year, with many new insights and surprising answers. In addition to a financial commitment, the Information Technology Society within VDE was pleased to participate in developing the study itself again. We hope to continue our collaboration with MÜNCHNER KREIS and the other editors and partners for the coming year. I am convinced that you will also find the results of the study exciting and I hope you find it interesting reading.



Methodology.

Robert A. Wieland
Managing Director,
TNS Infratest GmbH,
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For the fourth successive year, the MÜNCHNER KREIS project partners have scrutinized the future of information and communication technology (ICT) and media, to describe their particular importance for societal and economic development, along with the associated challenges. After past years, in which – starting with a determination of the status quo – we used qualitative and quantitative expert surveys to describe the future of ICT and media from the experts' perspective, this year's study changes the perspective. This time, the private users of ICT and media have their say. The study for the year 2011 focuses on people from six countries, who assess developments in ICT and media based on their particular backgrounds. This point of view makes it possible, for the first time, to illustrate attitudes, preferences, and even reservations and fears of those surveyed with regard to specific, innovative "pictures of the future" – in an international comparison.

This switch to the user perspective represents an important step toward estimating the future of ICT and media. Involving people in the development and design of future trends and technology at an early stage helps to reveal their fears and reservations, to better tailor the innovations – and the corresponding communication – to individual needs. The team of authors shows which topics are particularly significant for Germany's economic and societal development, identify the role played by interdisciplinary collaboration and describe how Germany stands in international comparison. In the framework of this study, potential development vectors were compiled, to help players from politics, business and science to drive the future of ICT and media forward, together with users and for users.

Creating the questionnaire.

Building on the core topics identified in the previous phases of the project, "Prospects and Opportunities of ICT and Media", 16 pictures of the future were developed as examples, to emphasize the ever greater integration of information and communication technologies – along with media – in various life situations and areas. The main issues involving the 16 pictures of the future, along with more detailed questions for the users, were developed in workshops with the team of experts that supported the projects. Qualitative pre-tests (think-aloud interviews) were used to review the questionnaire in advance, making it possible for the survey participants to identify potentially troublesome aspects and shape them for international field work.

Internet-based user survey.

An Internet-based survey was completed by a total of 7,231 regular Internet users in six countries: Europe was represented by Germany and Sweden, the Americas by the USA and Brazil and Asia by China and South Korea (referred to simply as "Korea" in the study). More than 1,200 individuals were interviewed in each country. The survey is statistically representative for regular Internet users between the ages of 18 and 70 in each country.

The participants were asked to answer a series of questions to describe their attitudes and reactions toward new technologies. Based on these questions, 30 percent of the people surveyed were identified in each country as being especially open to new technological innovations[1]. This group is identified separately at several points in this study and used as a comparison group called "innovation-minded participants". The results of all people surveyed are always listed by country, with the label "total" and respective country code.

Questionnaire.
The questionnaire consisted of three closely interrelated sections. Each respondent was asked the screening questions on personal characteristics first, followed by four of the 16 pictures of the future, selected by an algorithm at random. The second section contained 13 questions on each of the presented pictures of the future, and was answered in the same sequence by all those surveyed. This assessment of the pictures was followed in the third section by additional statistical questions and questions involving behavior and attitudes, including but not limited to ICT-related topics.

Presentation of results.
The results of this year's study are presented from several different perspectives and at several analysis levels.

The "Regions and Constituents" section shows:
- Attitudes, behavioral patterns and statistical questions in international comparison,
- Differences between all people surveyed and the innovation-minded participants,
- Results of four interdisciplinary topics: protection of personal data, willingness to pay, user friendliness and trust in technology.

The "Pictures of the Future" section shows:
- The detailed results on each of the 16 pictures of the future, grouped by subject, in seven life situations.

"We are pleased to open a new perspective on the prospects and opportunities of ICT and media together with you, and look forward to many interesting debates."

[1] The utilized approach corresponds to the FutureView™ model by TNS.

The Method.

Reasons behind this study, the timeline of the “Future Study” project and methodology profile.

The principle behind the "MÜNCHNER KREIS Future Study".

Prologue from the targets of MÜNCHNER KREIS:

"Around the world, we are seeing the rapid development and spread of new information and communication technologies, along with new media. [...] They are having lasting effects on our daily lives, society and the global transfer of knowledge and expertise.

New technical infrastructures, platforms and services are an expression of these changes. They offer new access to information and communication, as well as to knowledge dissemination and education. The spectrum ranges from telemedicine and e-learning to entertainment, from production and consumption of goods and services to social networking and the design of modern, user-friendly government services.

The transformation to a connected information and knowledge society must be shaped through foresighted analysis and critical, constructive expert debates. This is the primary challenge for MÜNCHNER KREIS. [...]
Special attention is paid to the prerequisites needed to successfully enable incremental innovations to information and communication technology (ICT) and media. [...]

We must aspire to give individuals a demonstrative picture of the future of information and communication technologies, including media, to clearly illustrate the possibilities and potential consequences of innovation. With this, MÜNCHNER KREIS performs the task of preparing the general public for the process of progress, while at the same time attempting to record people's responses to new information and communication opportunities and take them into account in the system designs."

A variety of efforts will be needed to meet the demand for contributing toward illustrating and educating people about the changes in an increasingly digital world. The "MÜNCHNER KREIS Future Study" project is one of them. This study has become an important tool – not only for gaining insights into future trends in ICT and media, but also as a form of discourse with the societal groups that can influence and shape these trends.

Achievements to date.

The initial years of the "Prospects and Opportunities of Information and Communication Technologies and Media" – referred to in short as the "MÜNCHNER KREIS Future Study" (also known as Delphi Study) – were characterized by in-depth professional discourse on a wide range of subjects, based on quantitative and qualitative surveys of experts.

Enriched with the knowledge and experiences gained from the extensive results of the first three years of the project, a new focus for the 2011 Future Study was developed at the start of the year. A change of perspective was made for the fourth phase of the project, setting the focus firmly on the human factor. The result was a model that places people, as users of ICT and media, at the center of the study, shifting the focus to the user's perspective. With this approach, the project team followed their belief that it would enable new insights into developments, and thus into the design parameters at various levels. In particular, the experiences of consumers and users make it possible to open new perspectives for technological development and shaping of the digital future.

Objectives of the 2011 Future Study.

The results of the 2011 Future Study show how individual users – and innovation-minded users in particular – will experience information and communication technologies and media in the future. This will help identify the opportunities and obstacles that users see in the usage of ICT and media innovations. As such, the results can provide insights into which innovation fields seem to promise the most potential and/or prove difficult in coming years. The analysis shows how business and society will change with future developments in the ICT and media sectors; where potential for creating value will lie in future and how Germany can profit from this, both societally and economically; which potential obstacles may rise and which recommended activities can help to reduce and lower these obstacles.

Concept and methodology.

Changing to the users' perspective made it necessary to focus on specific topics. Accordingly, the focus has shifted from the broad spectrum of future-related topics for ICT and media to user-relevant applications. As a first step, the four topics "e-health", "e-energy", "Mobility" and "Media and digital life" were identified as the main points. To ensure that the topics and questions were selected according to a structured, theoretically-backed process, the specific application cases were aggregated alongside a pragmatic pattern of what is commonly thought of as the "future Internet": the Internet of Things, Internet of Services and Internet of Knowledge. The result was seven specific life situations that transform the basic questions into the users' needs. Therefore, despite the necessary reduction of topics, the systematic alignment with technological trends remains at a sufficiently broad level for a "MÜNCHNER KREIS Future Study".

The shift from the expert perspective to the user perspective also had many consequences for the study's structure and procedures. Instead of identifying and discussing scenarios for development trends and potential future ICT solutions, application cases were described in the form of "pictures of the future" elaborated as specific, daily life situations that users experience. Using "pictures of the future" as a methodological tool served an important purpose for the survey: the need to explain something that is unknown as yet, while "translating" a complex, highly technical vision into the language of users and consumers. Another important component of the concept was to surmount thought patterns and associations with known products and services, to open a "space of possibilities". To master this challenge, each picture of the future concentrated on just a few, central functions of future ICT applications. As such, when reduced to its core function, each picture of the future focuses on the needs and desires of people in a world that is being transformed by ICT and media.

The 16 final pictures of the future are the result of several panels held by the Future Study's team of experts – with representatives from public and industrial research – and weave their way through seven basic life situations encountered by users in a digital world. The differing numbers of pictures in each individual life situation is due to the results derived from the Delphi Studies from previous years, which of course cannot be applied to all life situations equally. People from six countries assessed developments and ICT and media, based on their own personal experiences, and estimated potential future functions of applications. This point of view makes it possible, for the first time, to illustrate attitudes, preferences, and even reservations and fears of those surveyed with regard to specific, innovative pictures of the future and debate them in an international comparison.

The Method.

The principle behind the "MÜNCHNER KREIS Future Study".

This intensive survey of users in six countries – Germany, Sweden, the USA, Brazil, China and Korea – not only provides in-depth insights into assessments of expected future technologies, but also makes it possible to identify societal and cultural differences. These functions serve as proxies for the nearly infinite number of new products and services that modern people expect in a world that is becoming ever more mobile and digitized, automated and transparent – which open countless new perspectives while creating a number of risks and security issues at the same time.

In addition to the change of perspective toward the user, the structure of this year's study also differs. The project team felt it important to make the survey and analysis processes as transparent and comprehensible to readers as possible. While the classification of the pictures of the future into the seven life situations corresponds to individual needs, enabling modular access to the individual results, the structure of the individual chapters makes it possible to comprehend the research process. The introduction to each life situation is its classification in the context of a greater problem, which forms the starting point of the examination. When the picture in question is portrayed, both visually and with a text description, readers can reach their own assessment first, then compare it with the survey data and go into more depth with the experts' analysis. To aid understanding of the summarized picture of the future, the technological foundation and current state of research are described in brief. The state of realization and implementation is also described for some of the pictures. The results are also presented using this step-by-step approach. The results are initially reported at a strictly descriptive factual level; the continuation and in-depth classification then take place in a detailed, specialized article. This not only ensures that the methodological process is transparent, but also attempts to capture an additional level for expert dialog about the pictures of the future in a digital world.

The Method.

The principle behind the "MÜNCHNER KREIS Future Study".

Classification of the method.

Future researchers can no longer rely on many of their former methods. In light of the incredible dynamism of developments, the frequency of disruptive innovations and high level of complexity, conventional instruments such as forecasting, trend research and even scenario analysis have met their limits or deliver results that are sketchy at best. All the same, it is still necessary to gain insights into the future of ICT and media, primarily to help shape it.

The approach of the "MÜNCHNER KREIS Future Study" to this challenge is multi-faceted. It combines established procedures with new ones, for example, the Delphi survey in 2009 with moderated online discussions in 2010; it supplements the quantitative core specifically with qualitative research phases and elements, and its general orientation is trans-disciplinary. Working on the future of ICT and media in the range of topics covered by MÜNCHNER KREIS and its involved organizations is a long-term undertaking. The Future Study can be seen as an iterative process – in the temporal dimension of four years – with constant review, adjustment, continuation, aggregation and interpretation of results, combined with any necessary reorientation. An approach like this requires periodic evaluation of the current situation, which includes defining a new starting point from which the next step is taken.

It is the project team's responsibility to carry out this evaluation and to continue the Future Study as a research concept. The project team's staffing, from different disciplines and from academia and industry, makes competition for positions and recommendations from the results particularly intensive – but also innovative, by bringing surprising results, unexpected constellations and even unforeseen overarching patterns to the fore. To date, the project team has managed to strike a balance between continuity and transformation, not least through its composition: around half of the team has been active for the full four years of the project, while the other half consists of people who only had peripheral involvement with the project, if any. And this is of primary importance with regard to the transfer of the results. The goal of the "MÜNCHNER KREIS Future Study" has always been to leave the realm of pure research and help shape the future of ICT and media in society. This competition for positioning has always been characterized by attempts to reach a large clientele and to disseminate the results to decision-makers from the many sectors of society. Seen from this perspective, the "MÜNCHNER KREIS Future Study" is also an exercise in translation: conveying the results to the specific contexts and interest groups in the public and private sectors and translating them for different research cultures and across disciplines.

The results of this year's Future Study from the user perspective paint a multi-faceted picture with connections to a wide range of audiences. This applies to the economy in particular and to the companies located in Germany, with regard to market opportunities for new ICT solutions and future products. The results show whether people find anything positive in the pictures of the future and the functions they imply, or whether they are largely critical/negative and express concerns. They also illustrate vividly whether today's consumers understand a given picture of the future and would be willing to try it out. The data indicate whether or not the survey participants find a given topic relevant and exciting, and whether they think them feasible. Provisional conclusions can be drawn as to whether consumers will be willing to pay for certain functions in future or whether they will even use them at all, even if they were free of charge. The results also underscore the importance of shaping favorable framework conditions to promote innovation and use.

The results of the pictures of the future supply ample substance for multi-faceted, international debate for a wide range of audiences who will play a role in shaping the future of ICT and media. They provide a new framework in which the future can be shaped in more detail, depth and precision and illustrate the diverse potential for the societal players – socio-culturally, politically, technologically and economically.

But please read for yourself!
The 2011 Future Study project team looks forward to the debate on the findings described herein.

The Method.
The principle behind the "MÜNCHNER KREIS Future Study".

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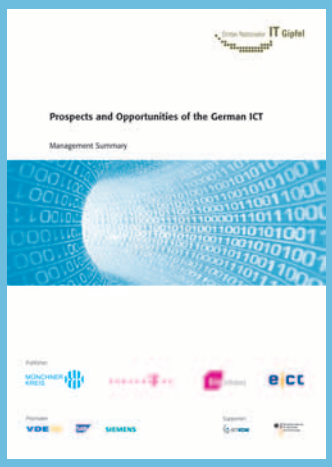
Timeline of the “Future Study” project.

2008
Exploration



Dritter Nationaler IT Gipfel

Method:
Preliminary survey of MK[1] members, secondary analysis and quantitative survey of experts in Germany

Participants:
538

Infrastructure
Information Society
Structural Change
Drivers
Innovation
Human Factor
ICT

2009
Visions

Nationaler IT Gipfel
Stuttgart 2009

Method:
International Delphi Study (quantitative survey of experts)

Participants:
551

Web 2.0
Digital
IT Security
Green IT
Automobile
Future
Media
ICT
Broadband
E-Energy

[1] MÜNCHNER KREIS

The Method.
Timeline of the “Future Study” project.

The Method.
Timeline of the "Future Study" project.

2010
Impulses

Nationaler IT Gipfel
Dresden 2010

Method:
International qualitative and quantitative surveys of experts

Participants:
977

ICT
Europe
New
Framework
Business Areas
Future
IT Security
Openness
Responsibility
Education
Skills

2011
User perspective

Nationaler IT Gipfel
München 2011

Method:
International quantitative survey

Participants:
7,231

Change of Perspective
Willingness to Pay
Reservations
Users
Human Factor
Innovation-Minded
International
Life Situation

Methodology profile.

MÜNCHNER KREIS

Editors, partners, creative support

Volume I to III

2008 2009 2010

Vision
Foundation Opinion
Concept Approach
Plan Idea Thought
Inspiration
Proposal Suggestion
Brainwave

User perspective

1: Learning and knowledge.
2: Work and organization.
3: Entertainment and storage.
4: Living.
5: Staying healthy.
6: Maintaining mobility.
7: Consumption and payment.

Pictures of the Future

16

+

Questionnaire

Questionnaire with 13 assessment questions, plus questions on attitudes, behaviors and estimates on various situations and statistics

Method of data collection

Computer-assisted web interviews (CAWI)

Survey focus

6 countries

Survey period

23 days

From Aug. 17 to Sep. 8, 2011

Population

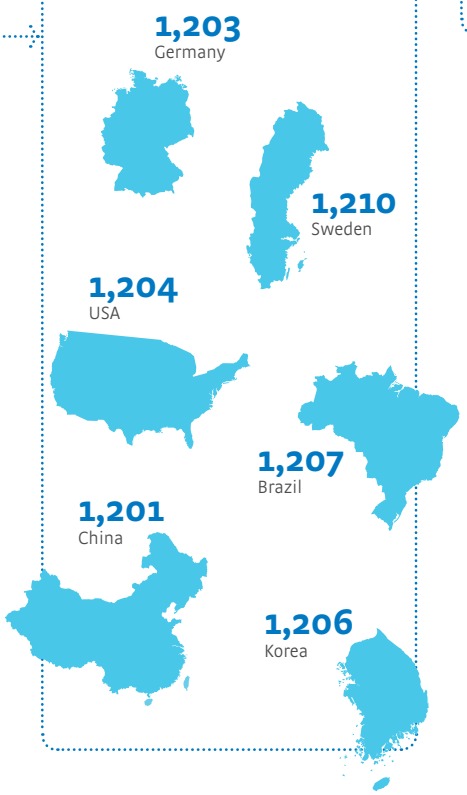
Persons in private households, aged 18 to 70, who use the Internet regularly.

Online panel, data weighted according to primary characteristics (gender, age and formal education), results representative for the population

Countries surveyed

7,231

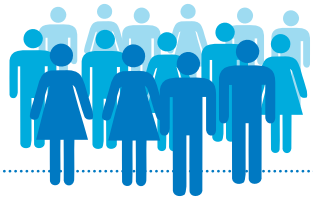
Interviews conducted



Description and interpretation

38

Authors



At a glance.

Method of data collection
Computer-assisted web interviews (CAWI)

Reporting period:
Aug. 17 to Sep. 8, 2011

Interviews conducted
Total n=7,231; per country >n=1,200

Population
Persons in private households in German, Sweden, the USA, Brazil, China and Korea aged 18 to 70 years, who use the Internet regularly

Representative survey
Results are representative of the population

The Messages.

Management summary and summary of study and recommendations for action.

Management summary.

Users decide what the future will look like.

How do users assess the potential of a future digital world? This question was the focus of the fourth Future Study by MÜNCHNER KREIS and its project partners.

Ultimately, it is acceptance by users – based on their individual experiences – that will provide the impetus for future technology development. Accordingly, people – in their respective societal and cultural environments, with their attitudes and willingness to try, and even their reservations and fears – are the focus of the study.

The objective is to analyze how private users, particularly innovativion-friendly users, judge future ICT applications for typical life situations, which opportunities and barriers they perceive, which country-specific differences can be identified and which recommendations for action result for politics, business and science. The "picture of the future" is a methodological instrument that was used to illustrate potential future uses of ICT in specific daily life situations in an easily understandable manner. 16 pictures from seven basic life situations are used as examples for numerous other applications. A representative survey was conducted of 7,231 regular Internet users in private households, between the ages of 18 and 70: Germany and Sweden for Europe, the USA and Brazil for the Americas and China and Korea for Asia.

Challenges identified in the international comparison.

The international comparison shows significant differences in willingness to use ICT applications daily. The data impressively reflect the strong willingness in major growth countries of Brazil, Korea and China. Germany, Sweden and even the USA lag behind in this aspect. For Germany, as a technology-exporting nation, the task is to achieve the best possible positioning in these leading growth markets. Doing so requires detailed appraisals of the developments in these markets and the user perspectives of future ICT applications. Therefore, the results for the pictures of the future described in this study can only be a first step (see "Region and Constituents" section).

Support for new ICT-based applications in Germany.

Germany possesses a high level of technological skills in the relevant ICT areas, but finds very few early test and deployment areas for innovative applications in its home market. In China, Korea and the USA, in contrast, there are not only different economic and regulatory structures for technologies and products; the willingness to try new things among end customers there is also greater – as the study results show (see the "Pictures of the Future" section).

Germany must choose from the following possible courses of action:

- To protect its competitive industrial position, German industry must increasingly participate in growth in the new leading markets, including ICT.
- Success in these growth markets requires coordinated activities from politics and business. Specific target market programs are needed to gain detailed insights into ICT markets and users and convert them into promising applications.
- Products should no longer be developed primarily for the home market. To achieve lasting success, products should increasingly be developed for the so-called growth countries. Then, when strategically sensible, the reverse innovation method can be used to adapt them to the requirements of the home market. This, as well, requires coordinated activities among industry, politics and science.
- Boosting willingness to try ICT in Germany among end users, in business and at public institutions requires changes to framework conditions and more pilot trials.

Critical success factors for achieving acceptance of future ICT applications.

Privacy protection. Users around the world – and especially in Germany – have major fears about how their personal data is used. In particular, they fear the unauthorized storage and criminal misuse of their data. The increasing international importance of protecting personal data shown in the previous Future Studies has thus been confirmed from the user perspective. As a consequence, the statutory entitlement to protection of the individual and personal data must be embedded even more strongly in societal, political and individual awareness, as well as in institutional regulations.

In line with the primary importance of this topic, a "National strategy for the protection of privacy" should provide orientation for the technical functions that are needed to focus on the need to protect individuals in a digitized society, as well as provide specific assistance. The Secure Identities initiative of the Research Union is one possible starting point here. Based on the global sensitivity for this topic, Germany can develop the skills, functions and products (comparable to the environmental protection area) that can become a relevant economic advantage for Germany as a center of business. In addition, international harmonization of ICT systems will be needed – with regard to mechanisms for handling personal data – to boost the acceptance of ICT services overall.

Maximum user friendliness. User friendliness and ease of use are global, self-evident prerequisites for the acceptance and usage of new technologies and services. Successful products are setting new standards in this area.

Evolution of willingness to pay. There are significant differences in willingness to pay for technological innovations, both regionally and between applications. It is somewhat greater in Brazil, China and Korea. All the same, the user results now paint a more differentiated picture than the earlier trend of the "follow-the-free" mentality. A new willingness to pay is manifest for application such as healthcare, or for individual mobility services that offer comprehensive services in addition to mere information. It seems to be worth reviewing existing business models and putting together new, combined offerings. At the same time, the results show that the Internet is no longer seen as a strictly free medium.

Trust in IC technology. Around the world and across all applications, users fear system outages, poor reliability of the technology and immature solutions. This poses major challenges for business, science and politics. For example, they must explore the question as to how communication on the importance of beta-testing phases of products and services can help boost acceptance of the technology, or how trustworthy system designs – highly redundant and catastrophe-proof – can be actively developed and communicated. Trust in IC technology is especially critical to the success of newer developments, such as mobile e-commerce and dealing with personal data on the Internet (particularly with regard to permanent availability).

Future paths.

The topic areas of competency, security and new business areas in a digital society are being followed as continuous analysis paths in the series of Future Studies by MÜNCHNER KREIS. The pictures of the future from this Future Study have revealed new findings.

In addition to remarkable potential for innovative ideas that can be derived from all 16 pictures (see section "Pictures of the Future"), the insights gained in these three topic areas include the following:

Competency – abased on the life situation "learning and knowledge". Surveyed on the acceptance of the "electronic textbook", the results showed high approval worldwide that underscored the immense potential of innovative forms of teaching and learning. Germany is currently not one of the pioneering regions of this trend, which is essential for the required future basic qualifications of a modern society – and a successful economy. To capture its full potential, a new learning infrastructure will be needed, with the appropriate didactic concepts, teacher qualifications and across-the-board use. For education policies, this opens perspectives for the faster, broader implementation of ICT-based learning methods and instruments.

Security – based on the life situation "work and organization". Three surveyed pictures of the future – "the online data manager", "the lifetime data safe" and "the 'anywhere' desk" are harbingers of this trend. Long-term storage functions for personal digital data will become a new, key function for one's personal "digital life" and will represent a basic functionality of future economic and societal development. This will be accompanied by semantic search functions and automatic attribution, for example. The decisive factor here is that the secure storage, recovery and control of the data is provided for. This development will require scientific, technological and legal measures.

New business areas – through hybrid innovations such as the life situation "consumption and payment": functions for supporting and handling regular purchase and payment processes are widely accepted in western industrial countries when they result in increasing the temporal and geographical flexibility of an individual's personal life organization. New value creation networks result from connecting and enhancing merchandise distribution systems and logistics streams. The picture of the future "mobile shopping on my cell phone" examines the particular challenges of food transportation logistics in megacities, municipalities and rural regions with new "district functions" for local goods staging and distribution. The challenge here is to establish overreaching processes and interfaces with a wide variety of players, thus creating new logistics architectures.

The same applies to the life situation "maintaining mobility". The pictures of the future "autonomous car/car on demand" and "the personal mobility assistant" examined the potential of new mobility concepts that abandon the conventional paradigm of individual mass mobility. ICT-based applications offer myriad approaches to resource-saving mobility that enable multimodal transport strategies, more efficient traffic control and flexible, individual mobility without personal car possession. This is especially relevant in the industrialized west. Such a new mobility infrastructure will require stable coalitions between public and private players to enable the required investment and open longer-term perspectives.

By methodically involving users, this Future Study by MÜNCHNER KREIS and its partners focuses ICT development on the needs of people and society. The pictures of the future define impetus for the challenges and opportunities posed for technological and economic developments, which will be pursued further as we help pave the way toward the future.

Summary of study and recommendations for action.

An overview of the study

The focus of the fourth Future Study by MÜNCHNER KREIS and its project partners was typical users of ICT and media: their attitudes and preferences, as well as reservations and fears, with regard to selected future ICT applications. After all, it is ultimately the users, based on their individual experiences, who will open new perspectives for future technological development and the design of the digital future. A representative survey was conducted in six countries: Europe was represented by Germany and Sweden, the Americas by the USA and Brazil and Asia by China and Korea.

The aim was to analyze the following, based on an international comparison of the data:

- How average private users – and, as a subset, innovation-minded users – supported future information and comunication technology and experienced the performed functions in typical life situations
- Which opportunities and barriers users see in utilizing ICT and media innovations
- Which country-specific differences exist in the acceptance of new ICT and media
- What potential for value creation is identifiable and how Germany can benefit from this potential from a societal and economic standpoint
- Which recommendations for actions can be derived from the above for politics, business and science.

Method.
To illustrate potentially typical future uses of ICT in specific daily life situations to users in an easily understandable manner and transform them to the language of users and consumers, the "pictures of the future" were developed. They each show some of the few, fundamental functions of future ICT technologies in a typical personal and/or work context. As a consequence, users can not only better understand the respective underlying technology, but also incorporate them directly in their personal life context and decide whether or not they find them useful personally. The 16 pictures of the future that were used and serve as proxies for numerous other potential functions, can be divided into seven typical life situations: "learning and knowledge", "work and organization", "entertainment and storage", "living", "staying healthy", "maintaining mobility" and "consumption and payment".

Survey.
In the summer of 2011, an Internet-based survey was conducted of 7,231 individuals in private households, aged 18 to 70, who use the Internet regularly. Each participant was asked to assess four of the pictures, which were selected randomly. Each respondent also answered questions on attitudes, behavior and estimates (for example, on the protection of personal data, willingness to pay, user friendliness and trust in technologies). Based on their answers to 20 questions involving their attitudes and behavior regarding technology, a subset of innovation-minded respondents was defined in addition to the total group of those surveyed.

Key messages for the pictures of the future – overview

(1) Learning and knowledge.

Innovative forms of teaching and learning enjoy high levels of acceptance and willingness to pay worldwide.

The "learning and knowledge" life situation reflects the increasing importance of continuous learning. Everyone is increasingly being challenged to expand their personal knowledge and skills individually and in line with specific needs. Several different forms of conventional education and teaching are available, which can be enriched and even completely redesigned through the potential of new ICT and media. One example of an innovative educational concept is the "electronic textbook", in which the content and information needed for further education is made available on mobile devices in digital form. Novel forms of learning – such as networked, independent learning with interdisciplinary links – become possible.

The results of the study show that such innovative forms of teaching and learning have much potential. In fact, the people surveyed in all countries aside from Germany believe that the electronic textbook is already available or is about to be launched. China and Brazil show much more affinity to such forms of teaching, whereas skepticism is dominant in Germany, even though a large share of users is generally in favor of such a concept. The primary arguments against deployment are the resulting dependence on technology, the high costs, and fear of data misuse.

Politicians, in particular, must act to ensure that the immense potential for innovative forms of teaching and learning is utilized. Greater flexibility for change processes is needed in education policies, as a prerequisite to developing and realising the corresponding, balanced pedagogic and didactic concepts. Other necessary factors include accelerated expansion of network infrastructure across the board and an increase in media competency among the population, to be achieved through appropriate measures and funding. Businesses must ensure that suitable, mobile devices that are readily available on the market can be integrated, independently of a specific operating system, to enable ICT-based lessons that are based on an integrative education network with standardized content to take root.

(2) Work and organization.

ICT services to support required work and administrative processes enjoy high acceptance when they solve the user's region-specific problems.

In the "work and organization" life situation, we can expect more applications in future that support our daily work processes. For the digital world, this is represented by two pictures of the future: the online data manager, a software solution that organizes a user's data access and usage through Internet services on the user's behalf, and the "anywhere" desk, in which a user's smartphone grants access – via numerous network connections – to personal programs, data and computing power, which are present either on physical systems or virtually in the cloud. In addition, the "digital city service office" shows how typical bureaucratic tasks, such as those required by a relocation, can be handled online.

Wide receptiveness for the online data manager in all countries – aside from the USA!

The results for the online data manager show wide receptiveness – with the exception of the USA – toward the possibility of achieving a greater degree of self-determination and decision-making power over one's personal data. It seems to be a welcome application in China, in particular, to give users a certain amount of control over their personal data despite the lack of binding data protection laws. Willingness to pay is also highest there, as well as in Brazil. The majority of those surveyed would prefer a free-of-charge model overall, however. Overall, the online data manager has a realistic chance of acceptance and use in all countries

except for the USA, provided that it can guarantee deletion of the data by the Internet service providers and that the regulatory framework is enhanced such that the online data manager compiles with the highest existing requirements for data protection, as well as enabling switching to other online data managers. Politics and business are both called upon here.

'Anywhere' desk especially popular in Brazil, China and Korea.

Germany has the fewest people willing to use the "anywhere" desk in the international comparison, while major potential is apparent in China, Brazil and Korea. The willingness to pay is also greater in these countries than in the USA or Germany. The concerns voiced most included a fear of misuse of personal data, the costs of use and misgivings associated with the physical security of data and accessing it. In the end result, the application has potential, provided that politics and businesses succeed in implementing the suitable technologies and framework to protect against criminal misuse of data and strengthen the basic right to privacy of personal data.

The digital city service office helps solve region-specific problems, especially in Brazil and China.

The objective of the digital city service office is to enable the handling of typical bureaucratic processes online, by consolidating administrative services as online service packages. Receptiveness for it is high among most of the people surveyed – at least those outside the USA They seem to think this scenario is much more simple and solution-oriented than conventional visits to the authorities, which many think of as complicated. This picture of the future is received most positively in Brazil and China, as such services can help solve serious problems, such as the difficulty of visiting the authorities in person and brief office hours. In contrast, although this vision is judged positively in Germany, Sweden and the USA, the necessity is not perceived to be as great, because bureaucratic processes aren't required as often and because accessibility is good overall. The greatest barriers are perceived to be data misuse and a lack of trust – both in the reliability of the technology and in the provider of the online services. In consequence, the development and implementation of a digital city service office that meets user demands for security, reliability and credibility could succeed if users were explicitly involved in the complete design and development process. To do so, however, functional organizational structures will have to be abandoned in favor of an organization based on processes and services. This means examining existing concepts of customer integration, customer collaboration and process orientation in business and science for their transferability and enhancing them further.

(3) Entertainment and storage.

In the "entertainment and storage" life situation, two novel challenges in particular are apparent in an increasingly digital world: firstly, the trend toward digital content – such as photos, videos, electronic diaries and much more; and secondly, entirely new ways of accessing and using the conventional medium of television. These developments are reflected in two pictures of the future, the "lifetime data safe" and "my personal TV". The aim of the data safe is to enable the reliable, secure storage of digital content, together with the permanent, location-independent ability to retrieve and read such content through intelligent search methods. In contrast, the picture of the future for personal TV describes a vision of watching television independently of place and time, with convergent usage options and navigation through TV offerings through a self-learning program guide, which also makes it possible to exchange experiences and communicate with friends and family members.

The lifetime data safe is particularly well received in China, Brazil and Korea.

The generally positive assessment of its realism and uniqueness emphasizes the importance of the function for long-term storage and location-independent retrieval of digital content. Analogous to the other examples, receptiveness in the USA and Germany is once again lower than in China, Brazil and Korea.This could be related to a greater openness for innovation, but it could also be due to the fact that basic difficulties such as compatibility problems are solved by software systems in these countries. Here, as well, typical barriers include fear of data misuse and loss of data (especially in China), but also the unanswered question as to what happens to the data in case of death. A lack of nationwide broadband infrastructure – as in Germany, for example – poses a serious obstacle for location-independent data access. One clear result is that the quantity of personal digital data is increasing exponentially through the transformation to a digital society. As a result, the lifelong availability of one's one digital data can no longer be realized, neither technically nor temporally, by individuals. At the same time, the diversity of data objects is also increasing – just consider the certificates and other official documents that individuals have to manage over their lifetimes. An intelligent, long-term storage function in the personal usage context that makes data retrievable and readable – despite

the phenomenon of digital expiration resulting from incompatible data formats, programs and operating systems – as well as allowing secure, lifetime access will become one of the new key functions with technical and societal relevance. And although it represents a structural prerequisite along the path to digitization, no business case has so far emerged as an economic driver to shape the necessary development steps and framework. Accordingly, there is an urgent need for basic action through coordinated scientific, technological and political measures.

Openness to personal television differs vastly by country – not all functions are judged uncritically.

The various functions of "my personal TV" are assessed differently. The option of removing dependency on time receives comparatively high marks in Germany, while mobile forms of use and learning program assistants are less well received. Users wish to retain control of their program selection. Receptiveness to this picture of the future also varies internationally, with Brazil, China and Korea having the most positive figures. The most critical factor perceived in Germany is fear of misuse of data, while the respondents in other countries are more worried about high costs and, in some cases, navigation and orientation. Overall, an application of this kind can only be positioned successfully if it is based on a design that is clear, uncomplicated, and made for specific daily situations. Therefore, companies offering such services are advised to clearly emphasize the added value compared to contemporary television.

(4) Living.

No sweeping acceptance for individual energy or healthcare management in Germany!

The life situation "living" will be characterized by two major challenges in future, among others: firstly, the growing scarcity of conventional sources of energy, such as oil and coal, and the expansion of renewable energy sources will also open novel possibilities for private households. By modifying their consumption and generation behavior to price and weather trends, energy costs can be minimized and individual energy demand can be matched with supply. This scenario is reflected by the automatic energy manager, which draws on internal and external sources of information to take control of the complete energy balance. Secondly, as the result of an increasingly aging population, a shortage of care personnel looms in the long term. It therefore seems logical to develop new devices and media to support and carry out certain necessary activities, to enable as many people as possible to live independently at home, even in old age. This scenario is reflected in the "home healthcare assistant" picture, which can automatically prepare and serve food and drinks, clear away waste, dispense medicines at the correct time and carry out many other activities to support care staff.

Low willingness to pay and low sensitivity for the energy manager, particularly in Germany!

The widespread belief that the energy manager is already available today indicates a lack of transparency and sensitivity regarding an optimization in the energy and electricity area. The major arguments in favor of the energy manager are cost savings and protecting the environment; those against are fear of high procurement costs and reliability of the technology. Willingness to pay varies widely between countries. Overall, it is clear that electricity is not sufficiently transparent to many individuals, due to its permanent, easy availability. Therefore, for visions such as the energy manager to prevail, the primary need is for communication concepts that make electricity and its finite nature transparent, emphasize the necessity and benefits of new applications – including for private households – as part of the energy turnaround, point out the insecure nature of supply and continue to develop the regulatory framework. Municipal concepts such as "people's wind turbines" and "community power plants" with strong integration of residents, along with the installation of model regions such as the E-Energy program supported by the German Federal Ministry of Economics and Technology require the accompanying public relations efforts. Business is called upon to pursue the standardization of energy manager solutions and the corresponding interfaces. In particular, the technology behind the concepts must be enhanced to become reliable and simple to use.

The healthcare assistant is well received in China, but met with skepticism in Europe!

The healthcare assistant has a very large, receptive market in China, whereas it is largely met with skepticism in Europe. In particular, fear of losing social contacts, excessive costs, and mistrust of the technology speak against widespread deployment. Therefore, a prerequisite for introducing the healthcare assistant would be its inclusion in a comprehensive healthcare and old-age care model called "Autonomous life at home in old age," which stressed the following points

to build on the existing acceptance: support the maintenance and expansion of social contacts among those in need of care, create trust in the deployed technology and reimburse costs. This will require close collaboration among all those involved (doctors, health insurance funds and care and assistance staff), as well as a billing and reimbursement model that is integrated in the social-welfare system. While this largely involves the shaping of the political framework, business is called upon to take the individual technologies required by the healthcare assistant that are already available today and integrate them to create a mature, secure, reliable, easy to use, reasonably-priced system – but one that has a modular structure nonetheless. Only so will it be possible to tailor it to the differing care levels needed, along with specific cultural aspects. Another decisive factor is a region-specific marketing concept, one that might let people experience the basic assistance functions in a different environment, such as a hotel.

(5) Staying healthy.

Applications to support communication WITH doctors meet greater acceptance worldwide than applications to support the transmission of health-critical data TO the doctor.

The "staying healthy" life situation is closely related to "living", particularly in the face of an aging population and improving medical options, not to mention the tight cost situation in healthcare and the associated need to take responsibility for oneself. A prerequisite for this is excellent communication with doctors, who require near-time information on critical health values and changes on one hand, and whose diagnoses and recommendations have to be comprehensible to patients on the other hand. These requirements are modeled in three scenarios: telemonitoring involves recording health data remotely and transmitting it to the doctor, the intelligent doctor's report formats relevant medical information to help inform patients and electronic prescriptions serve as a replacement for handwritten or printed prescriptions.

Telemonitoring is met with the least acceptance in Germany and the USA!

The number of people who reject telemonitoring out of hand is highest in these two countries and Sweden. Moreover, only very few people were willing to pay for it. In contrast, a majority of respondents in China, Brazil and Korea would be willing to pay for such services, but only under the prerequisite that users can decide which values are measured and used. A relationship of trust must also be established on the user side. As a consequence, politics (and health insurers) are called upon to educate the general public, as well as implement legislative measures to ensure – or at least make it possible – that the population builds the necessary trust in telemonitoring and in the involved agents in the healthcare sector and in the security of their personal data. Businesses can glean from the survey results the fact that the market may not (yet) be ready for telemonitoring services and devices. It is possible, however, that willingness to pay might be tied more to the device itself than the service, which means bundled offers could help boost market access and success. Last but not least, science can interpret the results as a clear mission to concentrate on further simplification with regard to improving the underlying technology of the devices.

Only very few respondents are willing to pay for an intelligent doctor's report or electronic prescription.

Willingness to pay for an intelligent doctor's report is greatest in China. In Germany, as well, two-thirds say they would use the doctor's report. However, like with the healthcare card and electronic patient file, data protection and the basic right to privacy of personal data must be guaranteed. In particular, technical and regulatory measures must ensure that data can only be forwarded and evaluated with permission by the patient and cannot fall into the hands of unauthorized parties. In addition, it must not be possible to trace the data back to individual patients. It must also be guaranteed that data is not saved in online databases, and rules must be defined to determine who is authorized to delete this data (particularly when it becomes outdated) and replace it by more recent data. Moreover, continuous editorial and scientific examination of the provided background information is needed. Politics, business and science must develop technical solutions, uniform rules and organizational processes for all those involved (patients, doctors and medical service providers).

(6) Maintaining mobility.

ICT applications aimed at improving existing mobility concepts have a realistic chance if they can solve an existing mobility problem and if country-specific reservations are taken into account in their further development.

The need to optimize conventional mobility concepts is apparent: reaching one's destination accident free, or getting there without getting caught in traffic, is becoming ever more difficult as traffic density increases. While existing navigation systems can provide a wide variety of information, they do not allow end-to-end trip planning across multiple modes of transport, with all the necessary booking and payment processes. There is clearly demand for a way to bridge longer distances without needing your own, possibly cost-intensive car. All of these circumstances are modeled in three pictures of the future: firstly, networked "ambient communication" with the aim of enabling communication and networking among vehicles and between vehicles and the infrastructure, to output warning messages for hazardous situations in real time and directly in the vehicle. The other two are a "personal mobility assistant", which provides end-to-end support for users in planning and conducting trips – automatically booking all the necessary tickets and making reservations – and the "autonomous car/car on demand", which independently drives to a requested pickup point at a given time and then automatically delivers its passengers to their destinations (or is optionally simply driven).

A large proportion of users appreciates the information function of the personal mobility assistant, but rejects the personalized, automated processing function.

The personal mobility assistant integrates two functions: informing users and handling the necessary booking and payment functions. While nearly a third of Germans appreciate the information function, the option of automatically handling all bookings based on a user's personal preferences is largely rejected. As a consequence, the system is not met with great interest in most countries, although users in Brazil, China and Korea are the most open. Willingness to pay for such a service is also low overall. In Brazil and China, for example, only one-third of the population can imagine using such a service if costs were incurred. If the service were free of charge, at least half of respondents in all countries – with the exception of the USA – would use it. The primary arguments against use are privacy considerations and fear that the information would be opaque and/or unreliable. All the same, the end result showed that even if acceptance of the personal mobility assistant in the described form was restrained, a system like this could greatly simplify trip planning and execution for users. The implementation must be driven largely by business and science, who together must develop the suitable database and data mining tools to process the very large, heterogeneous datasets required for trip planning. The necessary data protection must also be ensured, particularly if the system is to handle payment transactions and personalized information is to be supplied. Politics and business are both called upon here – for example, to develop a multimodal mobility strategy for Germany with the objective of efficiently integrating the different modes of transport. This could involve the founding and funding of cross-industry initiatives for conducting appropriate reference projects, for example, in particularly targeted, interdisciplinary research funding of the underlying information, communication and traffic control systems by state and federal governments.

More than half of respondents would use an ambient communication function – but most of them only if it were free of charge.

The vision of achieving accident-free mobility through the deployment of cooperative ambient systems will become technically feasible from the year 2015. The majority of respondents in Germany, Sweden and the USA also foresee this in the near future, while a majority of drivers in China believe it is already available today. While a large proportion of respondents would use ambient communication if it were free of charge, just slightly more than a tenth of them in Germany and the USA are willing to pay for it. In this background, it is no surprise that costs are a major reservation. Interestingly, other reservations include the risk of information overload while driving (and the associated loss of concentration) and the reliability of the provided information. Such fears and reservations must definitely be addressed as part of the future development of these future-proof mobility concepts and countered by appropriate accompanying measures – particularly by politics. Business, namely the automotive industry, must declare its unanimous commitment to implementing ambient communication. The Car-2-Car Communication Consortium has launched initiatives at the European level to gain binding commitments from both

the automotive industry and the umbrella organizations of road operators to implement this technology from the year 2015. Politics should also state a clear commitment to introducing ambient communication and provide the necessary funding for infrastructure enhancement. The standardization of ambient communication at the European level must be completed as soon as possible, to enable rollout of the technology to begin in 2015.

Brazilians, Chinese and Koreans would like to have an autonomous car/car on demand immediately; Germans, Americans and Swedes are skeptical.

Acceptance of the picture of the future involving the autonomous car/car on demand, which also embodies a novel mobility concept, is mixed. Acceptance for autonomous cars is particularly high in China, Brazil and Korea, countries where motorization took place comparatively late (compared to Germany, Sweden and the USA), where possession of a driver's license or personal car is not taken as a matter of course, and where the sheer desire to cross distances without problems is greater than the mere joy of driving and owning a car that is more common in European countries. A large proportion of Koreans, Brazilians and Chinese expressed a desire for autonomous cars/cars on demand immediately or very soon, while many Germans see them more critically – 36 percent reject use completely, a comparatively high number. The primary arguments against use, named by a large share of respondents, were doubts in its reliability (and the resulting liability problems) and fear of high costs. Overall, autonomous cars such as a car on demand not only relieve the driver and make it possible to devote driving time to other pursuits, but also represent the key to completely new mobility concepts. The realization of autonomous vehicles and the mobility concepts they make possible will require coordinated action by politics, industry and science. Politics must fulfill the prerequisites to ensure that autonomous cars and automatic driving functions as incremental steps toward fully autonomous cars. This will only be the case, however, if industry manages to eliminate the reservations against autonomous driving, particularly those regarding reliability. Science and industry must work together to create the technical foundations to ensure that autonomous cars function reliably under all operating conditions. In addition, industry must counter existing reservations among users through targeted communication and by developing launch scenarios that incrementally lead to autonomous driving.

(7) Consumption and payment.

ICT applications to support and process conventional purchase and payment processes will be accepted by users if country-specific peculiarities are reflected and taken into account.

In our increasingly digital world, electronic commerce and mobile commerce continue to make advancements. The boundaries to physical shopping are blurring rapidly. Nonetheless, there are still obstacles that prevent consumption and payment habits from shifting entirely to the digital world, such as the dominance of physical means of payment (cash and credit cards) for both online and offline purchases, the importance of spontaneity and emotions when shopping (particularly limited sensory perception) and the need to submit physical identification to open an electronic account on the Internet. Reducing these obstacles further, or even eliminating them completely, is the aim illustrated in the "consumption and payment" picture of the future. The aim of "mobile shopping on my cell phone" is to allow the execution of spontaneous or emotionally driven purchasing decisions independently of time and space, by simply photographing and ordering the desired products via smartphone, for example, from catalogs or on posters. The "cell phone wallet" will not only integrate virtual loyalty cards, coupons, vouchers and tickets in a comprehensive security system, but is also to enable anonymous payment options in addition to conventional payments by PIN code. The final picture of the future in this area involves an enhancement to online banking: a scenario for end-to-end opening of an account on the Internet without requiring physical identification, along with an option for automated management of bills and invoices.

Chinese, Koreans and Brazilians will shop on their cell phones in future – users in Germany, the USA and Sweden do not find it nearly as attractive!

Acceptance of the vision of mobile shopping on one's cell phone varies widely by country. On one side are China, Korea and Brazil, with a very positive view, which is also expressed in a greater willingness of use and payment. On the other side are Germany, the USA and Sweden, with a carefully optimistic view, and with low willingness of use and payment overall. The reservations to use are even more differentiated. Germans fear misuse of their data most, while Swedes and Koreans shy the risk of defective goods quality and Chinese worry most that the goods on offer will be outdated. In

comparison, Americans and Brazilians fear excessively high costs. In this background it is clear that a globally standardized process to implement a service such as "mobile shopping on my cell phone" will be unsuccessful, since the societal, economic, and cultural differences are simply too great from country to country. In western industrialized countries, the factors for success will involve increased flexibility in organizing one's personal life, in the sense of achieving independence of time and place. In China, Brazil and Korea, the potential lies in a significant rise in basic personal benefit, such as the availability and quality of goods. These aspects must be taken into account in the further development of such concepts, as well as supplementary concepts such as goods and price comparisons, information about ingredients, health compatibility and nutritional information for foodstuffs. At the same time, business is called upon to examine the impact of and possible solutions for a logistics supply chain to the user's residence. This will require simulation of goods distribution systems and logistics streams in megacities, municipalities and rural regions, with new "district functions" for local goods staging and distribution.

The cell phone wallet is met with strongly differing reactions around the world – acceptance is especially high in Korea and China!

The benefits of a cell phone wallet are recognized more readily by users in Korea and China than by users in Germany. The most typical reservations are fear of data misuse and safety. These concerns are extremely high in Germany – interestingly even higher than average among innovation-minded respondents. Users are also skeptical about security of the payment function, whereas electronic archiving and provision of customer loyalty cards are seen as positive factors. As such, public relations work is needed in particular – jointly by politics, business and science – to make the possibilities for use more transparent and to demonstrate the benefits of the functions, to increase acceptance of the technology. In addition to the potential of this concept, the public relations campaign must address the concerns regarding data misuse, which appears in nearly every scenario. After all, the possibilities to block use, deploy passwords or simply delete virtual cash holdings represent very interesting solutions to protecting personal data and property better. If all this potential is illustrated more clearly and the electronic data wallet is linked with applications such as the online data manager, existing acceptance can be boosted even more. In addition, technical modification of the systems is required to enable use in retail outlets down to the smallest snack bar and stationery shop. Politics and the financial sector are also called upon to use new risk models and to continue developing a secure framework for anonymous digital payment.

The possibility to open accounts on the Internet with electronic invoice management divides users.

Acceptance of options for opening online accounts without media discontinuities, in combination with the electronic management of invoices, is split into the same division of proponents and skeptics seen in existing online banking transactions. While a third of the respondents in Germany and a majority in the other countries believe that immediate use would be possible, a sizable share of the people surveyed in Germany hopes that it will never become possible. In turn, rejection of the concept is greatest in Germany and the USA, while China, Brazil and Sweden are much more open to such an application. More than a third of the population in Germany and the USA would not

even use this service if it were provided free of charge. The picture is much different in China, Brazil and Korea, where three-quarters of survey participants were in favor, and in China, where a whopping 89 percent of respondents would use this service if it were free of charge. The greatest reservations – once again, differing by country – involve misuse of data, while costs are not perceived to be as problematic. Nearly half of respondents in Germany and two-thirds of Chinese and Koreans fear that the process for opening an account is insecure, a fear shared by only a quarter of the Swedish people surveyed. Overall, this vision has potential as a realistic niche application, if it is possible to establish a highly functional, generally accepted security infrastructure. In addition, legal obstacles must be eliminated – those related to written correspondence – particularly the formal requirements involved in communication with banks and electronic invoice handling.

Overview of key messages on interdisciplinary topics

In addition to their assessments of the 16 described pictures of the future, the respondents were also asked about four overreaching topics: privacy protection, willingness to pay, user friendliness and trust in technologies.

Users around the world fear the unauthorized storage and criminal misuse of their data!

With regard to protection of personal data, users everywhere are very afraid of the unauthorized storage and criminal misuse of their data – this fear is reflected in the assessments of the various pictures of the future. It is no surprise that this topic is seen much more critically in Germany than in China, Korea, Sweden, the USA or Brazil. At the same time, it becomes clear – especially in the field of data storage – that applications like the online data manager could become relevant in the future.

Although the importance of the security of personal data has been a key factor in discussions of the digital society for some time now and is even embedded in the German constitution (the basic right to privacy of personal information), discussions have not yet resulted in the advancement of any holistic, interdisciplinary solution approach. Technical security measures have merely been developed in sub-segments, to capture application areas that boost efficiency or reduce costs with a perspective toward adding value (healthcare card, identification cards, streamlining of administrative processes). Overreaching initiatives have only been introduced to counter tangible risks resulting from the growing vulnerability of ICT-based systems, such as the "National strategy for critical infrastructure protection (CIP Strategy)" from the German Federal Ministry of the Interior and the associated activities by the National Cyberdefense Center.

Therefore, from a societal and individual perspective, it has not yet been possible to guarantee protection of privacy and personal data – which is an explicit claim of the German constitution – through the measures needed to embed it in the general consciousness and become widespread in ICT systems. Only then can this basic claim for protection be raised to at least the same level as is currently valid for goods, equipment and the maintenance of business functions and national security. A "National strategy for the protection of personal data" is required here to provide orientation for the necessary technical functions.

This could result in an economic advantage for Germany as a center of business. The security of personal data could become an increasingly relevant component of solutions offered by the German software industry, since they already have proven competency in the security area. The internationally increasing importance of this area, already forecast in previous Future Studies, has now been impressively confirmed from a user perspective in this study, underscoring the breadth of the potential application area.

Depending on region and application, there are strong differences in willingness to pay for technological innovations, which makes it necessary to examine and assess each from a market-specific and user-specific perspective. At the same time, the results show that the Internet is no longer seen as a strictly free medium.

The picture of costs and willingness to pay is differentiated. In an international comparison, Germans are less willing to pay for certain applications. In contrast, respondents in Sweden and China are more afraid that future applications will cost too much. This fear is greatest among Brazilians,

who at the same time have the highest willingness to pay. Differences in willingness to pay are not only country-specific, however; this willingness also varies widely among the different applications illustrated in the pictures of the future. It is relatively high for the electronic textbook, for example, but rather low for applications such as the personal mobility assistant or opening accounts on the Internet. At the same time, it is clear that the Internet is no longer automatically perceived as a free-of-charge medium, but rather that a basic willingness to pay exists. Since this willingness is country- and application-specific, however, we recommend that business carry out a market- and user-specific survey for each new ICT development and enhancement.

Users around the world expect user friendliness and ease of use as a matter of course!

The results are clear: user friendliness and ease of use are important in all countries and for all applications and are a primary prerequisite for the acceptance and use of new technologies and services. At the same time, this aspect does not play a major role for the people surveyed – it is simply a self-evident prerequisite for the development of every new ICT function!

Users of all applications in all countries are afraid of technical failures, unreliable technology, incorrect use and the corresponding liability issues!

With regard to the topic of "trust in technologies", respondents in all countries and for all pictures of the future agree: the greatest technology-related fears involve failure of the technology, reliability issues and incorrect use – along with the corresponding liability issues. This poses a major challenge for business, science and politics. To gain and strengthen users' trust in new technologies, the underlying technologies must work reliably, and this must be communicated credibly. This applies particularly to applications in areas with increased sensitivity, such as healthcare, mobility and financial transactions on the Internet. The more sensitive the application, the more stable the expected functions must be. Market success will strongly depend on whether mature technological solutions are selected for the implementation process of these sensitive applications. The process can be influenced positively through accompanying scientific research of acceptance of the technology, along with proactive information activities during launch.

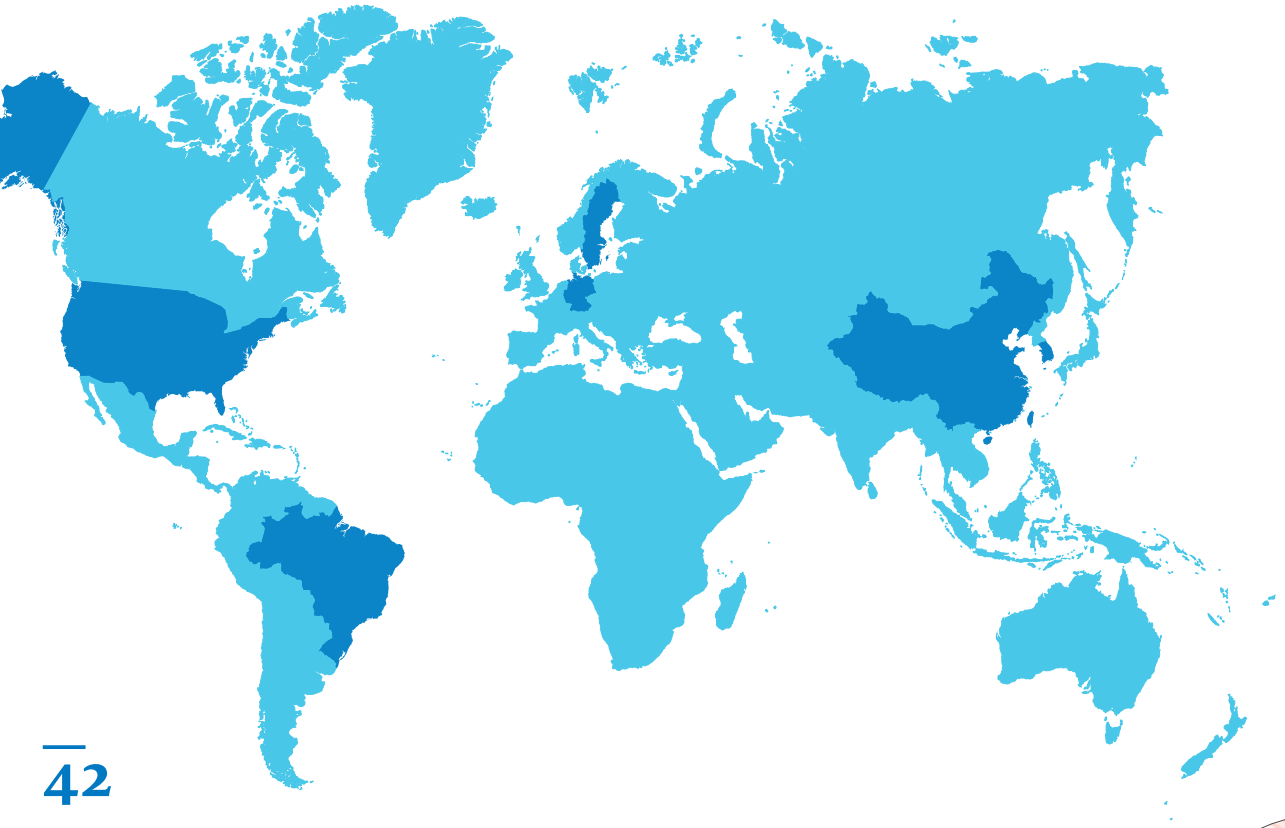
Users are very interested in new technologies and enjoy talking about them!

An open information policy will encounter willing ears, since – as the survey clearly showed – general interest in new technology is high, as is the willingness to talk about it.

This potential must be explored. It would ultimately be a missed opportunity if the pictures of the future described in this study – and the future ICT-supported functions that build upon them – failed to achieve the broad penetration that the results of the study would imply due to problems with data protection/privacy, security or other open issues in the various countries. The outlined potential of the ICT is immense. To capture it, politics, business and science are all called upon to develop and enhance the technological functions outlined in the pictures of the future, promote this development through the targeted launch of research projects and funding support, and accompany development through fine-tuning of relevant laws of regulations and comprehensive public education measures. At the same time, society must become more receptive to digital changes and cannot wait until practicality has been demonstrated in other countries and all critical questions have been dealt with.

Regions and Constituents.

A closer examination of the six surveyed countries, overall and innovation-minded participants and an analysis of the interdisciplinary topics on the protection of personal data and privacy, willingness to pay, user friendliness and trust in technologies.



Regions and Constituents.
Overview.

Overview.

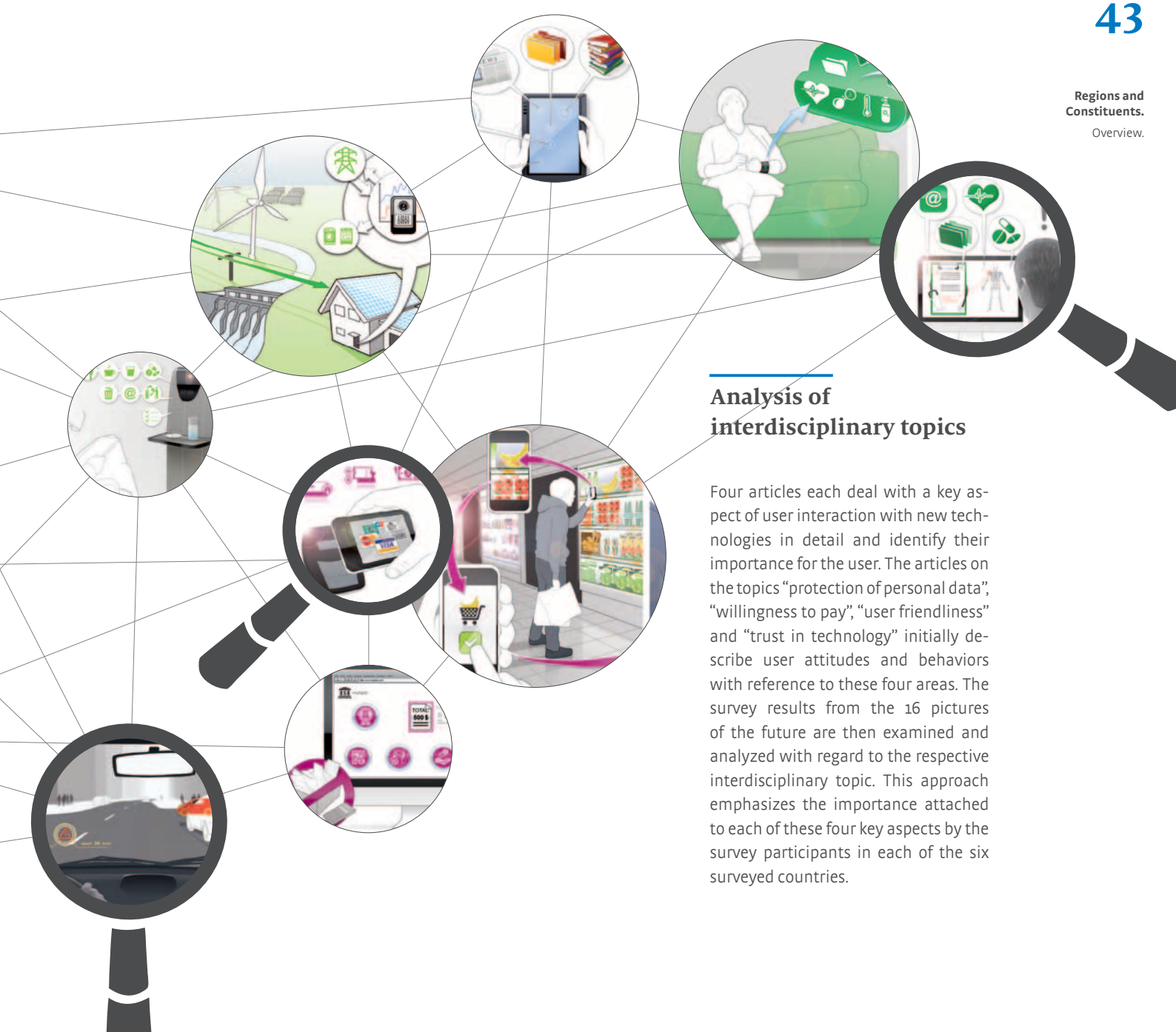
The countries in detail

The country profiles provide an overview of the economic importance of the six examined countries and information on their respective populations.

Information is provided for each country, for example, on Internet use, ownership and use of technologies, use of media, lifestyles and their predictions for the future. This "characterization" of the countries, based on survey answers and secondary data, provides a foundation for interpreting the survey results from the 16 pictures of the future.

Comparison of total participants and innovation-minded participants

This study reports on the results from all participants; however, answers from "innovation-minded" participants are also provided in many cases. Innovation-minded participants are people who are particularly open to new ideas in the technology area and who actively represent and help disseminate them. The group of total participants always includes the data from the innovation-minded participants as well. A comparison of the two groups reveals significant differences in socio-demographic characteristics, as well as in attitudes and behaviors. This background information makes it easier to interpret the respective results of the two groups for the 16 pictures of the future.



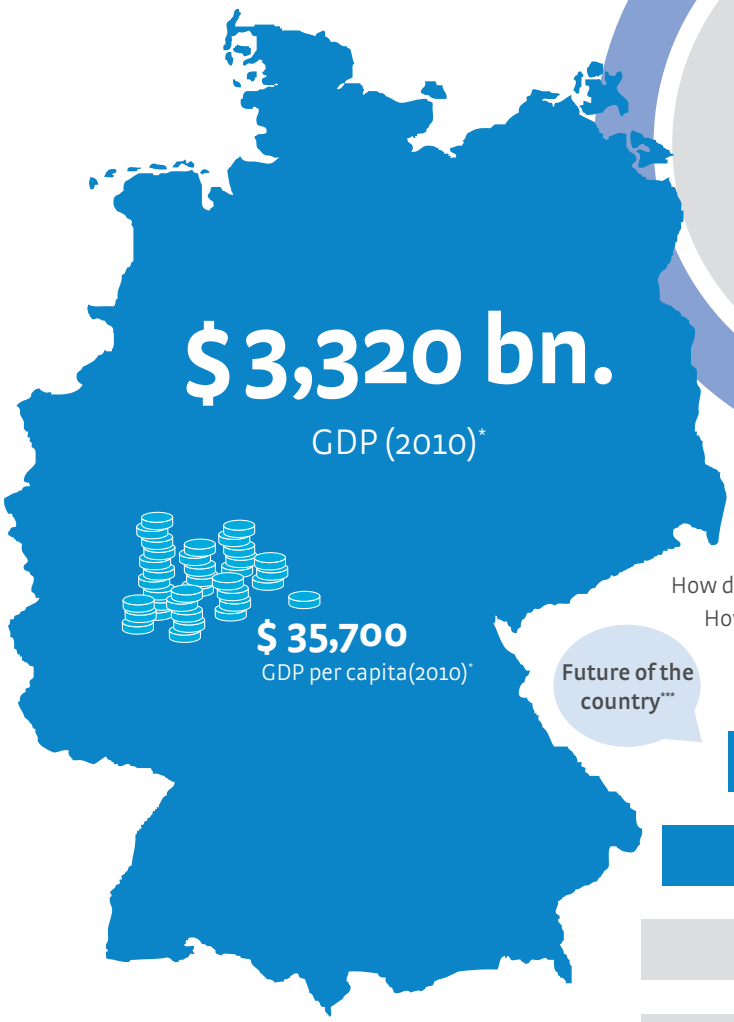
Analysis of interdisciplinary topics

Four articles each deal with a key aspect of user interaction with new technologies in detail and identify their importance for the user. The articles on the topics "protection of personal data", "willingness to pay", "user friendliness" and "trust in technology" initially describe user attitudes and behaviors with reference to these four areas. The survey results from the 16 pictures of the future are then examined and analyzed with regard to the respective interdisciplinary topic. This approach emphasizes the importance attached to each of these four key aspects by the survey participants in each of the six surveyed countries.

Germany in detail.

Overview of country-specific survey results.

Economy and society



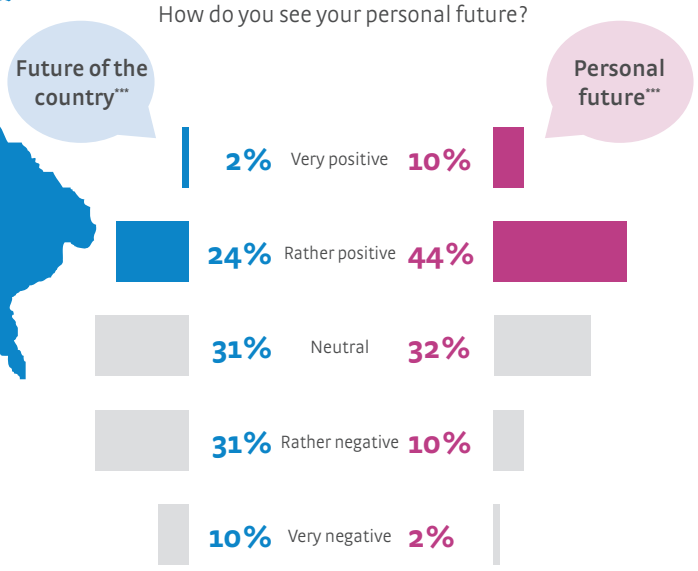
$3,320 bn.
GDP (2010)*

$ 35,700
GDP per capita(2010)*

81.9%
use the Internet (2010)**

81.5 m.
residents (2011)*

How do you view the future of your country?
How do you see your personal future?



9%
travel more often for business and

14%
do more personal travel than they used to

52%
work at least **30 h** per week

* Source: CIA Factbook 2009-2011 ** Source: ITU 2010 *** Less than 100 percent: Don't know / no answer

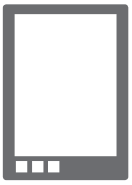
Basis: all people surveyed, Germany (DE) n = 1,203

Ownership and use of technologies

105 m.
cell phones (2009)*

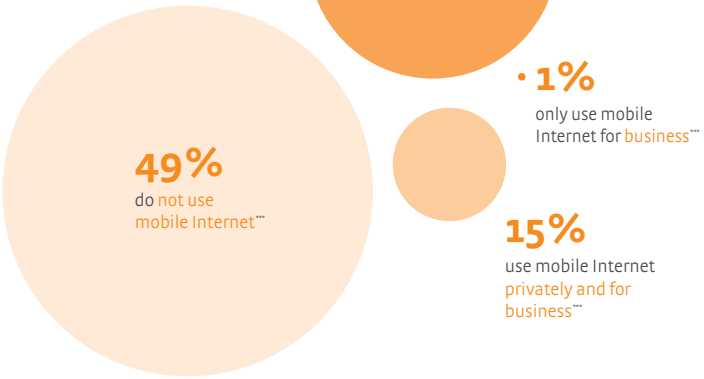
53%
own a notebook or netbook

29%
own a smartphone



7%
own a tablet computer

20% often use social networks such as Facebook to keep in touch with friends and acquaintances



Media and living

23% TV
47% Internet
23% radio **17% newspaper**

Share of those surveyed who would miss the medium very much

17%
exercise regularly

10%
say: "I always eat healthy foods"

9%
are opinion leaders, that is, their friends and family members often ask their advice about new technology products

12%
say: "My life just keeps getting busier and busier"

7%
rarely seem to have time to do the things that are really important to them in their lives

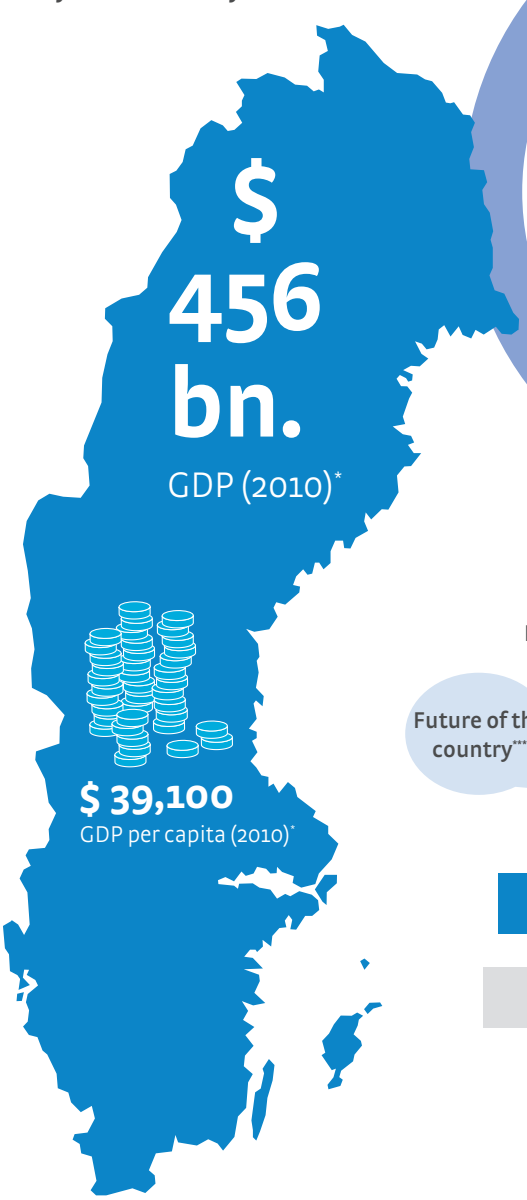
Sweden in detail.

Overview of country-specific survey results.

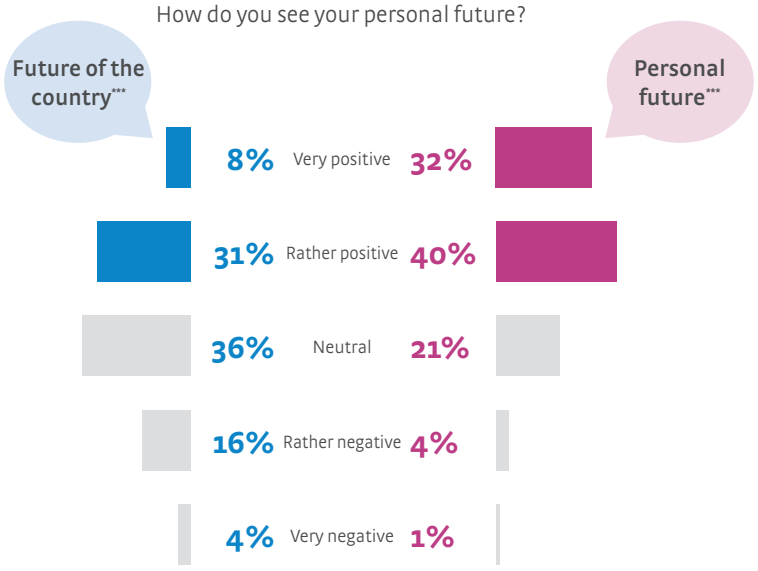
Economy and society

90.0%
use the Internet (2010)**

9.1 m.
residents (2011)*



How do you view the future of your country?
How do you see your personal future?



4%
travel more often for business and

11%
do more personal travel than they used to

53%
work at least **30 h** per week

* Source: CIA Factbook 2009-2011 ** Source: ITU 2010 *** Less than 100 percent: Don't know / no answer

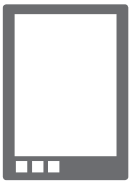
Basis: all people surveyed, Sweden (SE) n = 1,210

Ownership and use of technologies

11.4 m.
cell phones (2009)*

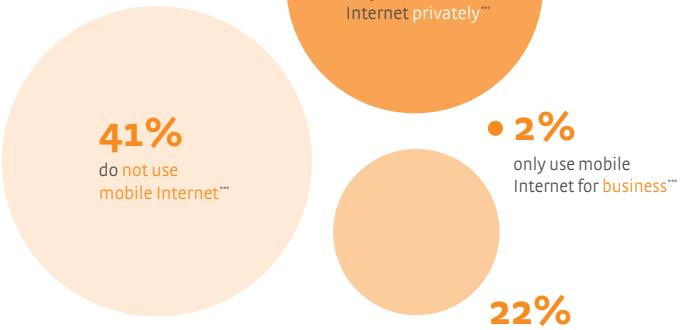
23%
own a notebook or netbook

38%
own a smartphone



10%
own a tablet computer

25% often use social networks such as Facebook to keep in touch with friends and acquaintances



Media and living

23% TV
50% Internet
20% radio
18% newspaper

Share of those surveyed who would miss the medium very much

9%
are opinion leaders, that is, their friends and family members often ask their advice about new technology products

16%
exercise regularly

8%
say: "I always eat healthy foods"

8%
say: "My life just keeps getting busier and busier"

5 %
rarely seem to have time to do the things that are really important to them in their lives

The USA in detail.

Overview of country-specific survey results.

Economy and society

Regions and Constituents.
The USA in detail.

79.0 %
use the Internet (2010)**

313.2 m.
residents (2011)*

$ 14,660 bn.
GDP (2010)*

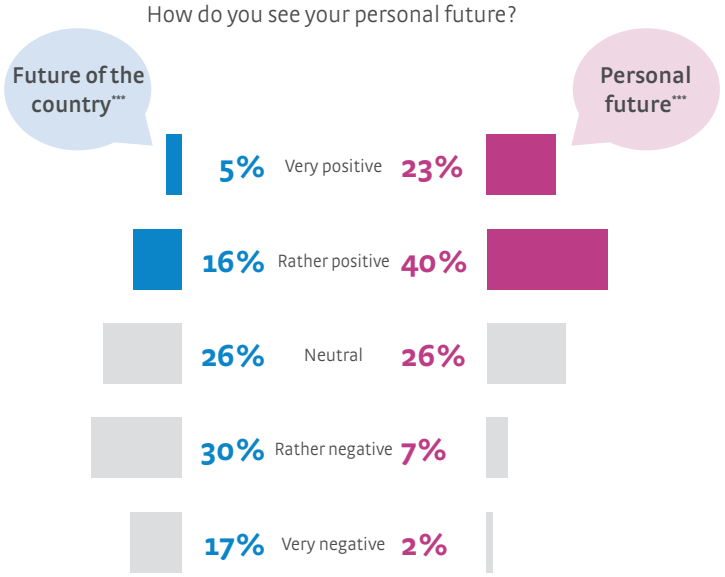
$ 47,200
GDP per capita (2010)*

5 %
travel more often for business and

11 %
do more personal travel than they used to

43 %
work at least **30 h** per week

How do you view the future of your country?
How do you see your personal future?



* Source: CIA Factbook 2009-2011 ** Source: ITU 2010 *** Less than 100 percent: Don't know / no answer

Basis: all people surveyed, USA (USA) n = 1,204

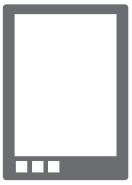
Ownership and use of technologies

286 m.
cell phones (2009)*

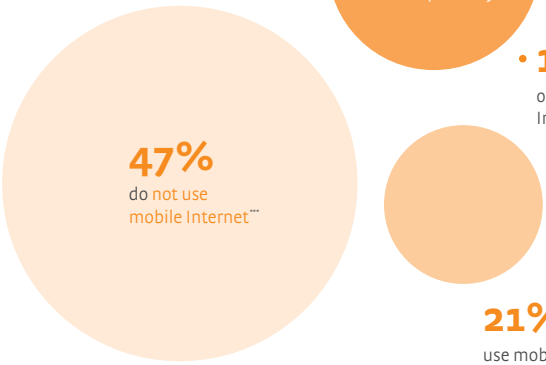
32% often use social networks such as Facebook to keep in touch with friends and acquaintances

28%
own a notebook or netbook

35%
own a smartphone



9%
own a tablet computer



Media and living

33% TV
53% Internet
23% radio
12% newspaper

Share of those surveyed who would miss the medium very much

13%
are opinion leaders, that is, their friends and family members often ask their advice about new technology products

22%
exercise regularly

13%
say: "I always eat healthy foods"

19%
say: "My life just keeps getting busier and busier"

10 %
rarely seem to have time to do the things that are really important to them in their lives

Brazil in detail.

Overview of country-specific survey results.

Economy and society

40.7%
use the Internet (2010)**

203.4 m.
residents (2011)*

$ 2,090 bn.
GDP (2010)*

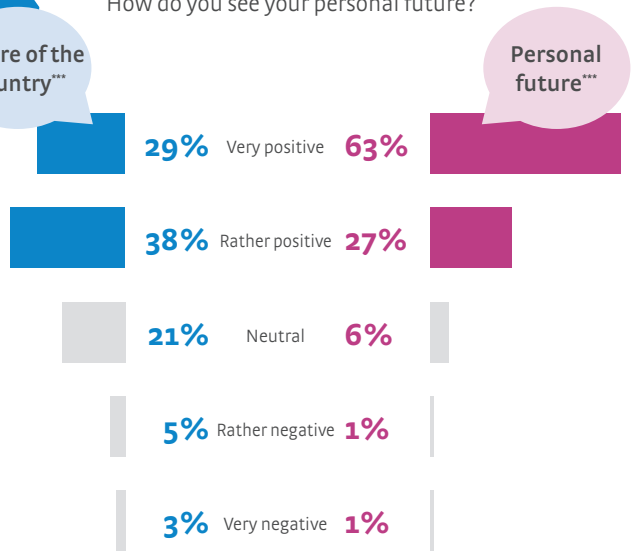
$ 10,800
GDP per capita (2010)*

10%
travel more often for business and

17%
do more personal travel than they used to

42%
work at least **30 h** per week

How do you view the future of your country? How do you see your personal future?



* Source: CIA Factbook 2009-2011 ** Source: ITU 2010 *** Less than 100 percent: Don't know / no answer

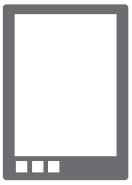
Basis: all people surveyed, Brazil (BR) n = 1,207

Ownership and use of technologies

174 m.
cell phones (2009)*

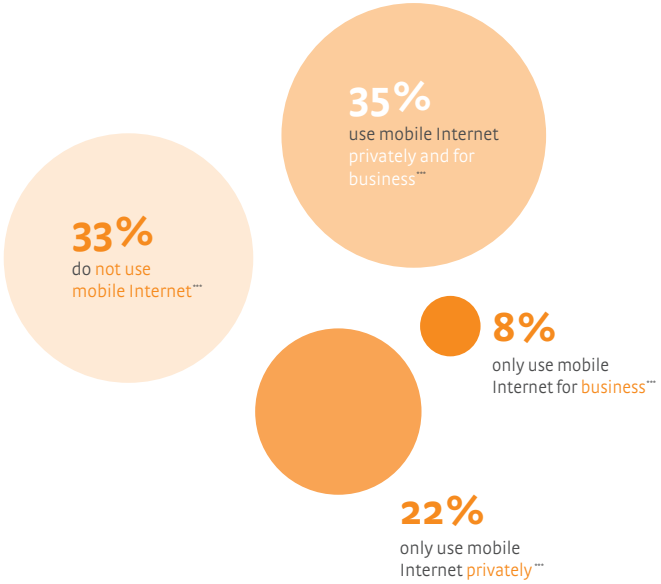
44%
own a notebook or netbook

31%
own a smartphone



11%
own a tablet computer

41% often use social networks such as Facebook to keep in touch with friends and acquaintances



Media and living

46% TV
65% Internet
27% radio
21% newspaper

Share of those surveyed who would miss the medium very much

19%
are opinion leaders, that is, their friends and family members often ask their advice about new technology products

18%
exercise regularly

23%
say: "I always eat healthy foods"

24%
say: "My life just keeps getting busier and busier"

11%
rarely seem to have time to do the things that are really important to them in their lives

China in detail.

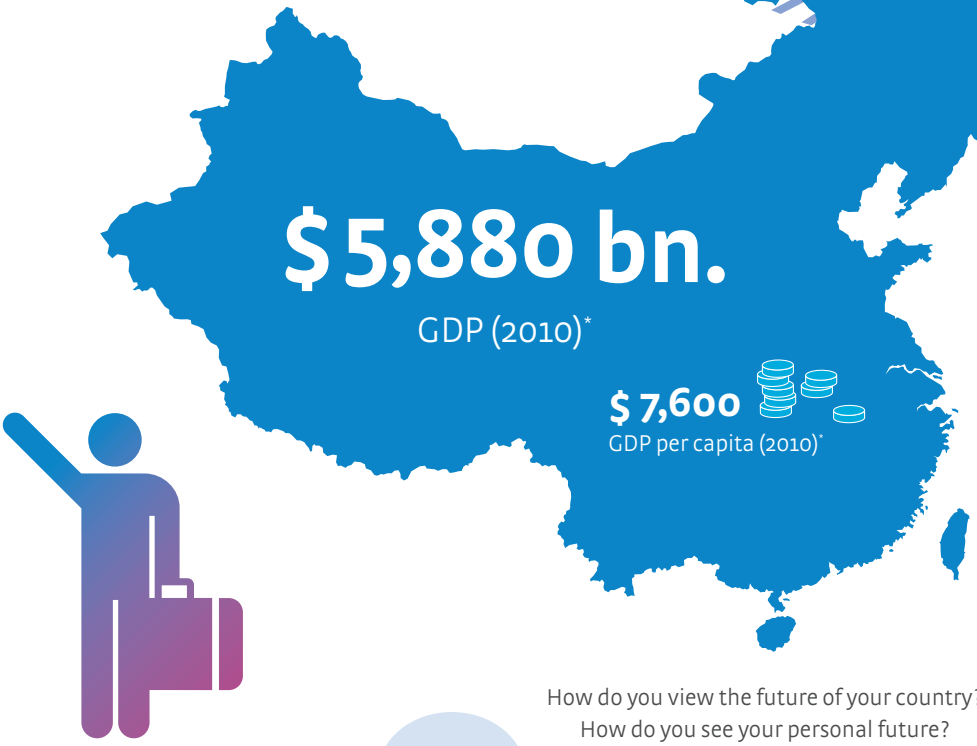
Overview of country-specific survey results.

Economy and society

34.3%
use the Internet (2010)**

1.34 bn.
residents (2011)*

77%
work at least **30 h** per week



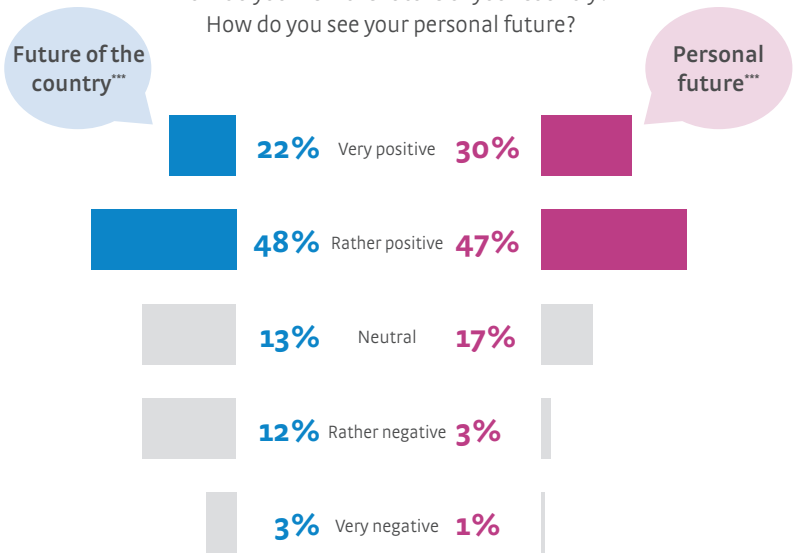
$ 5,880 bn.
GDP (2010)*

$ 7,600
GDP per capita (2010)*

12%
travel more often for business and

17%
do more personal travel than they used to

How do you view the future of your country?
How do you see your personal future?



* Source: CIA Factbook 2009-2011 ** Source: ITU 2010 ***Less than 100 percent: Don't know / no answer

Basis: all people surveyed, China (CN) n = 1,201

Ownership and use of technologies

747 m.
cell phones (2009)*

63%
own a notebook or netbook

57%
own a smartphone

26%
own a tablet computer

16% often **use social networks** such as Facebook **to keep in touch** with friends and acquaintances

55%
use mobile Internet privately and for business***

30%
only use mobile Internet privately***

9%
only use mobile Internet for business***

4%
do not use mobile Internet***

Media and living

24% TV
62% Internet
17% newspaper
15% radio

Share of those surveyed who would miss the medium very much

19%
are opinion leaders, that is, their friends and family members often ask their advice about new technology products

23%
exercise regularly

25%
say: "I always eat healthy foods"

8%
say: "My life just keeps getting busier and busier"

7%
rarely seem to have time to do the things that are really important to them in their lives

Korea in detail.

Overview of country-specific survey results.

Economy and society

83.7%
use the Internet (2010)**

48.8 m.
residents (2011)*

$ 1,010 bn.
GDP (2010)*

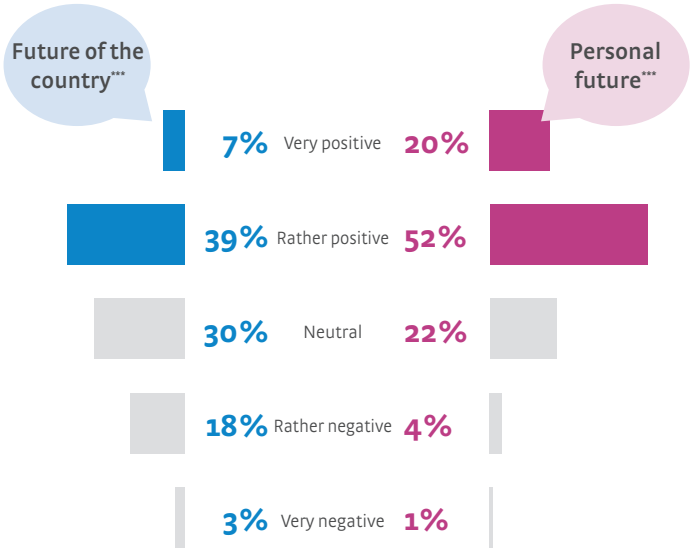
$ 30,000
GDP per capita (2010)*

19%
travel more often for business and

20%
do more personal travel than they used to

60%
work at least **30 h** per week

How do you view the future of your country?
How do you see your personal future?



* Source: CIA Factbook 2009-2011 ** Source: ITU 2010 *** Less than 100 percent: Don't know / no answer

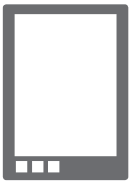
Basis: all people surveyed, Korea (KR) n = 1,206

Ownership and use of technologies

47.5 m.
cell phones (2009)*

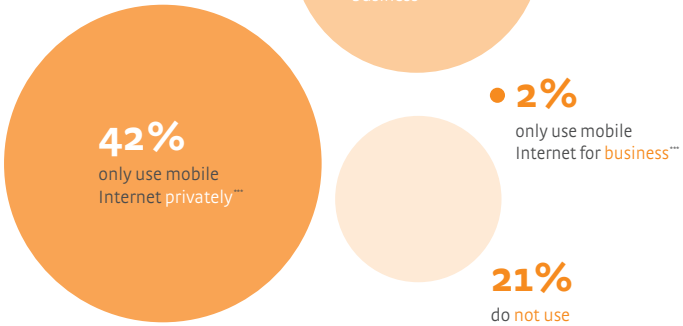
53%
own a notebook or netbook

56%
own a smartphone



15%
own a tablet computer

20% often **use social networks** such as Facebook **to keep in touch** with friends and acquaintances



Media and living

33% TV
65% Internet
11% radio **11% newspaper**

Share of those surveyed who would miss the medium very much

11%
are opinion leaders, that is, their friends and family members often ask their advice about new technology products

18%
exercise regularly

22%
say: "I always eat healthy foods"

14%
say: "My life just keeps getting busier and busier"

7%
rarely seem to have time to do the things that are really important to them in their lives

Comparison of survey respondents. Total and innovation-minded respondents based on Germany as an example.

16% enjoy trying out **complicated technology products**

1,203
Total surveyed

Total surveyed

51%
female

49%
male

42.6
average age
in years

Regions and Constituents.

Comparison of survey respondents. Total and innovation-minded respondents based on Germany as an example.

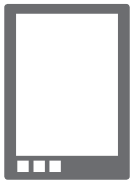
26%
have a **high school diploma** or **higher degree**

26%
see the **future of their country** positively

55%
see their **personal future** positively

53%
own a notebook or netbook

29%
own a smartphone



7%
own a tablet computer

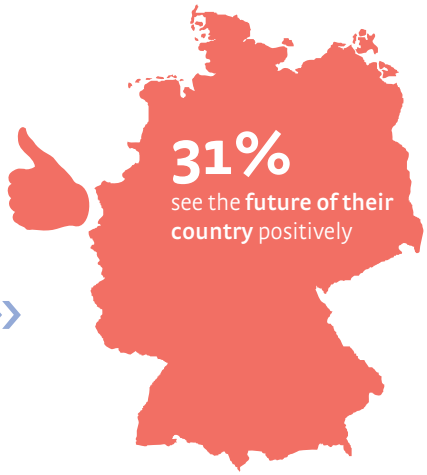
Innovation-minded respondents

38% female

62% male

39.7 average age in years

32% have a **high school diploma** or **higher degree**



62% own a notebook or netbook

46% own a smartphone

11% own a tablet computer

64% see their **personal future** positively

Regions and Constituents.

Comparison of survey respondents. Total and innovation-minded respondents based on Germany as an example.

The human factor is the focus of this year's study. "Average people" will always judge future ideas differently than experts; they are often more skeptic toward innovative ideas and tend to reject them. Nonetheless, the thoughts, experiences and fears of an "average person" with regard to the pictures of the future are decisive elements that must be considered in the design and spread of future technologies. This makes it possible to incorporate references to useful enhancements, for example, and modify and improve critical issues (or address them in communications at an appropriately early date).

To identify ideas that the average population still views skeptically today, but very likely portray future trends, this year's study identified participants who are particularly open to new technologies. These "innovation-minded" participants are people who play a decisive role for the market of information and communication technologies, now and in the future. In contrast to the other survey participants, this special group is characterized by a strong willingness to try out new technologies. Its members are particularly open to new ideas and, moreover, actively promote these ideas as well, aiding in their dissemination. A comparison between the total participants and innovation-minded participants shows significant differences in both socio-demographic variables and in attitudes and behaviors.

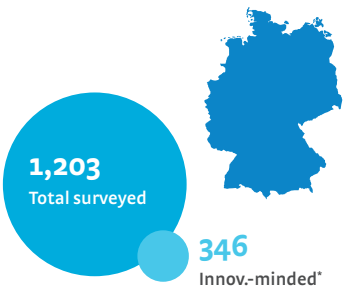
Regions and Constituents.

Comparison of survey respondents. Total and innovation-minded respondents across the surveyed countries.

Comparison of survey respondents. Total and innovation-minded respondents across the surveyed countries.

Germany

Total / innov.-minded*



51% female / 49% male

38% female / 62% male

42.6 | 39.7

Average age in years

53% own a notebook / netbook

62% own a notebook / netbook

7% own a tablet computer

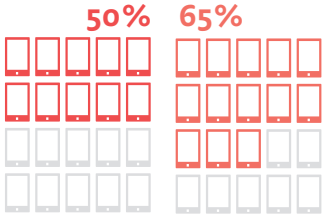
11% own a tablet computer

29% own a smartphone

46% own a smartphone

Use **mobile Internet**:

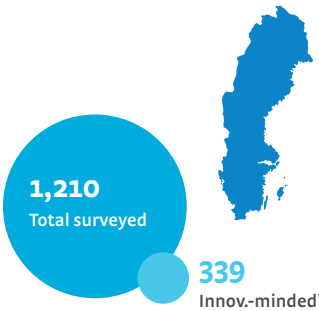
50% 65%



14% of total respondents and **24%** of innovation-minded respondents do more personal travel now than in recent years

Sweden

Total / innov.-minded*



54% female / 46% male

38% female / 62% male

42.9 | 39.1

Average age in years

23% own a notebook / netbook

41% own a notebook / netbook

10% own a tablet computer

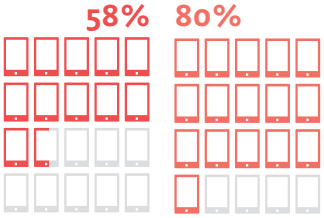
20% own a tablet computer

38% own a smartphone

59% own a smartphone

Use **mobile Internet**:

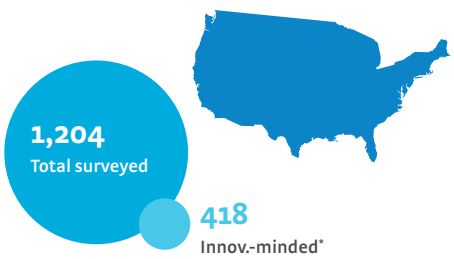
58% 80%



11% of total respondents and **16%** of innovation-minded respondents do more personal travel now than in recent years

USA

Total / innov.-minded*



53% female / 47% male

51% female / 49% male

42.8 | 39.6

Average age in years

28% own a notebook / netbook

38% own a notebook / netbook

9% own a tablet computer

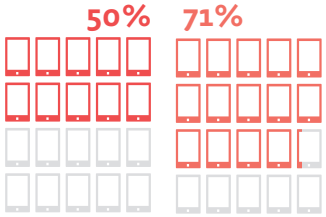
15% own a tablet computer

35% own a smartphone

52% own a smartphone

Use **mobile Internet**:

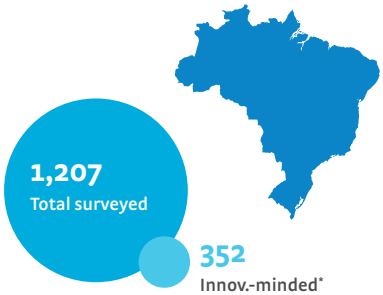
50% 71%



11% of total respondents and **15%** of innovation-minded respondents do more personal travel now than in recent years

* innovation-minded respondents ≙ 5 %

Brazil
Total / innov.-minded*



48% female | 52% male

44% female | 56% male

37.1 | 37.6

Average age in years

44% own a notebook / netbook

50% own a notebook / netbook

11% own a tablet computer

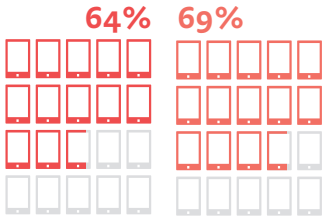
11% own a tablet computer

31% own a smartphone

39% own a smartphone

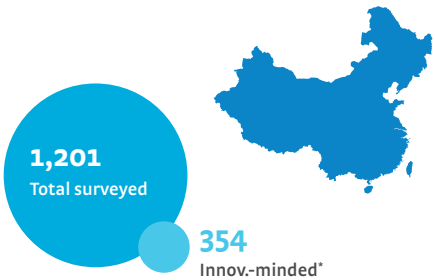
Use **mobile Internet**:

64% 69%



17% of total respondents and 28% of innovation-minded respondents do more personal travel now than in recent years

China
Total / innov.-minded*



44% female | 56% male

40% female | 60% male

34.5 | 32.9

Average age in years

63% own a notebook / netbook

69% own a notebook / netbook

26% own a tablet computer

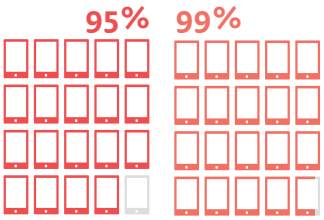
35% own a tablet computer

57% own a smartphone

70% own a smartphone

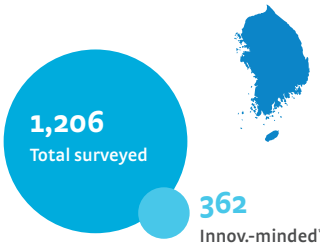
Use **mobile Internet**:

95% 99%



17% of total respondents and 31% of innovation-minded respondents do more personal travel now than in recent years

Korea
Total / innov.-minded*



46% female | 54% male

39% female | 61% male

37.2 | 36.7

Average age in years

53% own a notebook / netbook

64% own a notebook / netbook

15% own a tablet computer

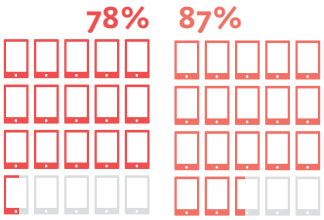
23% own a tablet computer

56% own a smartphone

65% own a smartphone

Use **mobile Internet**:

78% 87%



20% of total respondents and 27% of innovation-minded respondents do more personal travel now than in recent years

Regions and Constituents.

Comparison of survey respondents. Total and innovation-minded respondents across the surveyed countries.

Interdisciplinary topic: Protection of personal data.

Regions and Constituents.

Interdisciplinary topic: Protection of personal data.

Summary of insights and results gleaned from the study on the topic of "protection of personal data"

Germans often perceive themselves to be very sensitive when it comes to privacy. This perception is entirely justified. As the international comparison in this study clearly shows, Germans are very afraid that their personal data might be abused.

How survey participants deal with personal data and payment transactions on the Internet.

Yet the Germans are not alone in their fears: when asked directly, 40 percent of Germans surveyed stated that they try to reveal as little personal data on the Internet as possible. This same statement is also given by 39 percent of Brazilians, 40 percent of Koreans and even 45 percent of Americans. As such, there is a relatively high awareness of the possibilities for data abuse in other countries as well. Only Swedes and Chinese seem to be less worried, with around every fourth person (28 and 25 percent, respectively) expressing fears.

At the same time, only very few of those surveyed allow this mistrust to keep them from using the Internet altogether. Only 15 percent of Germans, for example, replied that they are reluctant to make payments over the Internet because they are afraid of being defrauded. This is the second-largest figure in international comparison, after Brazil with 26 percent; yet at the same time, 59 percent of Germans surveyed replied that the statement *"I don't like to use Internet payment methods because I am afraid of becoming a fraud victim"* hardly applies to them or not at all.

While Germans do not seem to be more sensitive than survey participants in other countries with regard to use of their personal data and payment transactions on the Internet, a comparison of the data from all the pictures of the future clearly shows that Germans are very worried about the safety and security of their data on the Internet. This is reflected in many of the results.

I try to reveal as little of my personal data on the Internet as I can

(FIG. 1, percentage values)

Conclusions on this topic from the survey results for the 16 pictures of the future.

The survey participants had the option to select both positive and negative aspects in the descriptions of many of the pictures of the future. More than 40 percent of Germans answered that they liked the fact that their data would be 100 percent secure in the "anywhere" desk scenario. This was often indicated as positive in the other countries as well. A noteworthy result, however, is that some Germans also saw this factor as critical: the survey participants doubted – although promised by the picture of the future – that 100 percent protection would ever be possible. Only Swedish and Brazilian survey participants expressed these doubts in similar numbers (21 to 30 percent). In contrast, participants identified critical factors in two other pictures of the future: the automatic transmission of data (in the telemonitoring scenario) and the fact that personal preferences are saved (for the personal mobility assistant). Collecting personal data to customize the user experience is seen as critical by many of the participants. It is also noteworthy that use of the new electronic ID card, which was introduced in Germany on November 1, 2010 and which enables unique identification on the Internet, was flagged as critical in all the future scenarios in which it is used (the digital city service office, opening bank accounts on the Internet and electronic

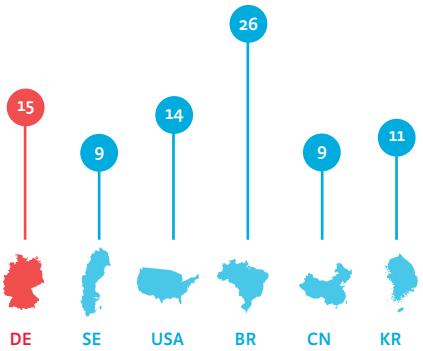
bill management. In contrast, many aspects of the online data manager were rated positively – a picture of the future that focuses on the idea of managing personal data on the Internet automatically and, in particular, controlling this data and protecting it against unauthorized access. Many of those surveyed in other countries also see this as a positive factor (see FIG. 16).

The survey participants could specify up to four concerns for each picture of the future. For this purpose, ten statements were displayed for each future scenario – some standardized and some individually formulated. It was also possible for survey participants to indicate that they had no concerns. From an examination of the expressed concerns and their placement across all 16 future scenarios, it is clear that Germans fear misuse of their personal data the most. The fear most frequently expressed by Germans in ten of the 16 future scenarios is *"[that] my data could be misused"*. The corresponding responses from the other countries are nowhere near as high: it is the most frequently listed fear for four of the future scenarios in Korea, for two in Sweden, the USA and China and for just one in Brazil.

Fear of data misuse is the most named concern for the intelligent doctor's report in four countries: Germany, Sweden, the USA and Korea. This concern ranked third place in China and Brazil as well. As such, it is clear that information on one's personal health is considered to be very sensitive – many are worried by its potential misuse. Overall, the fear that personal data could be misused is present in all the described life situations. Of course, this worry is paramount for the scenario of opening bank accounts on the Internet with electronic invoice management. Three-quarters of German survey participants checked off this concern – which means Germans fear misuse of their personal data when opening bank accounts on the Internet more than any other future scenario and any other country. All the same, participants in other countries share worries about opening bank accounts on the Internet: it is the most-named concern in the USA and Korea, and the second-most in Sweden, Brazil and China.

Specific fears of data misuse are not the only widespread factor in Germany, either; the survey results show that Germans are highly sensitive to all matters involving their personal data in general. Another concern was queried in four of the future scenarios: *"[that] my data will be saved somewhere"*. While this was the second-most frequent answer in three of the four cases, such fears are less widespread in the other countries, even coming in ninth in one case. It is likely that fear that their data could be misused plays a role for Germans here as well; after all, once data is saved permanently, it is impossible to exclude the possibility of misuse completely. The future scenario of the online data manager is dedicated to this very fear of unnecessary storage and misuse of personal data, providing a solution that helps users to organize and control access privileges to their personal data on the Internet. When necessary, it protects the data against third-party access. It stands to reason that the greatest concern is that the data still exists after deletion, which means the online data manager cannot help after all. This fear tops the list of concerns in four countries (Germany, Sweden, the USA and Brazil) and is the second-most frequent concern in China and Korea.

"Worries that data will be misused take first place with Germans much more frequently than with the average."

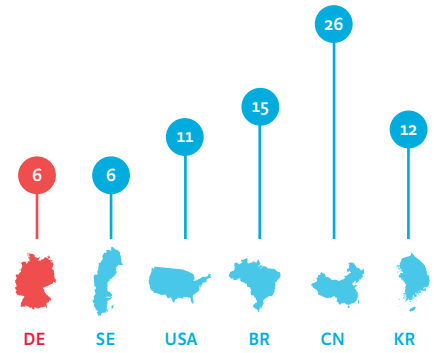


I don't like to use Internet payment methods because I am afraid of becoming a fraud victim
(FIG. 2, percentage values)

Interdisciplinary topic: Willingness to pay.

Summary of insights and results gleaned from the study on the topic of "willingness to pay"

For many people, costs are a major factor in determining willingness to try out new technologies and technological applications. The indicated willingness to pay for new technologies varied widely among the surveyed countries.



Any technology that saves me time is worth paying extra for
(FIG. 3, percentage values)

Survey participants are generally willing to pay more for distinctive and / or time-saving technologies.
All survey participants were asked to indicate the extent to which statements on general attitudes applied to them. According to the results, only a small portion of those surveyed in all six countries were willing to pay more for new, distinctive technology products. Only five percent of Germans surveyed expressed willingness, along with eight percent of Americans, six percent of Koreans and four percent of Swedes. In contrast, 16 percent of Chinese and eleven percent of Brazilians expressed willingness to pay more. Compare this with the large numbers of respondents in Sweden, Germany, the USA and Brazil who are totally against spending more for new, distinctive technology products: nearly a third of all Swedes (30 percent) and more than a quarter of Germans (28 percent), Americans (28 percent) and Brazilians (25 percent).

Even when *"technology that saves me time"* is involved, only a few of those surveyed were willing to spend more. The share of Germans and Swedes is lowest, and six percent, and is once again largest in China: a quarter of survey participants are willing to spend more money for time-saving technologies. Twenty percent of Germans, Americans, Brazilians and Swedes said they would not spend more on technology products even if they promised time savings. In an international comparison, Germans are largely unwilling to spend more for distinctive or time-saving technologies. An examination of other data on costs and prices partially confirms this picture, however, the survey participants in other countries also proved to be very cost-sensitive.

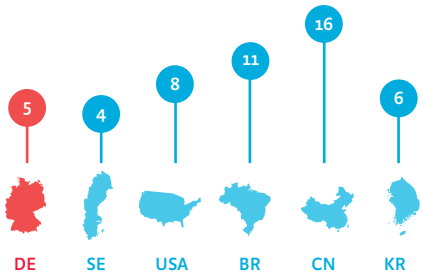
Conclusions on the topic of willingness to pay from the survey results for the 16 pictures of the future.
After reading the text and examining the picture of the future, each survey participant could check off four concerns for each future scenario. Participants could choose from ten statements – some standardized, some individually formulated. There were significant differences among the countries surveyed across all of the future scenarios. While Brazilians fear high costs the most in eight of the future scenarios, this concern never achieves first place at all in Germany, Sweden and China, and only once in Korea. Only in the USA are worries that an application or technology could cost too much anywhere near as high as Brazil, with five first places. While the other countries are apparently confident that the financial burden imposed by using future ideas will be compensated accordingly by the added value, will not be too high or might be borne by others, Brazilians and Americans believe they will bear the costs themselves and, accordingly, worry about how high they will be. A closer examination of the future scenarios in which Brazilians and Americans most fear high costs returns interesting findings. In both countries, cost worries are greatest for the future scenarios that involve healthcare applications in a broad sense: telemonitoring and the home healthcare assistant, along with the intelligent

doctor's report and electronic prescription. Evidently, the survey participants in these countries base their expectations of high personal costs on their experiences with the current, dominant local healthcare system and state of medical care. In Germany, Sweden, China and Korea, in contrast, other worries are more prominent.

It is also interesting that Brazilians are most worried about costs with regard to two of the three future scenarios involving mobility. In no other country are costs named as the greatest concern in the scenarios of the autonomous car / car on demand and ambient communication.

In contrast to their widespread worries about excessive costs, Brazilians are near the top of the international comparison when it comes to willingness to pay. In many cases, Brazilians are more likely than survey participants from other countries to spend money on the described future scenario. Overall, Brazilians are quite prepared to pay for future technologies, yet still fear excessively high costs.

The greatest willingness to pay for the described ideas and applications in future – as already seen in their general willingness to spend more for distinctive, time-saving technologies – is encountered in China. For nearly all the pictures of the future, the share of participants who would be willing to pay for an idea is greatest in China. In contrast, the USA and Germany frequently alternate in occupying the bottom two spots. In a comparison of participants' willingness to pay for each picture of the future, it is noticeable that participants in nearly all countries are most willing to pay for digital textbooks. Aside from the Koreans, the share of participants who would be most likely to pay for this future scenario was greatest. Modern learning materials that are adapted to today's lifestyles are obviously an important



I am prepared to pay more for new technology products that I consider to be original in some way

(FIG. 4, percentage values)

theme worldwide, which would elicit financial support from users (or their parents). 45 percent of participants in China would pay for a digital textbook; the figure for Germany is 28 percent.

Of all the described ideas, Germans are least willing to pay extra for the personal mobility assistant (three percent). Existing, free-of-charge information systems (no matter how limited their functional scope) have apparently generated expectations that such a service could be available free of charge in future. In the USA and Brazil, the future scenario with the least willingness to pay is opening bank accounts on the Internet (at four and 17 percent, respectively). Furthermore, large numbers of participants indicated that this scenario was already available in their respective countries – aside from Germany (see FIG. 120). Therefore, the low willingness to pay in the USA and Brazil is likely due to local experiences with free or extremely low-cost offerings

"Worries about high costs top the list among Brazilians much more frequently than the average."

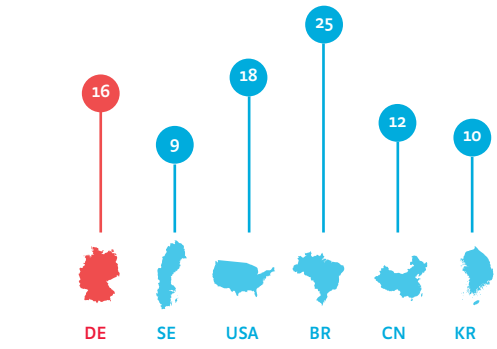
Interdisciplinary topic: User friendliness.

Summary of insights and results gleaned from the study on the topic of "user friendliness"

As information and communication technologies permeate more and more areas of our daily lives, ease of use becomes ever more important. While it is true that younger generations are frequently growing up with these new technologies, to enable widespread use – in the healthcare sector, for example – it is critical for users to be able to operate the technologies intuitively.

User attitudes toward simple and complex operation of technologies.

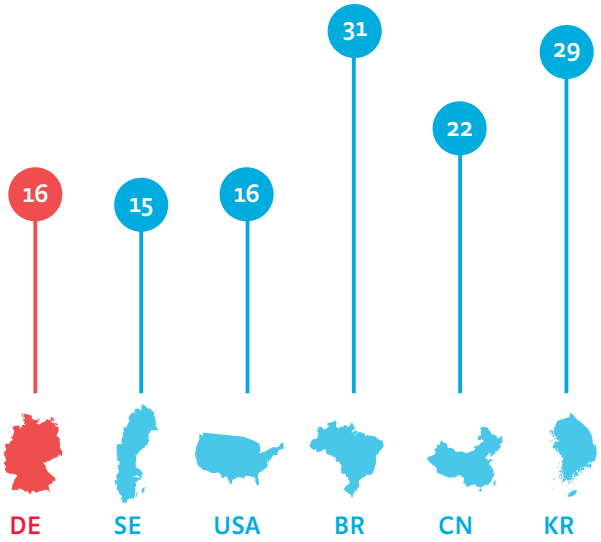
Attitudes toward difficult-to-operate technology products vary widely among the surveyed countries. While a quarter (25 percent) of all Brazilians say they only use technologies that are simple to operate, only a tenth of participants in Korea (ten percent) and Sweden (nine percent) share this response. Nonetheless, 31 percent of Brazilians enjoy trying out complicated technology products. In Germany, the USA and Sweden, in contrast, only 16 and 15 percent (respectively) report that they enjoy dealing with complicated technologies.



(FIG. 5, percentage values)

Conclusions on the topic of user friendliness from the survey results for the 16 pictures of the future.

Participants could highlight the positive and negative aspects from the description of each respective picture of the future. In the future scenario of the digital city service office, more than 40 percent of Germans indicated that they liked its ease of use. Participants in the USA and Korea also highlighted this aspect as positive. They would be happy to be able to deal with formalities such as changes of address or appointment concerns simply, online. For the automatic energy manager, as well, participants in Germany highlighted the word *"simple"* as positive in the context of installation and use – a popular characteristic in Sweden, Brazil and the USA as well. Ease of use is also appreciated in the area of telemonitoring (Sweden and the USA), as does the simple visual display used in ambient communication (China and Korea) and the city service office (Sweden). It is clear that ease of use, simplified displays and easy management are aspects that appeal positively to users. At the same time, there is no clear picture as to which applications or which users this is most important to. Survey participants were given the option of specifying their four most relevant concerns associated with each of the presented scenarios. Ten statements – some standardized and some individually formulated – were shown for each picture of the future. One of these was the worry that *"I can't operate it by myself/it's too difficult to use"*. Each participant could select up to four concerns or indicate that they had no concerns.



I enjoy trying out complex technology products

(FIG. 6, percentage values)

It is apparent that worries of overly complicated operation are largely irrelevant in comparison to the other described concerns. The survey participants in all countries agreed that worries about usability were largely secondary. Germans have astonishingly few worries that the technologies described in the pictures of the future could be too difficult to use. This fear took last place – that is, the fewest participants named this concern – in 14 of the 16 future scenarios. Fear of complicated technology also comes in last for eleven future scenarios in Sweden and the USA, and in ten cases in Brazil. Evidently, functional scope and its perceived benefit are a much greater focus in assessing the technologies. If expectations are high, then people will be likely to accept more complicated use. Furthermore, the participants might expect future technologies to be intrinsically easy to use – and may be self-confident that as experienced users of technology, they will not have any difficulties with future technologies, either. Overall, the topic of user friendliness is shown to be of low relevance to the survey participants. Other concerns (such as data protection / privacy, costs and reliability of the technology) are much more important to the participants. In contrast, ease of use is of secondary concern.

“Worries of overly complicated operation are a comparatively low priority – especially in Germany.”

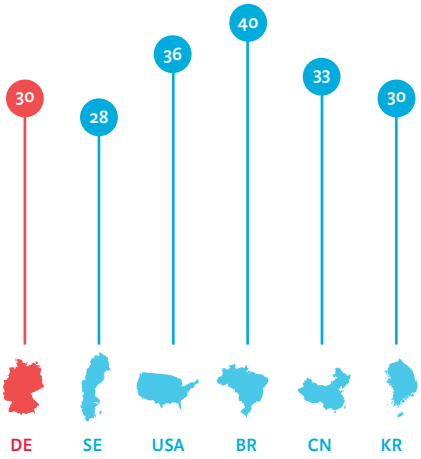
Interdisciplinary topic: Trust in technology.

Summary of insights and results gleaned from the study on the topic of "trust in new technologies"

Interest in and occupation with new technologies are crucial prerequisites for the use of innovations and acceptance of the information and communication technologies that are permeating more and more aspects of our daily lives. The survey participants in the various countries express wildly varying levels of interest in new technologies. Upon reflection of the pictures of the future, however, it is clear that concerns are similar internationally with regard to the descriptions of future technologies.

Basis for trust? General interest in new technologies among survey participants.

30 percent of Germans indicate that they inform themselves about new technology products thoroughly before making a decision. This figure is similarly high in China (33 percent), Korea (30 percent) and Sweden (28 percent), and even higher in Brazil and the USA (40 and 36 percent, respectively). In contrast, they discuss new technology products with others much less frequently. Germans and Swedes have the lowest figures, at eight and seven percent, respectively. In contrast, around a quarter of Brazilians (28 percent) and Chinese (22 percent) say they often talk with others about new technology products they have seen recently. One noticeable result is that, in their own estimation, Brazilians are the most thoroughly informed about new technologies and often discuss them with others. But does interest in new technologies and information about them have an impact on trust in technology?



I research new technology products very carefully before choosing one

(FIG. 7, percentage values)

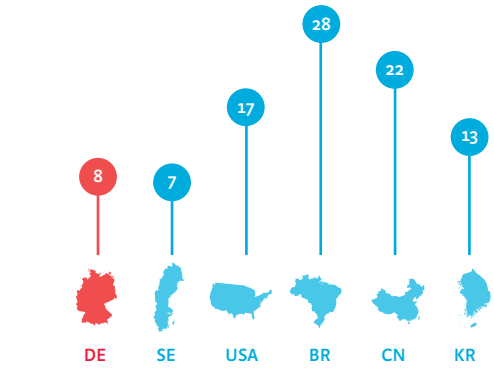
Conclusions on the topic of trust in technology from the survey results for the 16 pictures of the future.

Survey participants were asked to specify their four greatest concerns with regard to each picture of the future. For this purpose, ten statements were displayed for each future scenario – some standardized and some individually formulated. Each participant could select up to four concerns or indicate that they had no concerns.

In an international comparison, Sweden takes top spot most frequently with the concern *"[that] the systems [could] fail or become unavailable"* – this is the most widespread concern among Swedes for four of the future scenarios. This concern was named most for two future scenarios by participants in China and Korea and once by participants in Germany. Fears of equipment failure did not reach the top spot for any future scenario in the USA and Brazil.

All the same, it is noteworthy that fears of equipment failure take the top spots in nearly all countries for some of the future scenarios. In particular, the survey participants are in agreement when it comes to autonomous cars/cars on demand: worries about malfunctions are greatest in Germany, Sweden, China and Korea, where they take the top spot; it is the second-most frequently named worry in the USA and takes fifth place in Brazil. The second-greatest fear in Germany, Sweden and Korea is closely related to the first: that users themselves will be made liable in case of technology failures. This was the most

important concern in the USA and the second-most in Brazil. It should come as no surprise that in a picture of the future in which autonomous cars/cars on demand no longer require drivers, and would also serve as chauffeur for non-drivers (children, the elderly etc.), high priority is given to the reliability of the technology. Many people today cannot yet imagine that the involved technology could work error-free and be safer than human drivers. Accordingly, liability issues in case of technological failure are particularly important to many of the survey participants. In this context, it becomes clear why the words *"without a driver's license"* in the description of the future scenario were often highlighted as critical. 21 to 30 percent of survey participants in Germany and the USA indicated this passage to be negative; the corresponding figure for Korea is 31 to 40 percent. Swedes also take a critical view to the idea that family members who do not (or no longer) drive might be chauffeured by an autonomous car/car on demand. Here, as well, it is clear that the survey participants do not trust the technology entirely. The survey participants seem to prefer a scenario in which an autonomous car/car on demand can only be used by people who are capable of taking control themselves in case critical systems fail.



I often discuss new technology products I have seen recently with other people

(FIG. 8, percentage values)

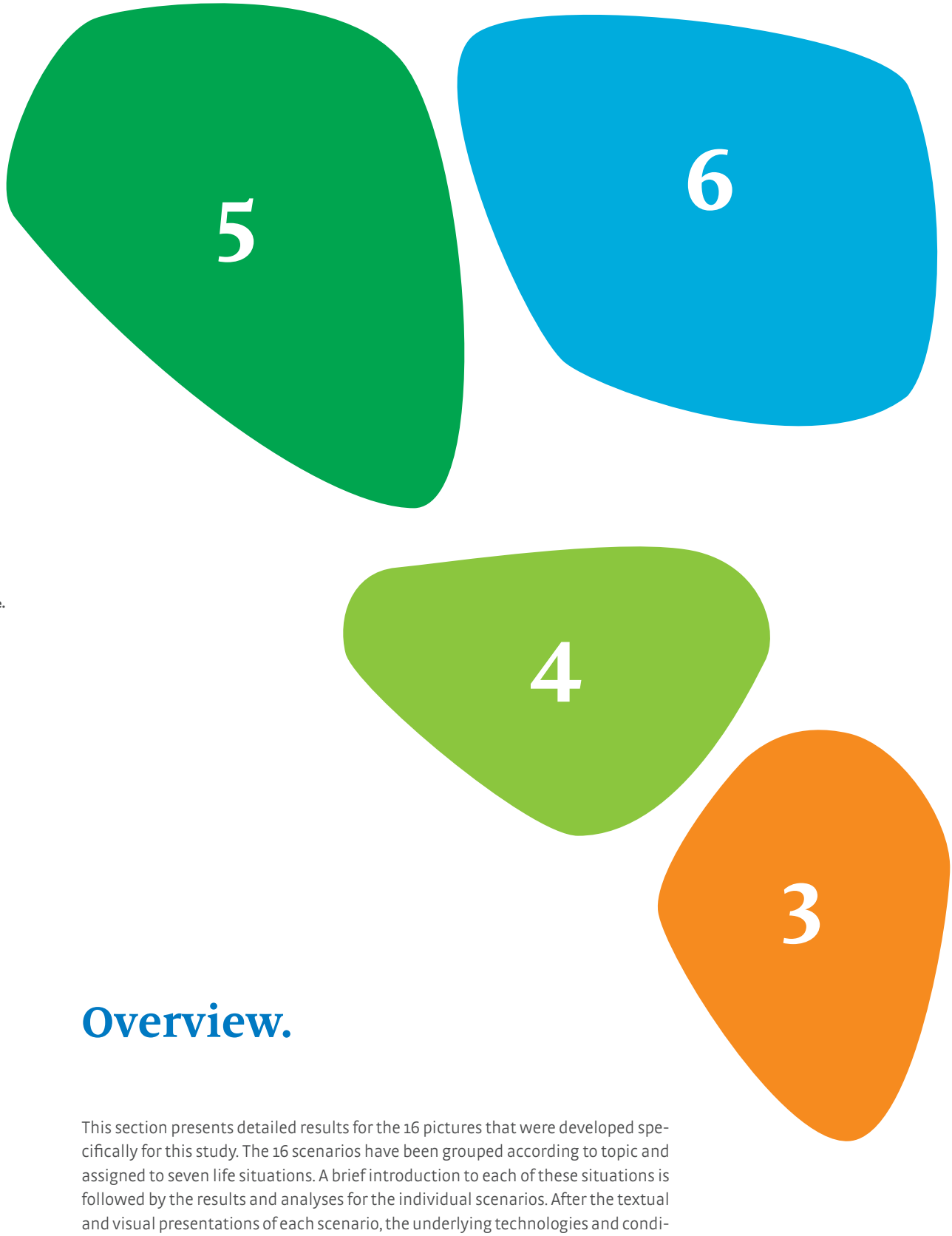
Questions about the reliability of the technology are also a primary concern for many people when it comes to the home healthcare assistant and telemonitoring. Concerns about the reliability of the technology involved in a healthcare assistant took second place in Sweden, the USA, China and Korea and third place in Germany. In Germany, this is immediately followed by the fear that the assistant could administer the wrong medicines or the wrong dosage to the person under care; a fear that was ranked highly in many other countries as well: second place in Brazil; third place in Sweden, the USA and Korea and fifth place in China. Worries that the technology is not yet mature were also related and were named frequently in all countries. In the telemonitoring scenario, as well, worries about technological failures were expressed particularly often in many countries. It was the most-named concern in Sweden; the second-most named in Germany, China and Korea; third in the USA and fifth in Brazil. It is understandable that reliability of the technology is a primary concern for telemedicine users, and especially for a healthcare assistant – which looks after people who can no longer live independently, after all – where malfunctions of the underlying technology can have a profound impact. In these cases, in particular, the technology must function reliably to gain the trust of users and their family members.

No clear link is discernible between interest in technology and trust in the same. All the same, Brazilians – who claim to inform themselves about new technologies and discuss them with others the most – have the fewest concerns when it comes to the reliability of the technology.

"In Sweden, the reliability of the technology tops the list of concerns most frequently in an international comparison."

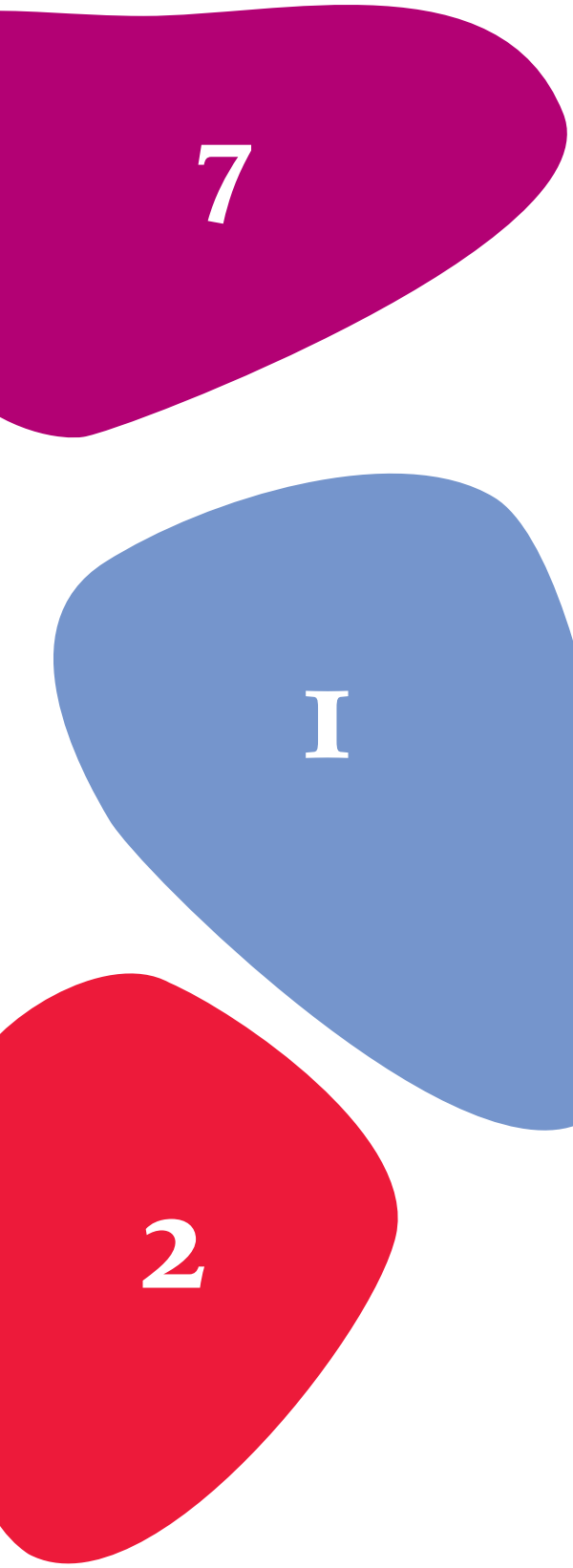
The Pictures of the Future.

A closer examination of the six surveyed countries, overall and innovation-minded participants and an analysis of the interdisciplinary topics on the protection of personal data and privacy, willingness to pay, user friendliness and trust in technologies.



Overview.

This section presents detailed results for the 16 pictures that were developed specifically for this study. The 16 scenarios have been grouped according to topic and assigned to seven life situations. A brief introduction to each of these situations is followed by the results and analyses for the individual scenarios. After the textual and visual presentations of each scenario, the underlying technologies and conditions required in each case are described in greater detail. Next comes a scientific description of the results, accompanied by a presentation of the survey data in charts. Finally, the results of the survey are interpreted in depth for each picture and recommendations supplied for business, science, politics and society.



Chapter *I*
Learning and knowledge.

The electronic textbook.

The need to learn, understand and acquire knowledge plays a subordinate role compared with the aspects of physiology, security relevance, individual and social aspects. Nevertheless, the area of learning and knowledge represents a basic requirement whose importance cannot be rated highly enough on our way to the knowledge society.

The information that is currently available in all spheres of life is increasing exponentially, so that the processes used to acquire and process information are not only difficult to assess but also subject to continual change. Various learning methods are available, from YouTube, with its information, training and lecture offers, to new teaching and lecture formats such as webinars and web-based training, right through to digital textbooks and various different student and study platforms. All these tools are extremely efficient at serving the need for learning and knowledge during basic and advanced training as well as in day-to-day life and work, and can convey a broad range of learning topics with the utmost clarity.

In order to satisfy the need to learn and gain knowledge during training, it is of fundamental importance to acquire general media skills as the basis for future learning in schools and training institutions. The advantages of the new media must be seen to be appropriate and useful, the risks explained and efficient usage learned and trained. This also teaches the skills needed to achieve an appropriate balance between the different methods of acquiring and processing information and competence and know-how development (see Mittelstrass 2011). The future will see the advent of ICT-based learning and knowledge in the first years of school education as well as in training institutions, with the result that it will flank the entire education lifecycle. Handling information from and via the Internet requires not only traditional basic reading, writing and arithmetic competence but also suitable media proficiency, which can only be claimed at present by a quarter of the German population (see Volume 2 of the 2009 study: International Delphi Study 2030). This basis must be provided in order to counter the dangers that would face us in a future digital divide.

In our day-to-day lives, one key qualification is indispensable for people who use the Internet in order to learn and to acquire knowledge. Everyone must have sufficient basic know-how about information processing and data security on the Internet, and above all be able to handle their personal data competently. This skill is a vital prerequisite for the acquisition of concrete application know-how. The qualification needed for people to move confidently around the media landscape is not only of elementary importance in acquiring information but also in the general development of know-how at work and at home. It is equally important to be able to assess the relevance, credibility and topicality of information and sources on the Internet (see Volume 2 of the study: International Delphi Study 2030). The principle of lifelong learning is a new aspect in continuing education that affects everyone in some form or another. Individuals are required to assume responsibility for their own further development so that they can face new challenges at work and new occupation profiles.

Experts forecast that all school students will be using electronic devices as elementary components of their school education and that the permanent use of ICT infrastructure in schools will be taken for granted by the year 2019 (see International Delphi Study 2030). The learning media's interactive operating and communication functions will, in future, support various cognitive skills and learning speeds by bringing enjoyment to learning, and will safeguard learning success over the long term. The picture of **the electronic textbook** illustrates a potential vision for schoolbooks of the future.

Knowledge and learning will be characterized by the media used and the media skills that are acquired in the process. New teaching and learning methods will be geared to the dynamics of the Internet and its vast flood of information, and to ensuring that they are processed suitably. This will establish the basic foundation for satisfying education needs in the different phases of people's lives. The electronic textbook paves the way for future media competency in the education system. However, it also has far-reaching consequences for the school system. ICT requires intensive training if it is to become a personal tool for teaching staff and a state-of-the-art ICT infrastructure must be provided in schools, while interactive textbook formats mean that homework can be redefined and learning programs used. The electronic textbook therefore represents the basis for an extended learning concept.

The electronic textbook.

FIG. 9: Evaluation of individual aspects of »the electronic textbook«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

My child carries several books to school and back home every day. The books are very heavy, however, and I'm worried that my child is carrying too much. In addition, new media are becoming more and more important, and I want my child to learn how to use them competently.

There are now electronic books that run on one mobile device, the electronic textbook. The electronic textbook not only helps to **cut down** on the **weight my child has to carry** but, thanks to innovative technology, reading the new electronic textbook is particularly **easy on the eyes.***

Electronic textbooks open a wide variety of didactic options to teachers and students: you can underline content, **highlight** important text passages, add comments, and find specific content more easily. By integrating multimedia content and establishing interdisciplinary cross-references, teachers can make learning an exciting, varied experience. Since the content is **updated regularly** through new teaching materials, press articles, etc., all students always have **up-to-date school books.** The electronic textbook also enables new methods of networked learning: when children are doing homework, for example, they can use the electronic textbook to **contact fellow students** or the **teacher.**

31-40%

*21-30% considered 'easy on the eyes' critically.

21-30%
of respondents marked this.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=301

FIG. 10: Visualization of »the electronic textbook«

"A personal electronic device (e. g., laptop) will be an elementary component of school lessons in Germany by the year 2019 at the latest."

(Result from the second phase of the study, thesis 10)

> "This enables teaching and didactic concepts to go innovative ways. Networked learning will become possible anywhere, with links between the individual subjects."

Dimension

The responsible use of information technology is a core competency which children must be taught in school nowadays along with reading, writing and arithmetic.

Using innovative technology in lessons.

Mobile devices are ideal for providing knowledge in digital format, i. e., especially when equipped with suitable search and link functionalities. This also applies to teaching materials such as textbooks. In collaboration with textbook publishers and manufacturers of hardware and software for mobile devices, today's paper-based school books will be replaced by electronic textbooks on mobile devices. This will make it possible to provide topical information in all modern media technology formats, and also the latest editions of teachers' books. Teaching and didactic concepts will therefore be able to go innovative ways. Networked learning will become possible anywhere, with links between the individual subjects. This can be expected to reduce the weight in children's schoolbags and retain money in family, school and school authority wallets.

Technical implementation on state-of-the-art infrastructures.

The technical basis for using modern media in teaching consists of a secure IT network for all public education institutions (an 'education network'). The education network could be implemented as a virtual private network (VPN) within an existing government agency network. This makes it possible to generate synergies, so that systems already available in a government agency network can also be used in the education network. As examples we can list typical infrastructure systems such as Internet gateways, firewalls, ad blockers and identity management. This gives students, teachers and even parents secure, identified access to the education network from the Internet. Learning platforms, electronic media libraries, communication infrastructures and an identity management system expand the education network into a digital education platform. Great importance will be attached to the possibility of managing permissions to use digital media (digital rights management). The digital education platform requires connectivity with providers of digital media and learning programs, who make content available for learning platforms and media libraries on the basis of a quality assurance process.

This would satisfy the conditions required for mobile access during lessons as well as for anywhere learning on mobile devices. In addition, standardized interfaces and virtualization technologies would make it possible to integrate any mobile terminal, a vital factor since Germany's school students can only be provided with electronic textbooks if parents are willing to finance mobile devices. In effect, it must therefore be possible to integrate all devices available on the market in the education network. Alongside the requisite technology, it will also be necessary to develop teaching concepts that show how suitable teaching content and targets can be communicated and achieved with greater efficiency in all areas of school, adult and vocational education.

Description

Respondents have a positive attitude toward use of an electronic textbook.

In Brazil, in particular, the reaction to the electronic textbook is evidently very positive – 66 percent of the people surveyed stated that they would let their children try the electronic textbook. By contrast, only 36 percent made the same statement in Germany. This is also reflected in the average values for these countries: whereas the average value of 1.5 in Brazil reflects people's willingness to try the electronic textbook, German respondents appear slightly more skeptical (average 2.2; see FIG. 11). On average, however, they would probably also let their children try out this scenario. In an international comparison of innovation-minded respondents, German people are again bottom of the league (average 2.0), whereas Brazil and Sweden head the field (both with average 1.4).

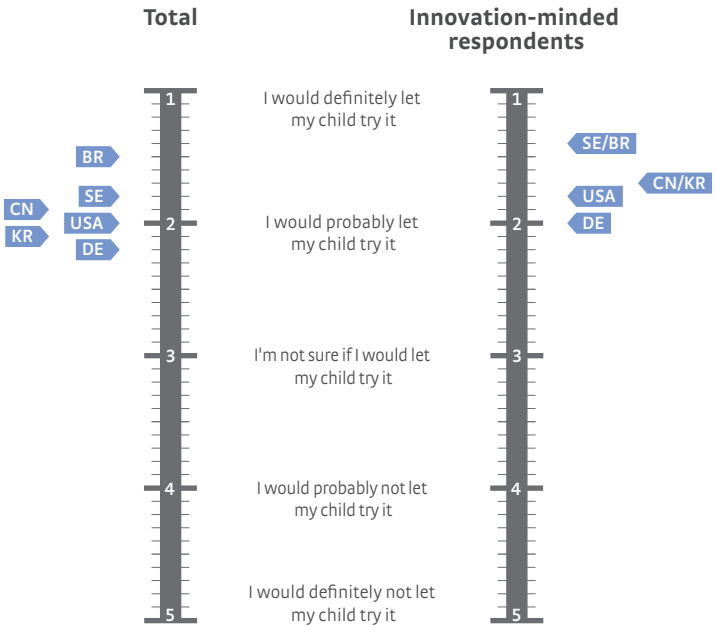
Respondents were asked to mark all the passages in the electronic textbook description that they liked and that they viewed critically

It is particularly striking that the health-related aspects of this future scenario meet with a positive response from German respondents.

At least 21 percent of respondents marked as positive aspects the passages *"cut down on the weight my child has to carry"* and *"easy on the eyes"* However, they also marked *"highlight"* (21 to 30 percent; see FIG. 9). Above all, the fact that students always have *"regularly updated"*, i. e., *"up-to-date textbooks"*, would appear to be an additional benefit in the eyes of German respondents (21 to 30 and 31 to 40 percent). 21 to 30 percent of respondents also state that they like the fact that the electronic textbook enables students to *"contact fellow students"* or the *"teacher."* One interesting aspect here is that an equal number of respondents also view *"contact to fellow students"* critically. They could be afraid that students might be distracted too easily and communicate with their co-students on topics that bear no relation to school. Even the term *"easy on the eyes"* was viewed critically by 21 to 30 percent of respondents. It can be assumed that they simply challenge this aspect, i. e., do not consider it credible.

FIG. 11: What respondents think about a trial with »the electronic textbook«

"How likely is it that you would let your child try out this scenario?"



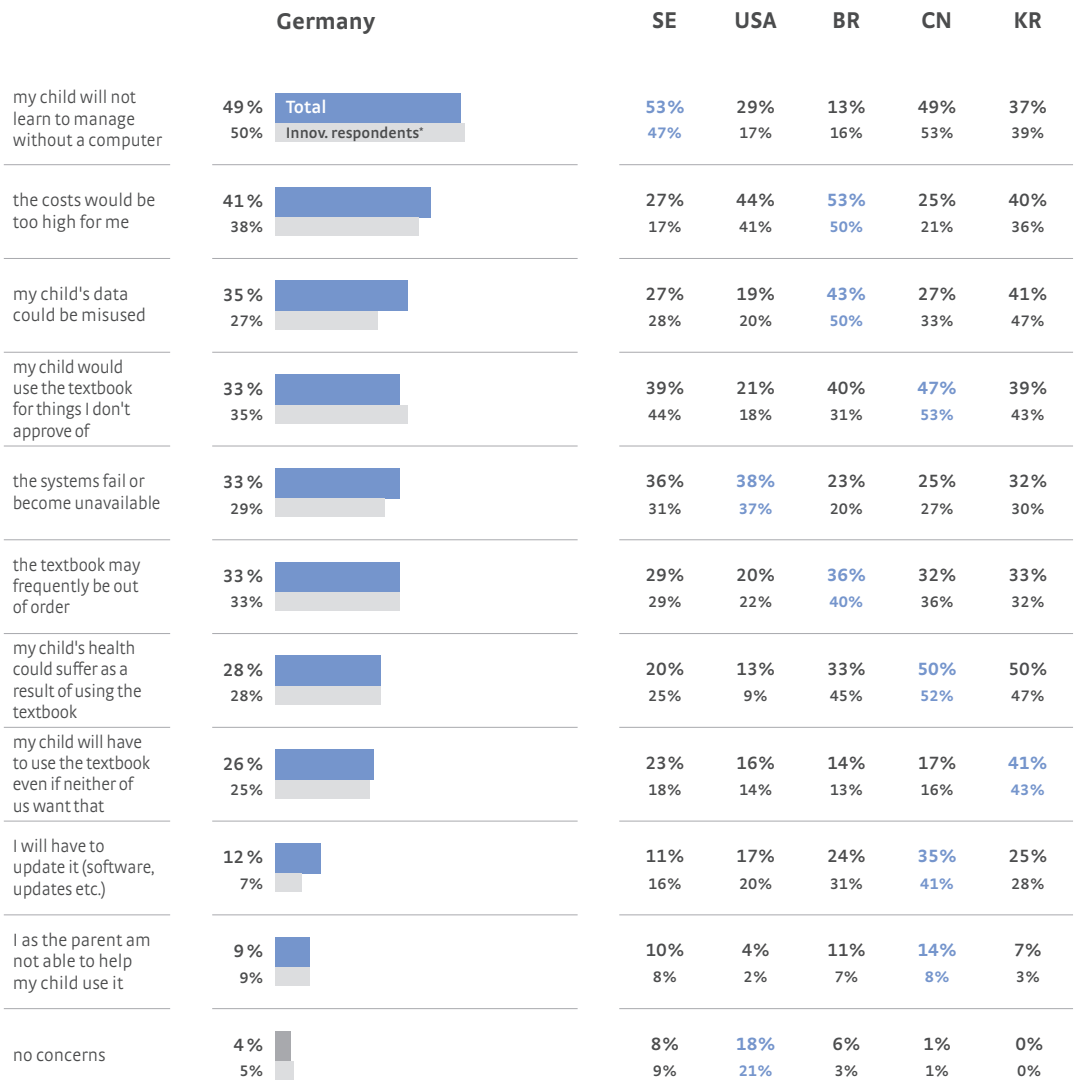
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=306, USA (USA) n=295, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=92, Sweden (SE) n=85, USA (USA) n=105, Brazil (BR) n=91, China (CN) n=97, Korea (KR) n=93

FIG. 12: Respondents' concerns about »the electronic textbook«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=306, USA (USA) n=295, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=92, Sweden (SE) n=85, USA (USA) n=105, Brazil (BR) n=91, China (CN) n=97, Korea (KR) n=93

Every second German respondent fears that, with the electronic textbook, children would not learn to manage without a computer (49 percent; see FIG. 12).

This concern is equally widespread in Sweden and China (53 and 49 percent), whereas only 13 percent of respondents quoted this concern in Brazil. Second on the German list of concerns are the costs. As many as 41 percent of German respondents are afraid that the electronic textbook would cost too much. In the USA and Brazil this is actually the most common concern (44 and 53 percent). The list of concerns again reflects a finding mentioned above: 21 to 30 percent of German respondents marked the phrase *"contact to fellow students"* as critical. This coincides with the fact that 33 percent of German respondents suspect that children would use the textbook for other things which

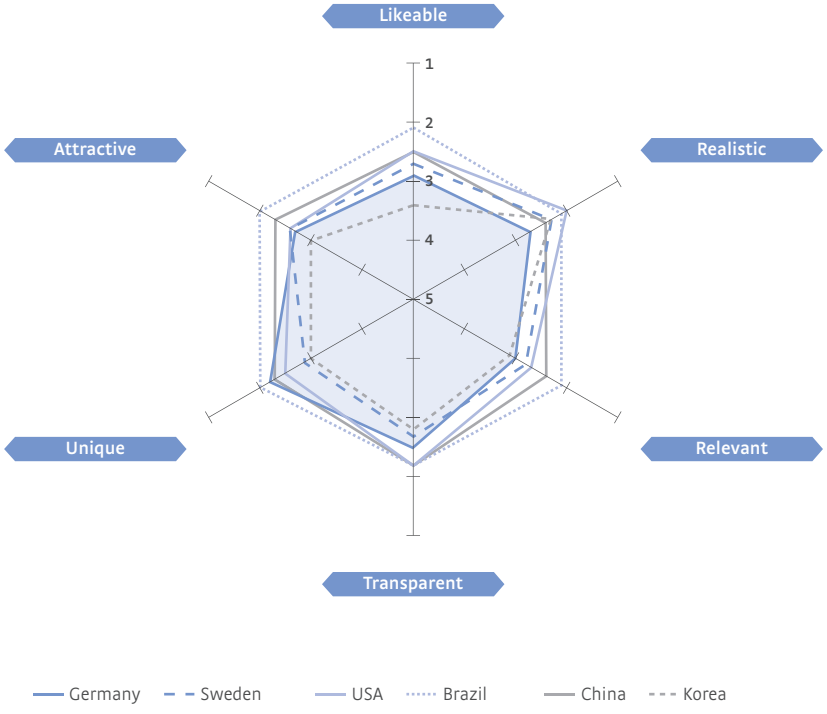
they would not approve of. In China, 47 percent of the people surveyed share this concern.

It comes as no surprise that 33 percent of German respondents are concerned that the technology could fail, and an equal number of them are afraid the textbook might frequently be out of order. These are undoubtedly important aspects if the electronic textbook is to be deployed across disciplines throughout the education system.

In China and Korea every second respondent fears that children's health could suffer as a result of using the electronic textbook (e.g., headaches). In comparison, this concern is relatively uncommon among German respondents (28 percent). It is interesting to note that a quarter of all people surveyed, including innovation-minded respondents in Germany, are concerned that children will have to use the electronic textbook even if they or the children do not wish to do so (26 and 25 percent). A majority of people who are very open-minded toward new technologies do not seem to be completely happy with the idea of nationwide rollout of an electronic textbook.

FIG. 13: Ratings for individual aspects of »the electronic textbook«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



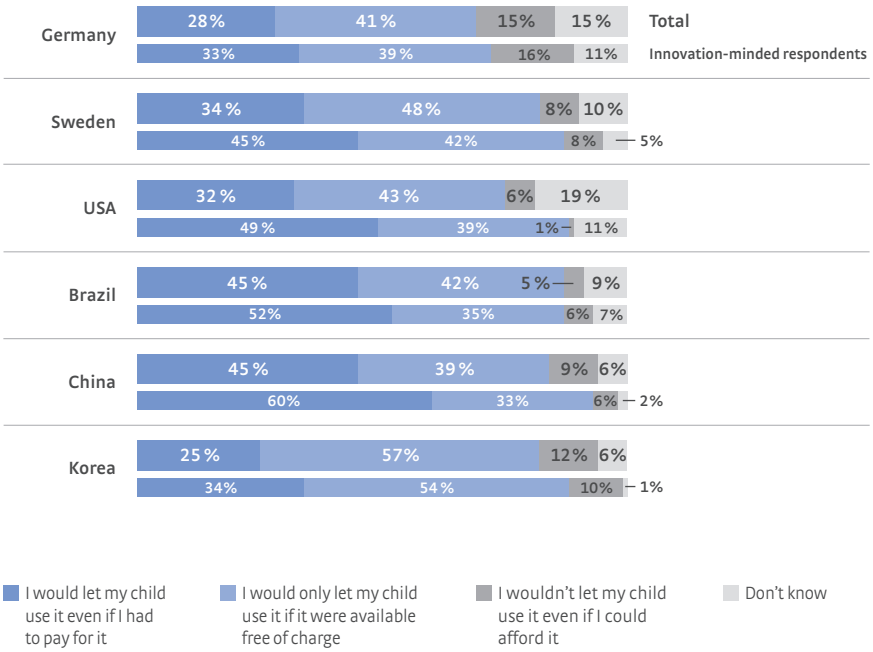
	DE	SE	USA	BR	CN	KR
Likeable	2.9	2.7	2.5	2.1	2.5	3.4
Realistic	2.7	2.3	2.0	2.1	2.4	2.3
Relevant	3.0	2.8	2.7	2.1	2.4	3.1
Transparent	2.5	2.7	2.2	2.2	2.2	2.8
Unique	2.2	2.9	2.5	2.0	2.3	3.0
Attractive	2.7	2.6	2.6	2.0	2.3	3.0

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=301, Sweden (SE) n=306, USA (USA) n=295, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=302

FIG. 14: Willingness to pay for »the electronic textbook«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=306, USA (USA) n=295, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=92, Sweden (SE) n=85, USA (USA) n=105, Brazil (BR) n=91, China (CN) n=97, Korea (KR) n=93

In an international comparison likeability levels for the electronic textbook vary greatly.

Whereas this concept is very well liked on average in Brazil (average 2.1; see FIG. 13), Koreans only rate it fairly likeable with an average of 3.4. The electronic textbook is also fairly well liked by German respondents (2.9). It appears that countries rate the relevance and attractiveness of the electronic textbook at a similar level to likeability: again, relevance is rated highest in Brazil, as is attractiveness (average 2.1 and 2.0). Korea, on the other hand, lags behind again on these two aspects, where the textbook is given slightly relevant and slightly attractive ratings (average 3.1 and 3.0).

Respondents in most countries consider this scenario very realistic. It receives the highest rating for realism in the USA (average 2.0) but the lowest rating of all in Germany (average 2.7). One exciting finding is the fact that the electronic textbook is given the best ratings for innovation and uniqueness in Brazil and Germany (average 2.0 and 2.2). It would seem that there is little awareness of the concept in these two countries. By contrast, this aspect is given a far lower rating in Sweden and Korea (average 2.9 and 3.0) – possibly due to the fact that initial experiences have already been made or public discussions conducted on the future use of electronic school books in these countries.

Willingness to pay for the electronic textbook is amazingly high.

45 percent of respondents in Brazil and China state that they would be willing to pay to use the electronic textbook, while every fourth German and Korean respondent also shows this readiness (28 and 25 percent; see FIG. 14). As was to be expected, the number of respondents who would be willing to pay for the electronic textbook is slightly higher among the innovation-minded respondents. In China, 60 percent of the innovation-minded respondents would pay for it, with 33 percent willing to do so in Germany. In the entire survey sample, the group which would let children use the electronic textbook if it were available free of charge prevails in most countries (Korea: 57 percent, Germany: 41 percent).

The number who would not let their children use the electronic textbook even if they could afford it is relatively low. The largest of these groups in an international comparison can be found in Germany with 15 percent, the lowest in Brazil (5 percent).

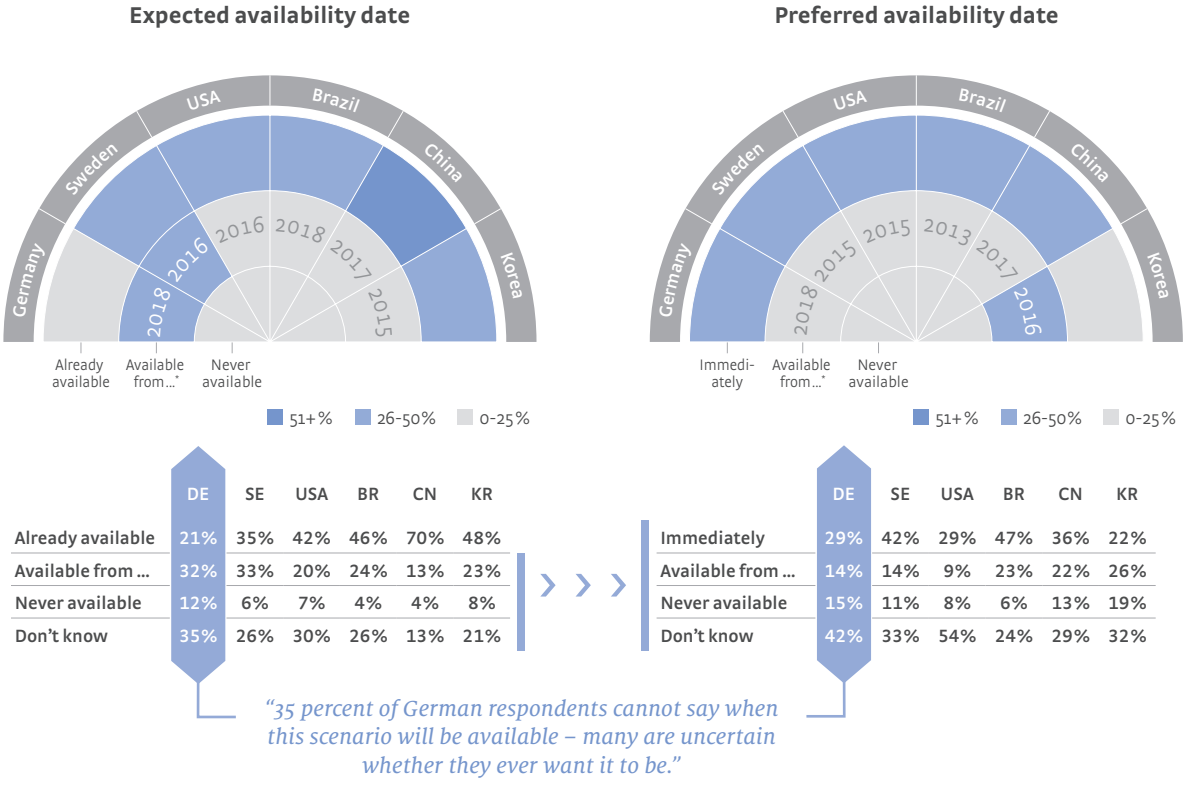
The electronic textbook is expected to be in use in most countries in 2011.

With the exception of Germany the majority of respondents in all countries state that the electronic textbook is already available to most school students or will become available in the course of the year 2011. In Germany around a third (32 percent; see FIG. 15), however, think that some time will pass before the electronic textbook is available.

Asked when they would like this scenario to be available to the majority of school students in their country, most respondents in all countries – with the exception of Korea – answered *"Immediately."* Despite broad approval for the electronic textbook, some German respondents hope that it will never be available.

FIG. 15: Expected availability date for »the electronic textbook« vs. preferred availability date for »the electronic textbook«

"When do you expect this scenario to be available for the majority of school students in your country?"
"When would you like this scenario to be available for the majority of school students in your country?"



	DE	SE	USA	BR	CN	KR
Already available	21%	35%	42%	46%	70%	48%
Available from ...	32%	33%	20%	24%	13%	23%
Never available	12%	6%	7%	4%	4%	8%
Don't know	35%	26%	30%	26%	13%	21%

	DE	SE	USA	BR	CN	KR
Immediately	29%	42%	29%	47%	36%	22%
Available from ...	14%	14%	9%	23%	22%	26%
Never available	15%	11%	8%	6%	13%	19%
Don't know	42%	33%	54%	24%	29%	32%

"35 percent of German respondents cannot say when this scenario will be available – many are uncertain whether they ever want it to be."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=301, Sweden (SE) n=306, USA (USA) n=295, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=302;
Preferred availability date: Germany (DE) n=242, Sweden (SE) n=194, USA (USA) n=174, Brazil (BR) n=164, China (CN) n=91, Korea (KR) n=149

"Emerging economies obviously realize that education is a key success factor."

Interpretation

The electronic textbook has already arrived in reality.
The international survey on the use of electronic textbooks produced several surprises. Above all in Brazil it shows a far more positive basic attitude toward modern forms of teaching than we find in the USA or Germany. Besides this, respondents in many countries believe that the electronic textbook is already in use or will be used in the near future. Here, in contrast to Germany, 70 percent approvers and 30 percent skeptics reveal a highly differentiated understanding among the countries' populations (see FIG. 11, 15 and 14).

Highest rating for the electronic textbook in Brazil.
Although the electronic textbook concept is considered relatively new in Brazil (average 2.0), the country is the most open to IT-based teaching. Countries like Brazil and China are convinced that modern forms of education are necessary. Almost half the people surveyed in these two countries would endorse use of the electronic textbook by their children even if it proved expensive (45 percent in each case). Emerging economies obviously realize that education is a key success factor. The willingness to go new ways in this field is seen as a potentially good way to improve quality of life. People are therefore more prepared to accept innovative change than in countries that already have a higher prosperity 'saturation' level, where they are seen to be more dependent on traditional teaching and learning formats.

The greatest barriers are dependency on technology and cost.
Around half the respondents in Germany, Sweden and China are afraid that their children will not be able to find their way around without a computer if they have to use one regularly in place of paper-based schoolbooks (see FIG. 12). In the USA, Brazil, Korea and also Germany, the costs are considered one of the greatest barriers to usage. Mobile devices have therefore not yet found a place in the life of most people. This is reflected very aptly in the range of barriers quoted, which extend from health or data privacy issues to a lack of trust in technology and the costs involved. The latter would naturally drop if laptops and tablet computers were used more extensively. Since today's parents do not belong to the generation of digital natives and do not see the necessity to stray from familiar behavior patterns, broad acceptance for electronic books will only be achieved in several years' time along with greater tolerance in the education sector.

Germans are more skeptical about the electronic textbook than the other respondents.
In an international comparison, respondents from Germany view the electronic textbook with greater skepticism and reserve even though the majority of the people surveyed approve of its use – with a count of 69 percent, while many other nations lie above the 80 percent mark. The majority of respondents in all countries outside Germany stated that electronic schoolbooks are already available. China is the clear leader in this field with a rating of 70 percent (see FIG. 14 and 15). The fact that respondents already take digital teaching for granted in day-to-day schooling in most countries explains the high acceptance rate. One astonishing finding is that the opinions of the innovation-minded respondents in Germany barely differ from the country's other respondents. This reflects the lower willingness of people in Germany to run the risk of negative consequences which could result from deploying new technologies in education. It is therefore more difficult to implement change processes in educational policy or these changes may be introduced more slowly than in other countries.

Brazil and China give high ratings to the social importance.
The impression is given in some countries that, through the degree of prosperity already reached, people tend not to see a need for change in existing educational policy structures; the opposite is true, however, in Sweden, Brazil and China. In Brazil, in particular, the untiring will to achieve even greater economic success and prosperity appears to be unbroken. The country also appears willing to be the first to go completely new ways in education. The high costs involved and other negative aspects do not deter Brazil's respondents from giving the digital schoolbook good ratings for attractiveness, relevance to good education and basic likeability (average values 2.0 or 2,1; see FIG. 13). Their striving for better living often means that they do not hesitate to address new ideas and to implement them. In countries such as Germany, however, people discuss and analyze the potential negative aspects before any decision to implement is taken. The initial approach to new forms of teaching in this country is therefore cautious, with the result that they do not as yet play a significant role in society.

All students have their own electronic device.
Alongside the benefits they provide for individual users, electronic schoolbooks also play a very important economic role. Around twelve million school students would need to be supplied with laptops or tablet computers in Germany alone. Viewing this at European or even global level makes the market even more attractive for device manufacturers.

Since infrastructures for learning platforms and study content are essential for optimal use of mobile devices in lessons, the concept is crucial for the IT industry as well as for the publishing sector, which supplies the content. The near future will bring the similar lightning development that we have already experienced in the area of mobile telephony. However, another aspect is also important in economic analysis: education is the main driver of innovation and therefore of economic growth. Today, development and concept design for new technologies are gaining greater importance alongside production and manufacturing. This means that the contest for international business will therefore be won in the field of education. With this in view, innovative new paths may well make the key difference.

Media competency as a social success factor.

The lightning pace at which man's knowledge is growing generates the need for new ways of learning. Today's immense knowledge databases on the Internet cannot be accessed via conventional methods and it is a long time since this know-how could be acquired solely by relying on analog schoolbooks. The increasing penetration of IT systems into all areas of our lives is another factor that makes it necessary to teach media skills alongside other basic skills in school. Moving safely round the Internet, using social networks in the right way and raising awareness for the risks of a virtual world are now part and parcel of every student's basic education, along with road safety education and social skills. This is the reason why learning is unlikely to be successful in the future if it ignores IT (see also Volume 2 of the 2009 study: International Delphi Study 2030). Increasingly, digital teaching and learning formats will therefore directly impact the education level of a society.

Summary and recommendations.

The results of the study reveal that, in an international comparison, German respondents tend to take a cautious approach to new paths in education. 15 percent of the people surveyed would prefer it if electronic textbooks never became available (see FIG. 15).

For industrial nations like Germany, the development of new innovative concepts is an attractive prospect for their economic future rather than manufacturing itself, due to present wage levels. Science and education will therefore have an important part to play. It will be necessary to react flexibly to new approaches in these fields and to take an open stance on change processes. If they do not succeed, these nations run the risk of being overtaken by other countries and relinquishing the chance to play a leading role in the world of international business in the future.

The first vital step for politics, business and the academic world will be to drive the expansion of network infrastructure throughout the country in order to establish the required environment. Furthermore, people will have to identify and eliminate barriers to use of the electronic textbook and dispel any fears about its usage. This involves first and foremost, alongside the costs, the right way to handle the technology. The feared dependency on computers, the right way to handle legal privacy issues and the worry that electronic textbooks could be used for purposes other than learning reveal that nations will have to invest more heavily in the development of media skills in future. This will call for action to be taken primarily by educational institutions and hence in educational policy-making. It will not only be vital to install the technical infrastructures but also above all to draw up and communicate balanced teaching and didactic concepts. At this point, business must support politics with innovative approaches and work toward technical concepts that will enable various manufacturers to operate side by side in the market. Standardization is the magic formula. In order to establish IT-based teaching for a universal educational network with standardized content nationwide, it will be necessary that all available mobile devices can be integrated with any operating system. This is the biggest technical challenge. The recommendation for society itself is that it should be more receptive to change and not wait on the sidelines until practical suitability is proven in other countries and all critical issues have finally been resolved.

The electronic textbook is no longer a future scenario in the classical sense, since it is already reality in many countries. Germany, too, boasts many examples of successful deployment. The basic attitude toward new and innovative approaches in education is largely positive. There is, however, still a large group of skeptics in Germany. If politicians succeed in establishing the conditions needed to improve the population's media skills, and if business can supply appropriate concepts to strengthen people's trust in the technology, lessons will be enhanced through the introduction of digital teaching units in Germany, too.

Chapter 2
Work and organization.

The online data manager.

The ‘anywhere’ desk.

The digital city service office.

Work and how we see it, its content and organization have always been subject to changes in technology, political developments and social norms. Two examples of historical changes are the move toward division of labor in society and industrialization. From today's viewpoint, demographic change and continuing globalization are the mega trends which, with their demand for maximum flexibility, will have a comparatively revolutionary impact on our future working world. A detailed analysis reveals that the abstraction and virtualization of work processes coupled with inter-regional mobilization of the workforce has left a deep mark. The global stream of goods and services hand in hand with distributed manufacturing processes were followed by the internationalization of business relations and work locations. This necessitates multilingualism and intercultural skills. A networked digital society requires new skills and careers, great flexibility and a modified system of values in order to face up to accelerated technology change and its impact on our working, social and private lives. The term work-life balance was coined to illustrate the problems involved in reconciling work and private life, and to address the responsibility of every individual to design their own lifestyle in modern societies, a need brought about by today's trend toward individualization. A standard career in which people hold one or two jobs throughout their working lives is rapidly losing ground in the western industrialized nations.

From the viewpoint of working people, ICT plays an increasingly important role in determining conditions of work, and actually represents a key influence factor on our working world. This requires media skills, a powerful communication infrastructure (including rural areas) and ICT solutions for smart travel-to-work concepts.

ICT is the basis on which today's work is organized and is set to play an even more important role in the future. Increasingly, shared data rooms, workgrouping, mixed media collaboration tools and real-time teleconferencing options will dominate our world of work. These options will be used not only in business enterprises but also in flexible workplace models. Whether we work at home or on the move, with mobile desks or satellite offices, all workplaces will be securely networked and feature efficient ease of use. In the future, workplace equipment comprising PCs, thin clients and virtualization concepts for managed desktops will be joined by mobile devices with add-on functions and new security concepts. In addition, the workplace of the future will be a smart environment, equipped with large-format displays and various input technologies, interactive function elements integrated in walls and desks, and portable mobile devices that interoperate with the infrastructure. Last but not least, today's changing world of work will force many people to relocate. Here again, ICT offers new solutions. More and more people are already choosing to register their place of residence or handle other formalities (e. g., re-registering motor vehicles) online. Flexible employees therefore spend less time on visits to public offices and complete their administration formalities anytime, anywhere.

The following pictures of the future illustrate the above ICT-based functions in tomorrow's working world.

The online data manager concept addresses a relevant section of the desirable scenarios described above in the area of data usage and security on the Internet.

Being able to access their own data easily at any time is a basic function that people will need in future work situations, which will be characterized by work mobility, changing work organization and dynamic team structures. A future-oriented solution can be expected to provide this access without employees having PCs of their own permanently available and without having to access local software on site. The future smartphone will be configured as an **'anywhere' desk** and have powerful communication mechanisms that provide secure access to any number of input and output devices as well as to all personal data – wherever users are and whenever they so require.

Citizen-friendly services provided by local and federal authorities make flexible employees' lives easier when it comes to moving house or changing their job. In addition, **the digital city service office** offers numerous other citizen-friendly services that help users find their way around a new town or village and to settle down quickly.

The online data manager.

FIG. 16: Evaluation of individual aspects of »the online data manager«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

I want to get maximum use from the Internet but I feel I have less and less control over what really happens with my personal data on the web.

31-40%

The new online data manager helps me **organize and control the access rights to my personal data on the Internet. When necessary, it protects my data against third-party access.**

21-30%

The online data manager is **made available** to me by a **private service provider** of my choice, which is **regulated by government authorities.** It employs the **highest security standards.** The online data manager controls access to the data I have decided to share and gives me an **up-to-date overview** of **who has accessed which data.** In addition to assigning **expiration dates** to my data, on which it is deleted automatically, I can also define **usage periods** and usage purposes for every entity that uses my data. The online data manager acts immediately if the entity that accesses the data does not use it for the agreed purposes, revoking access rights and ensuring that my data is **deleted** from the third party's database. The online data manager is not obligatory and I can **cancel my subscription** at any time. If I want to, I can define someone I trust as a contact person who would be able to access my 'digital inheritance' in my online data manager if worst comes to worst.

41+ %
of respondents marked this.

Liked Viewed critically

Percentage ranges are visualized in different font sizes

Basis: all people surveyed about this scenario, Germany (DE) n=301

FIG. 17: Visualization of »the online data manager«

"Tools used to manage (multiple) identities on the Internet will be in general use by 2019 at the latest." (Estimation by Germany experts)

(Result from the second phase of the study, thesis 30)

“In digital everyday life, the average digital user has no view or effective control over the vast number of accesses to their data.”

Dimension

Centralized data management for individuals as an element of user-controlled data sovereignty.
The triumphant success of free services on the Internet is largely based on business models that are financed through general, target group-specific and, increasingly, personalized advertising. Our individual digital lifestyles are effectively accompanied by the comprehensive evaluation of personal data and digital tracks on the Internet. This process performed with growing precision began long before the lightning rise of social networks and is beyond the comprehension or control of individual users. The administration of personal data on registered accounts for web-based services requires a volume of work that can scarcely be handled by individual users alone, irrespective of whether Internet service providers, search engine operators, social networks, voice-over-IP and net-based telephony providers or e-commerce are involved. In their digital lives, the average user has no view or effective control over the vast number of data accesses (who accesses their personal data when, for how long and for what purpose, who has passed it on, and how up to date was the data at the time). Users are often unaware how and under what circumstances access can be blocked, how to revoke consent once it has been granted, how data records can be deleted permanently from accounts if needed and how they can obtain a report that states how and where their data has been used up to now. In addition, users feel a growing desire to store their ‘digital inheritance’ with an independent provider where it will be kept available for those who come after them.

This is the situation that has given rise to the concept of an online data manager. The online data manager is a software solution on the Internet which manages ‘data as an article of exchange’ between the user and the provider of Internet services, enables access to the user’s personal data on request or for a certain period, blocks him or her for individual providers if so required, gives users an overview of their access permissions whenever they need it, and requests account deletion when the user considers it necessary. This service should be free of charge for the user and can be financed, if necessary, through a usage charge to be paid by the service provider.

Requirements for data security and regulation.
Providers who offer the online data manager must guarantee maximum data security and data protection, and are subject to the relevant regulatory controls. Naturally, all users can use or cancel the online data manager any time, correct and delete their data, transfer data when necessary to an alternative online data manager and store certain data as a ‘digital inheritance’ over the long term with predefined access rights for third parties.

The online data manager does not establish absolute data protection on the Internet. But it gives individual users a better understanding of who accesses their data, and enables them to reduce this group if they no longer want a specific provider to have access. This regulated approach opens up a market to a potentially large number of online data manager providers, at the same time satisfying maximum technical requirements with regard to data security and making it possible to change from one online data manager to another.

Description

Respondents from the different countries take very different views on a trial with the online data manager. Whereas the probability that the Brazilian and Chinese respondents would try this scenario is average (average value 2.2), people from Germany, Sweden and the USA are not sure whether they would consider a trial (average value 2.9, 2.9 and 3.4; see FIG. 18). Only 15 percent of the German respondents state that they would definitely try this scenario, while as many as 28 percent of the Brazilians but only four percent of the USA respondents are of the same opinion.

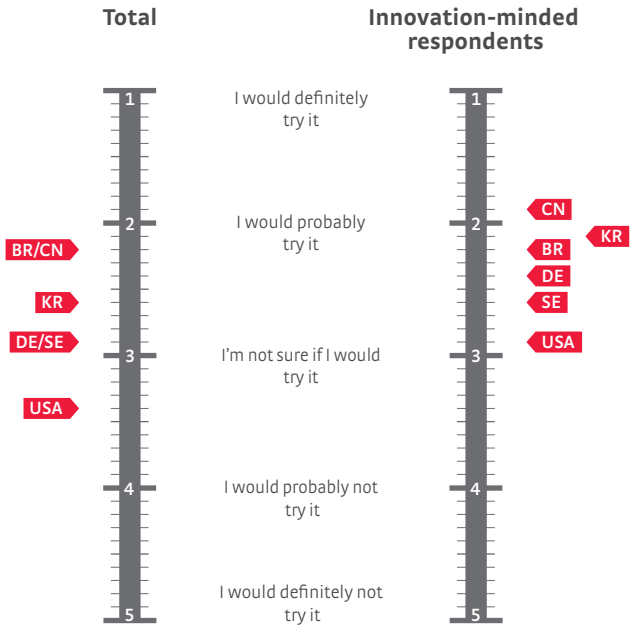
Even the innovation-minded respondents consider a trial less probable. With a rating of 1.9, the innovation-minded Chinese would be most likely to try the online data manager, innovation-minded respondents in the USA are the least likely to do so (average value 2.9). However, in the innovation-minded group 26 percent of the German respondents actually state that they would try the data manager, whereas only 10 percent of the USA respondents show the same interest.

Respondents then marked all passages in the scenario text that they particularly liked and that they viewed critically.

German respondents gave positive ratings to the core aspects of this scenario. *"Organize and control the access rights to my personal data on the Internet"* and *"Current overview of who accesses which data* (these were marked by at least 21 percent of the German respondents; see FIG.16). More than 41 percent of respondents also marked the phrase *"Protects my data against third-party access"* – this therefore seems to be one of the online data manager's vital advantages for at least two out of every five respondents. 21 to 40 percent of the people surveyed also like the fact that the online data manager complies with the *"Highest security standards."* Frequent marking of the phrases *"Expiration date," "Usage period"* and *"Deletion"* (21 to 30 percent) shows that respondents would appreciate this kind of control over their own data. The possibility of *"Canceling"* the online data manager service met with a positive response; 21 to 30 percent again underlined this aspect.

FIG. 18: What respondents think about a trial with »the online data manager«

"How likely is it that you would try this future scenario?"



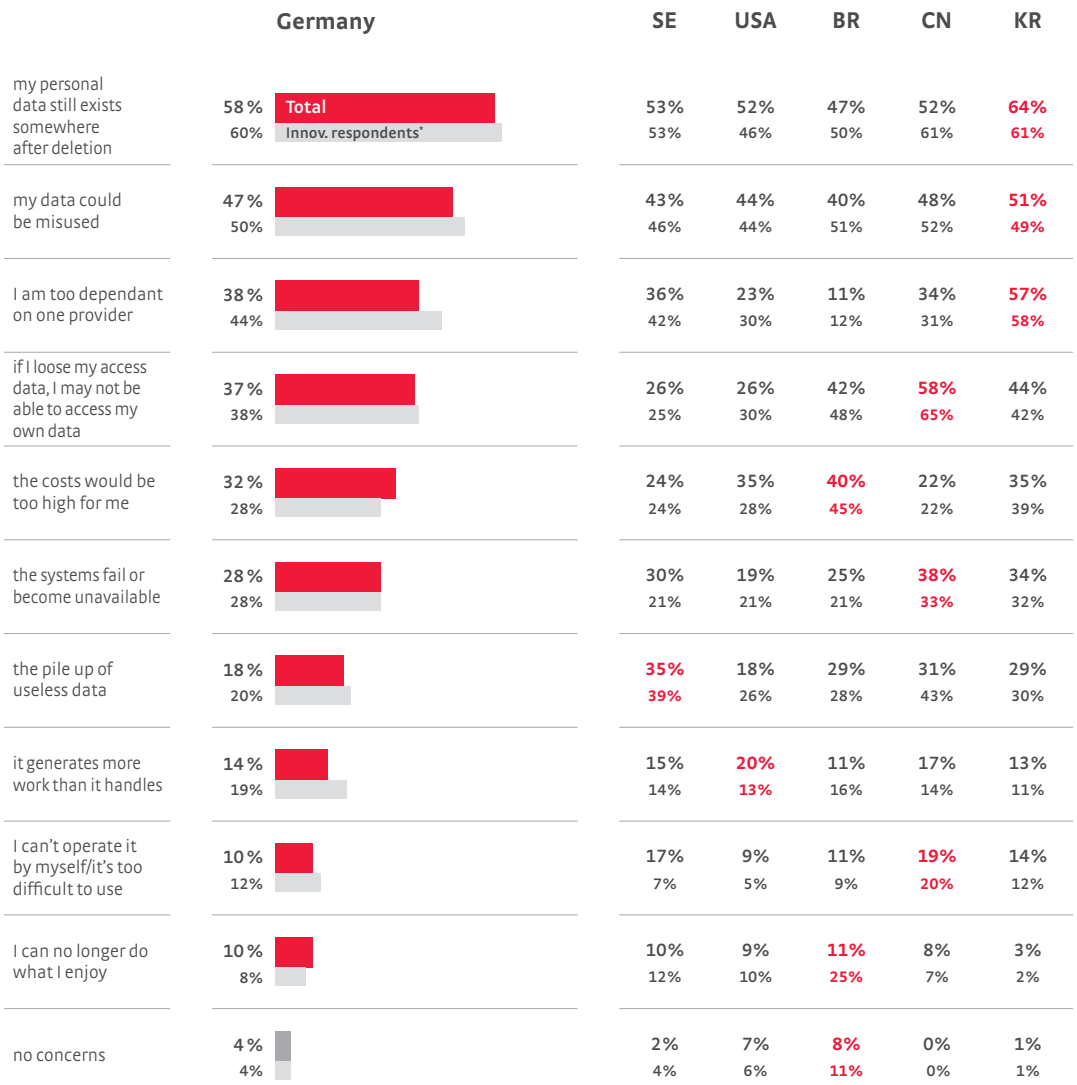
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=308, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=297, Korea (KR) n=299;
Innovation-minded respondents: Germany (DE) n=99, Sweden (SE) n=95, USA (USA) n=87, Brazil (BR) n=85, China (CN) n=101, Korea (KR) n = 89

FIG. 19: Respondents' concerns about »the online data manager«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=308, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=297, Korea (KR) n=299;
Innovation-minded respondents: Germany (DE) n=99, Sweden (SE) n=95, USA (USA) n=87, Brazil (BR) n=85, China (CN) n =101, Korea (KR) n=89

On the other hand, German respondents viewed the aspects *"Private service provider"* and *"Regulated by government authorities"* critically. Respondents are obviously not critical of the offer itself but are, nonetheless, critical of the service's delivery format.

The greatest concern among German respondents is that their data will still exist on the Net even after deletion – they do not believe that it is possible to permanently delete all personal traces on the Internet.

This is stated by 58 percent of German respondents (see FIG. 19). It is also the most widespread concern in the other survey countries – with the exception of China. In Korea as many as 64 percent of respondents marked this concern. It is not surprising that a future scenario dedicated to intensive administration of personal data on the Net is precisely one of the areas where many respondents fear that their data could be misused. This was stated by 47 percent of respondents in Germany – in Korea every second person expressed this opinion (51 percent).

One worry experienced at very different levels in the different countries is dependence on a single provider. While only 38 percent of respondents voice this opinion in Germany, the figure for

Korea is 57 percent, but only 11 percent for Brazil. One interesting discovery was that the innovation-minded respondents in virtually all the countries surveyed quote this concern more frequently (e.g., 44 percent in Germany). 58 percent of the Chinese respondents feared that they might not be able to access their own information if they lost their access data, and as many as 65 percent of the innovation-minded respondents in China marked this aspect. This concern was 'only' voiced by 37 percent of respondents in Germany, thus occupying fourth place.

As in many of the other future scenarios, the concern about personal costs is mentioned most frequently in Brazil, the USA and Korea (40, 35 and 35 percent). In Germany this is a fear for 32 percent – even so, one third of all respondents. An additional worry in many countries is expressed by roughly one third of respondents, namely that a lot of useless data could pile up, with Sweden leading the field at 35 percent. By comparison, this opinion is stated the least frequently in Germany and the USA (18 percent).

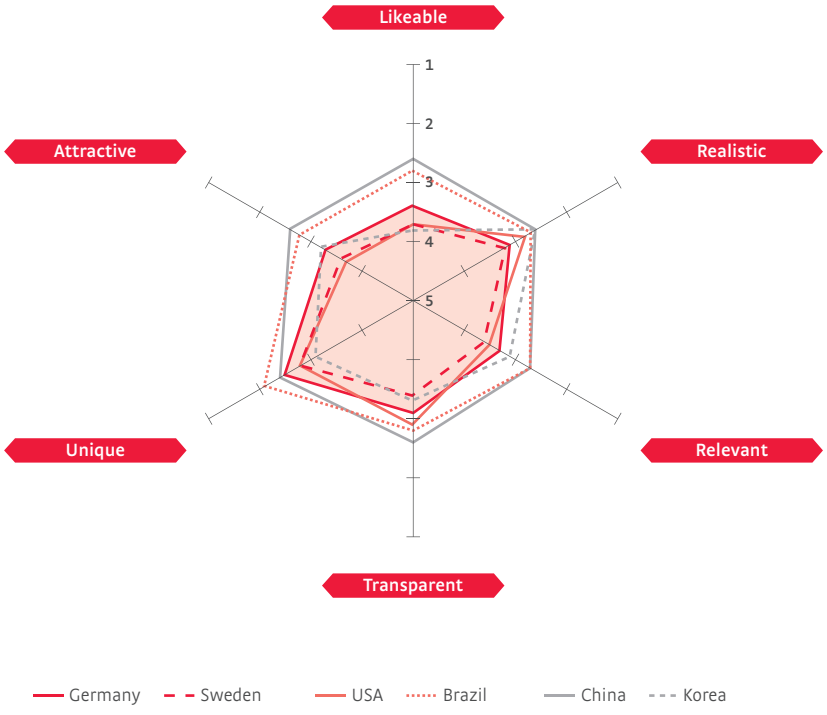
The online data manager is not so well liked on average

(see FIG. 20).

The best rating for the online data manager comes from the Chinese with an average of 2.6 – the worst at 3.8 is allocated by the Koreans. The attractiveness of the online data manager is assessed at a similar level to likeability. The US Americans give this scenario the lowest rating with an average value of 3.7. Overall the picture is considered fairly realistic, with the best results coming from the Chinese and the

FIG. 20: Ratings for individual aspects of »the online data manager«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



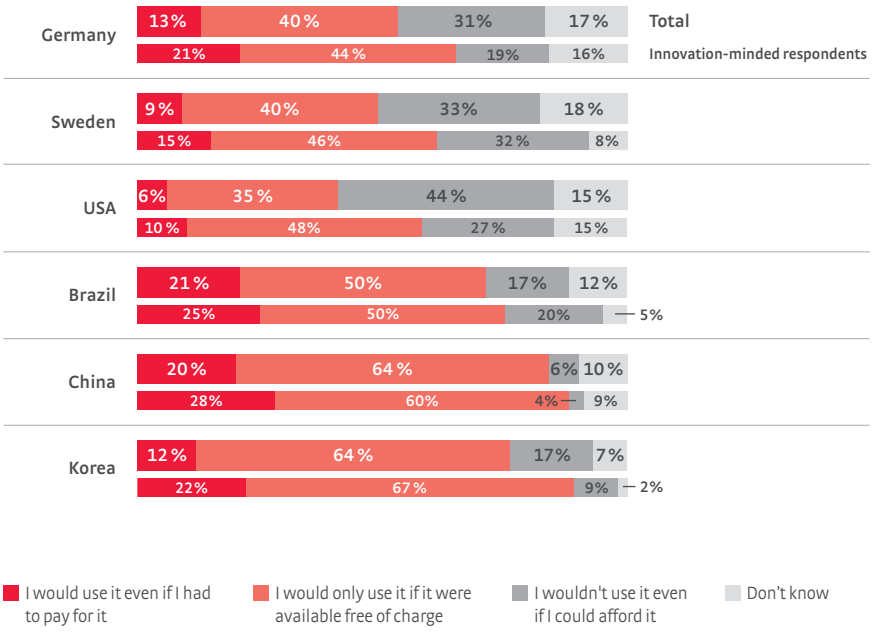
	DE	SE	USA	BR	CN	KR
Likeable	3.4	3.7	3.7	2.8	2.6	3.8
Realistic	3.1	3.2	2.8	2.7	2.6	2.6
Relevant	3.3	3.6	3.5	2.7	2.7	3.1
Transparent	3.1	3.4	2.9	2.8	2.6	3.3
Unique	2.5	2.8	2.8	2.1	2.4	3.1
Attractive	3.3	3.6	3.7	2.8	2.6	3.2

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=301, Sweden (SE) n=308, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=297, Korea (KR) n=299

FIG. 21: Willingness to pay for »the online data manager«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=308, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=297, Korea (KR) n =299;
Innovation-minded respondents: Germany (DE) n=99, Sweden (SE) n=95, USA (USA) n=87, Brazil (BR) n=85, China (CN) n=101, Korea (KR) n=89

Koreans (average value 2.6 in each case), while the Swedes find it slightly less realistic (average value 3.2). In Sweden the online data manager is regarded as not so relevant with an average value of 3.6 – opinions in Brazil and China are much better at 2.7. The Brazilian respondents feel that this scenario as a whole is very new and innovative – whereas the Koreans consider it only slightly new and innovative on average (2.1 and 3.1).

Willingness to pay for the online data manager is lowest in the USA.

Only six percent of US Americans state that they would use the online data manager even if they had to pay for it – in contrast, willingness to use it is relatively high in Germany at 13 percent (see FIG. 21). Among the innovation-minded German respondents, as many as 21 percent are willing to pay for usage. With the same percentage among all respondents, the Brazilians show the greatest willingness to pay for the online data manager.

It is striking that the percentage of people who would use the online data manager free of charge is very low in Germany, Sweden and the USA in a comparison of the different countries. Here only 40 or 35 percent of respondents are open to the idea of free usage. In Brazil, however, 50 percent of respondents would use it under these circumstances, in China and Korea 64 percent. As a result, many of the German, Swedish and particularly US American respondents would not even use this scenario if they could afford it. The figure is 31 percent for Germany, 33 percent for Sweden and even 44 percent for the USA. These countries appear to be the most skeptical of the online data manager. However, the group of non-users is not so big among innovation-minded respondents, as only 19 percent of the innovation-minded respondents in Germany would reject usage even if their finances allowed it. A relatively large group of 32 percent of the innovation-minded respondents in Sweden voiced the same opinion.

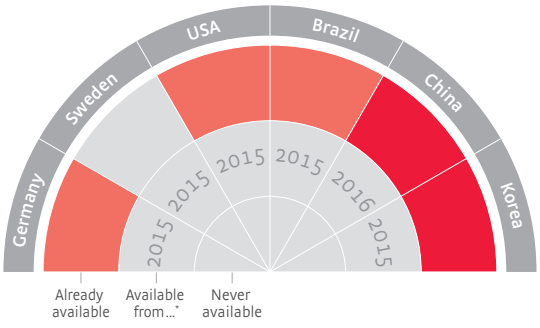
Asked when they expect the online data manager to be available, many respondents in virtually all countries believe that this scenario is already available or can be expected before the end of 2011.

In China and Korea this is the opinion of the majority of respondents (68 and 52 percent, see FIG. 22), while in Germany only 32 percent of respondents agree. Congruently, only three percent of the Chinese think that the online data manager will never be available, whereas in Germany the doubters account for 16 percent of respondents. In the countries surveyed, opinions about when the online data manager should ideally be available vary tremendously. The most frequent response in Germany, Brazil and Korea is "Immediately," an answer that is quoted by 26, 28 and 22 percent of respondents respectively. Respondents in China would like this scenario to be available in around 2015, but the largest group of respondents in Sweden and the USA hope that it will never be available (25 and 26 percent). This tallies with the results given above. The lowest rating for a trial came from respondents in Sweden and the USA, where the ratings for likeability, relevance and attractiveness is a clear indication that the response to the online data manager is not so positive in these two countries – consequently, there is low desire for availability among many respondents in these countries.

FIG. 22: Expected availability date for »the online data manager« vs. preferred availability date for »the online data manager«

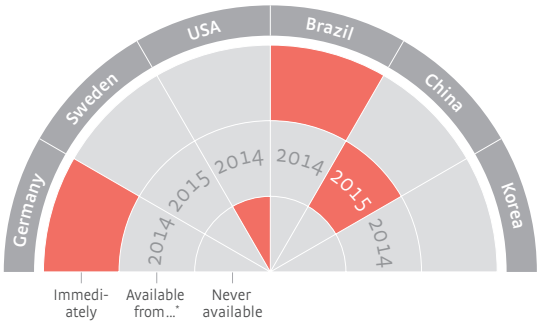
"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"

Expected availability date



	DE	SE	USA	BR	CN	KR
Already available	32%	24%	38%	47%	68%	52%
Available from ...	17%	22%	13%	16%	11%	18%
Never available	16%	19%	10%	8%	3%	8%
Don't know	36%	36%	39%	29%	17%	22%

Preferred availability date



	DE	SE	USA	BR	CN	KR
Immediately	26%	22%	16%	28%	20%	22%
Available from ...	8%	8%	10%	22%	26%	15%
Never available	19%	25%	26%	12%	5%	16%
Don't know	47%	45%	49%	39%	49%	47%

"68 percent of the Chinese respondents think that the online data manager is already available. Only a few hope that it will never become available."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=301, Sweden (SE) n=308, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=297, Korea (KR) n=299;
Preferred availability date: Germany (DE) n=204, Sweden (SE) n=234, USA (USA) n=183, Brazil (BR) n=167, China (CN) n=92, Korea (KR) n=145

"The online data manager can provide valuable support in digital everyday life."

Interpretation

The survey results relating to the online data manager confirm the concept's clear relevance but, at the same time, show that respondents view its efficiency and concrete design features with some criticism. Overall, the online data manager emerges as one of several conceivable options that could help individual users gain greater control over their data than is provided for by general legal requirements (where available) – with the clear exception of the USA and possibly also Sweden. The online data manager is seen in total as quite innovative and makes people curious to try it out. The chances of it being accepted and establishing itself depend – according to the overriding impression given by respondents – on a suitable regulatory framework that ensures an optimal level of data security. Although the online data manager cannot fully guarantee that the data users make available to different service providers is deleted permanently, it can be useful in the management of deletion requests.

Data privacy and data security – different socio-cultural and legal conditions.
The overall positive yet slightly hesitant confirmation of the online data manager's relevance reflects the complexity of the data privacy and data security issue in the countries that were surveyed. The individual results must be seen and interpreted in the context of the different socio-cultural backgrounds and legal frameworks in place in these countries. In the USA, the fundamental skepsis confirms expectations, in particular in view of the regulatory approach, whereby data privacy and data security basically follow the principle that the market regulates itself (with the exception of an important topic for this country, namely how to deal with security breaches). In contrast, the strong receptiveness of the online data manager is surprising, above all in China, where the majority of respondents consider that it already exists (see FIG. 22). In a country that lacks comparable data privacy laws, the online data manager seems to be welcomed as a means of giving individual users control and a certain degree of sovereignty over their data. The results of the survey do not, however, reveal details about whether and to which extent this finding bears relation to state supervision of Internet traffic. Between the two poles, USA and China or Brazil, lie the other countries that welcome the online data manager – the innovation factor is particularly important in Brazil – whereby difficulties and the risks involved in implementation are also emphasized (see FIG. 18 and 20). It comes as no surprise to find that the fear of dependency on, and possibly misuse of, data increases as users control their own central account administration. It must therefore be made even clearer that the online data manager does not guarantee absolute data privacy but can position itself to provide valuable additional support in users' digital everyday lives.

Traces on the Net.
The prime concern of people in almost all countries is that data could "still exist somewhere" even after it has been deleted (see FIG. 19). This realization is valid on a general scale, and any other conclusion would overestimate the online data manager's effective reach. However, if we see the online data manager as a service that controls access by service providers and grants it at a defined time or for a defined period, the management of access blocks and/or electronic deletion requests triggered by the online data manager would serve to improve service provider compliance. If, therefore, the online data manager assumes the role of compliance facilitator acting on behalf of the user, fears about its use are reduced to the general problem that the conduct of individual providers might not be legally sound – which exists to an equal degree with or without the online data manager. The online data manager will probably succeed in intensifying the compliance facilitator function in the perception of users and providers alike, if it can, on the basis of certification and regulatory controls, guarantee data privacy compliant behavior for its own actions.

Varying relevance of regulation.
Opinions about the national regulation and its effectiveness vary greatly as a result of the different legal backgrounds. Most respondents in the USA, where the online data manager is rated least relevant and least attractive (average value 3.5 to 3.7; see FIG. 20), reject the idea of regulatory controls. In the other countries, too, a concept whereby the online data manager would be offered in a market by private providers, who themselves have to satisfy certain regulatory requirements, is still viewed with skepticism. If we look at the strong reservations voiced by users (dependency on one provider and the risk of misuse; see FIG. 19), at any rate in countries that have data privacy legislation, the regulatory approach is probably the only one offered. The most obvious solution to the dilemma between users who choose to centralize their data administration and the risk of technical failure, long-term data loss, dependency on a single provider and data misuse is to impose an obligation on the online data manager to satisfy maximum data security requirements, as defined in regulatory provisions. As an expression of their private freedom of action, users must also be given the possibility of terminating use of the online data manager whenever they require, or of changing to another online data

manager at will. This results in the recommendation that, based on legal and regulatory provisions, data security must satisfy the most stringent technical requirements. Furthermore, the regulators must ensure that users will be able to change from one online data manager to another online data manager without any problems and take the access authorizations they have already granted with them.

Free service and usefulness.
Users virtually take it for granted that the model will be based on a free service, whereas a relatively high percentage of respondents in Germany – 13 percent – would be willing to pay for the benefits provided by an online data manager. It is striking that China has the largest number of respondents who would be willing to pay for the online data manager, with 28 percent of the innovation-minded respondents stating this fact. This again emphasizes that there appears to be a real demand for this service – possibly against the background of the lack of data privacy rights in this country. Here it would again be wise to make the online data manager model free of charge for users.

The general acceptance and attractiveness of this concept are ranked in the bottom third (see FIG. 20). In view of the concept's innovative nature in a sphere that is barely 'concrete,' this is, however, a relatively positive result, which must also be seen in the context of major national socio-cultural and legal differences. This goes hand in hand with the fact that people believe the online data manager could simplify their work and would not generate more work than it handles for users. The online data manager's usefulness profile therefore needs improving with practical application examples that show it off to its best advantage – one of these is that the online data manager centralizes views on which providers request access rights to dispatch newsletters, helps users issue blocks and delete requests for individual providers and thus makes account management more efficient.

Bundling data with maximum security and data growth.
The attraction of being able to control management of all data accesses by service providers with the online data manager is opposed by the fact that a "collection of useless data" could accumulate in the online data manager. The survey does not reveal whether this concern relates to a potential overall shortage of network line capacity or the line capacities of individual users, or whether the "useless" data referred to here could also be a place where individual users see additional privacy risks. It should be possible to address both these concerns – on the technology side as well as with a regulatory approach. If the online data manager is to conquer the market, it will need to offer lean processing on the technology side and deletion of log files and other information about past access requests on the regulatory side.

Digital inheritance.
The survey results do not indicate a greater demand or a critical stance on the aspect of digital inheritance. A demand among users for this service appears to be emerging only gradually. In view of the basic desire voiced by respondents for control over their data and the concerns relating to data security and protection from abuse which they associate with the online data manager, the practice – now common in social networks – of keeping accounts open over long periods does not represent the sole or completely satisfactory solution to digital inheritance. This calls for greater clarity in inheritance laws and regulatory constraints on the gatekeepers of digital inheritances, for which the online data manager could prove a suitable tool.

Summary.
The overall survey results indicate that the online data manager has a realistic chance of being accepted and used in most countries if its profile is sharpened – with the exception of the USA. To this end (at any rate in countries with data privacy and data security laws in place) the regulatory framework must be established so that the online data manager satisfies maximum data security requirements and so that an option is – technically and legally – available whereby users can change to another online data manager. When this is the case, the online data manager will close the gap in users' digital lives between general privacy requirements for service providers (to the extent this is regulated at all in the different countries at present) and the protection level based on the user's individual permission and pure self-regulation of the Internet economy.

The ‘anywhere’ desk.

FIG. 23: Evaluation of individual aspects of »the ‘anywhere’ desk«

“What do you particularly like about this scenario?”
“Is there anything about it that you view critically?”

I want to be able to **access** my digital data and **programs anywhere and at any time,** without having to own a PC or laptop that I have to administer and maintain (e. g., updates, firewall, CPU fan).

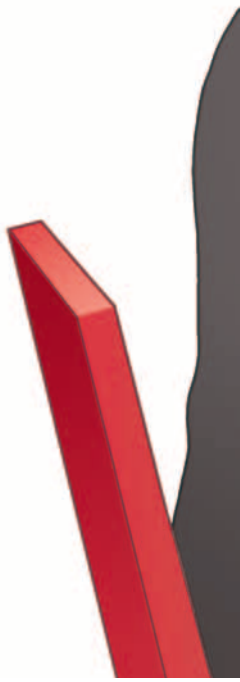
The ‘anywhere’ desk creates a new communication infrastructure that enables me to work **anywhere** (at home, at the office, in meeting rooms, stores, and on trains, planes and automobiles), without needing **a PC or laptop,** and to have convenient access to all my personal data and programs – with **100% protection*** against unauthorized access – through the communication networks.

Due to rapidly dropping prices, monitors and entry panels will soon become part of the basic infrastructure in private and public spaces. They will be available on walls, on tables or other furniture, on the backs of seats (in planes, trains and buses), in display windows, at info terminals – simply everywhere. My mobile telephone uses near field communication to establish a secure wireless link between these input/output devices and my private data store on the Internet – allowing me to use my data and programs conveniently nearly anywhere. **No one can eavesdrop on my data,** nor are any traces of my use visible. The advantage is that I no longer need a computer. I just need a screen, a keyboard, my cell phone and the service of the ‘anywhere’ desk.

21-30%

*21-30% considered ‘100% protected’ critically.

41+%
of respondents marked this.



Liked Viewed critically

Percentage ranges are visualized in different font sizes

Basis: all people surveyed about this scenario, Germany (DE) n=305

FIG. 24: Visualization of »the 'anywhere' desk«

"ICT systems have made it possible to work flexibly, whenever we see the need and wherever we are at the time. By 2024 at the latest, over 75 percent of office workers in Germany will regularly use a home or mobile office."

(Result from the second phase of the study, thesis 19)

"The digitization of our world is fundamentally linked with the concept that involves implementing access to all data from any location at any time."

Dimension

The smartphone, the basis for the 'anywhere' desk.

The digitization of our world is fundamentally linked with the concept that involves implementing access to all data from any location at any time. The functionality described here represents yet another step toward convergence, with the focus on convenient usage. It is based on two hypotheses:

(1) The smartphone is a device that people take for granted and that goes everywhere with them, like a wristwatch. It is subject to continuous further development and provides growing communication and computing capacities. The reasons for this development are not only to provide a means of communication but also to fulfill other central security-relevant functions such as identification, access and payment. This is gradually giving sharper contours to the concept of a personal 'access device' to the digital world: my digital gate.

(2) Dedicated stationary computer systems @home, @office and @public are no longer needed for standard interaction, transactions and desk work, since users can access their personal programs, data and computing capacity via versatile structured network linkups.

The functionality of the 'anywhere' desk is apparent on three levels:

(1) Ease of use: the cell phone's standard user interface (keyboard and display) can be conveniently enhanced by connecting any keyboard, mouse and display. These peripherals are operated over a second flexible user interface in the smartphone and integrated via a secure communication protocol. The physical link to large monitors (>10 MB) is wireline (USB, HDMI) or wireless (Bluetooth or similar to UWB). Users can therefore use any keyboard or monitor they already possess, or even a TV set, to benefit from the full range of mobile functionalities on their smartphones in far greater comfort.

(2) Convenient data access: the smartphone accesses the administration instance for personal data with special high security protocols over mobile broadband or WLAN/LAN. This is where authorizations, permissions, usage formats, program rights, data distribution and security strategies are stored. It is operated and visualized conveniently via the standard peripherals connected to the smartphone, as described above.

(3) 'Anywhere' desk without a local computer: the integration of input devices and monitors, which are taking our lives by storm as a result of falling display prices, can be connected via smartphone functions to build a 'smart environment' and replace the functionality of a local computer wherever a keyboard and monitor are available. The new administration instance offers a new individually configurable gate desktop as the new user interface.

In many cases, this will make it possible to replace dedicated local computers with standard desktop applications. The administration instance described above must then offer, manage and operate all standard PC program functionalities and services.

On its way into everyday life.

Some of the first-level smartphone functions are now starting to appear in marketable products, whereby improved interface compatibility, easy linkups and wireless display connections are already technologically feasible but have not yet come to market. The technological challenges involved in subsequent functionality levels are secure communication, user identification and authorization user, concept design and localization of the administration instance, and design and development of an intuitive user desktop..

Description

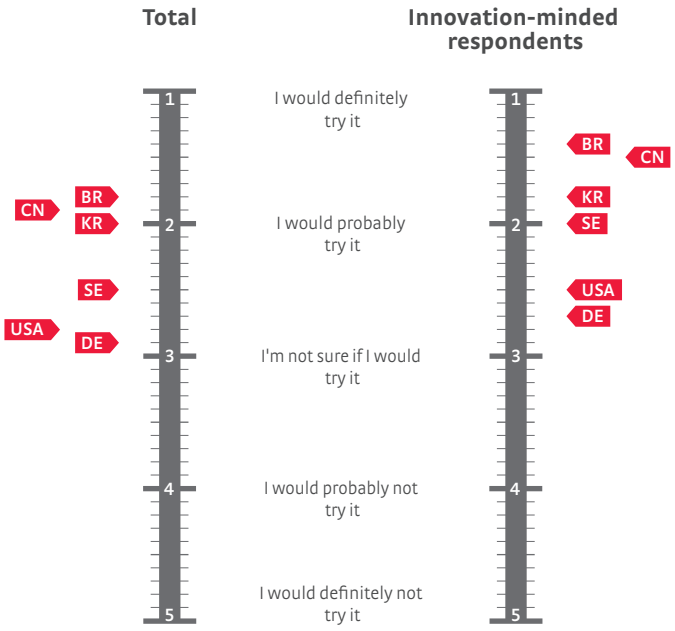
Openness toward the 'anywhere' desk varies greatly from one country to the next.
Respondents in Brazil proved particularly open-minded on this scenario – with an average value of 1.8 they state that they would probably want to try out the desk (see FIG. 25). 45 percent of the Brazilian respondents actually say they are certain they would try it. In contrast, the people surveyed in Germany are not so keen on a trial. The average figure of 2.9 indicates that the average German respondent is not sure whether they would try out this concept. In fact, 15 percent of the German respondents actually claim that they would definitely not try the 'anywhere' desk, whereas only one percent of the respondents from China share this opinion.

The core elements of this scenario, "anywhere and at any time," "have access to all data and programs" "in any location" were marked as positive by many German respondents.
The Germans also liked the fact that no one can "eavesdrop on my data" (21 to 30 percent; see FIG. 23). More than 40 percent marked what is probably the most important aspect, *"100 % protection"* for personal data and programs, which is an indispensable prerequisite for a future concept involving the transmission of personal, private and business data. It is interesting to discover that 21 to 30 percent of the Germans surveyed also marked this important passage as critical – indicating that many tend to be skeptical about 100-percent protection and believe that it will not be possible to deliver on this aspect.

Unsurprisingly, the key concern of German respondents about the 'anywhere' desk is data misuse.
63 percent of all respondents voiced this concern, and even among innovation-minded respondents the figure was still as high as 53 percent (see FIG. 26). In Brazil, however, this concern is only mentioned half as often – only every third respondent fears that data could be misused as a result of using the 'anywhere' desk (34 percent). Associated with this worry – which is the one most frequently quoted in Germany – is the concern that "takes second place" in Germany, namely that personal data could still be stored somewhere. This is named by every second respondent in Germany (52 percent), but by only 23 percent in the USA. It appears that the fear of data being stored and misused is ever-present in Germany.

FIG. 25: What respondents think about a trial with »the 'anywhere' desk«

"How likely is it that you would try this future scenario?"



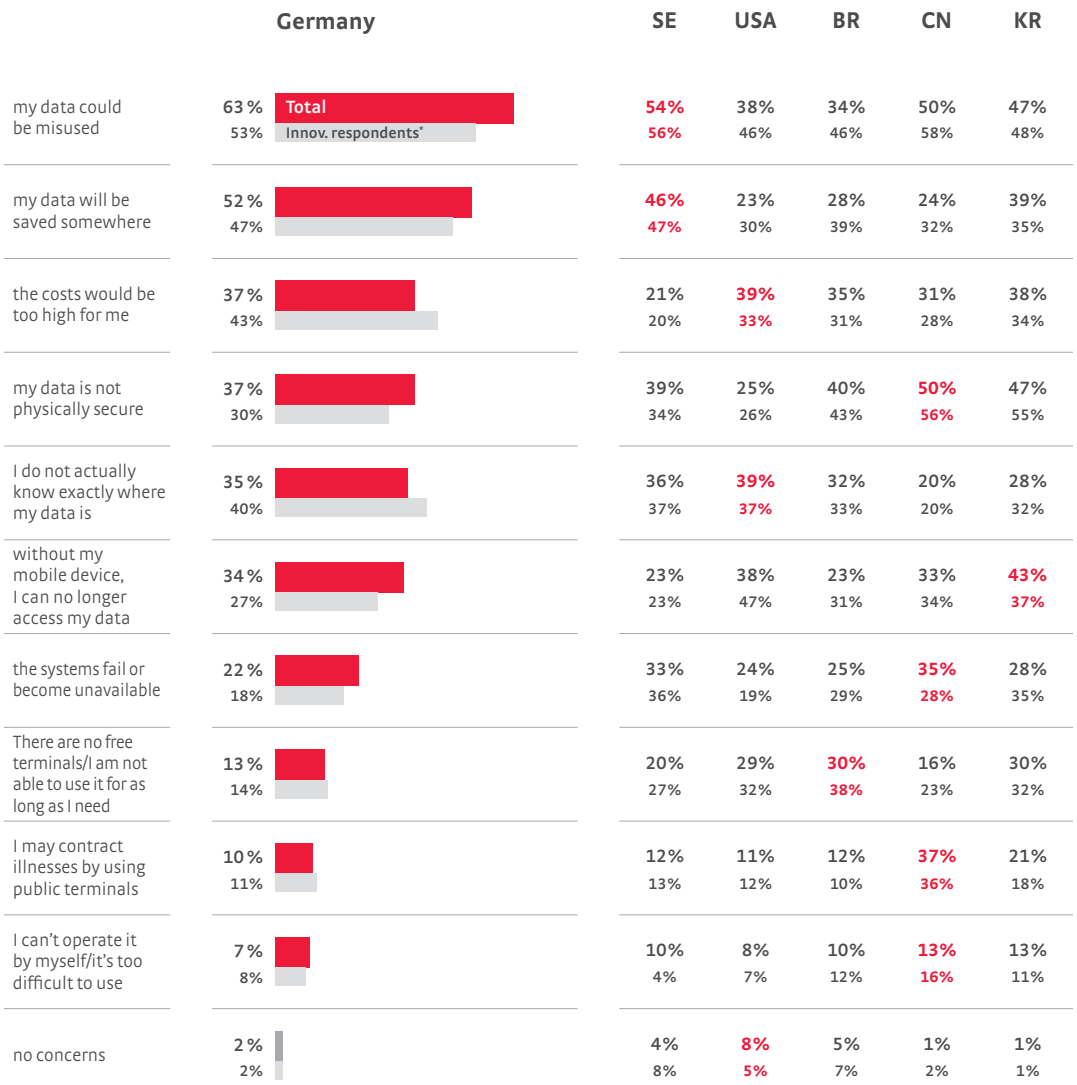
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=308, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=297, Korea (KR) n=299;
Innovation-minded respondents: Germany (DE) n=99, Sweden (SE) n=95, USA (USA) n=87, Brazil (BR) n=85, China (CN) n=101, Korea (KR) n = 89

FIG. 26: Respondents concerns about »the 'anywhere' desk«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=305, Sweden (SE) n=299, USA (USA) n=305, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=301;
Innovation-minded respondents: Germany (DE) n=85, Sweden (SE) n=84, USA (USA) n=99, Brazil (BR) n=94, China (CN) n=95, Korea (KR) n=98

Respondents in the majority of countries surveyed also have growing fears that the costs involved in using the 'anywhere' desk could be too high. The largest number of respondents stated this in the USA (39 percent) but this text passage was also marked by at least one third of all respondents in Korea, Germany and Brazil (38, 37 and 35 percent).

This future scenario demonstrates that a cell phone can be used with a generally available communication infrastructure (display and input devices) to access and work with personal or business data and programs at any time, in any location. It is obviously important for many respondents that the data and programs are also available as a binding link without using the cell phone: 23 percent of the Swedish and Brazilian respondents are afraid that this would no longer be

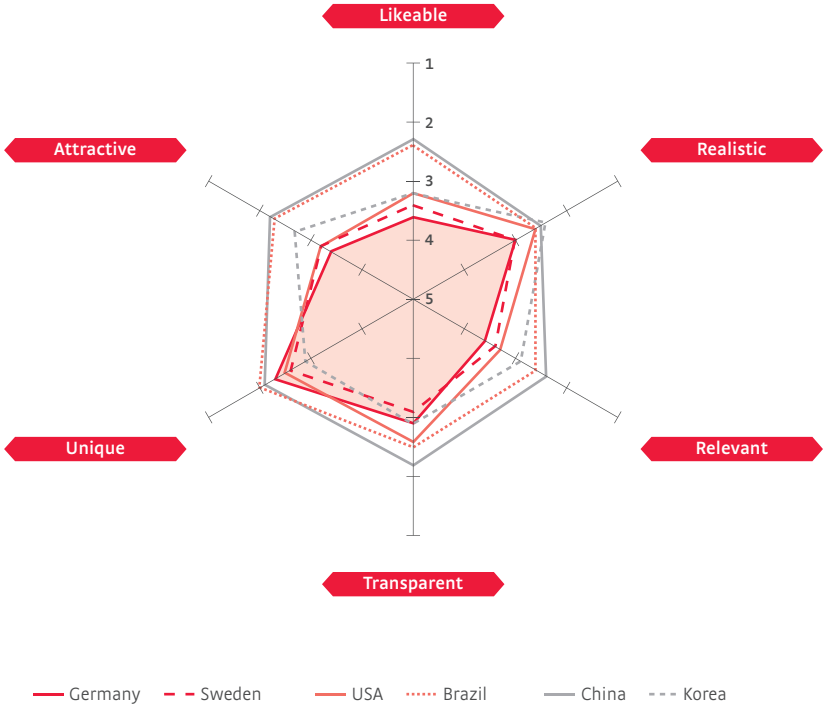
the case, with the figure actually as high as 43 percent in Korea. It is naturally also vital for this application that the technology is always available – technical failure is therefore feared by 35 percent of Chinese and 33 percent of Swedish respondents. It is interesting that this concern features the least among respondents in Germany, namely 22 percent, so that this country is the one with the greatest confidence that this service can be provided reliably.

Of course, one vital prerequisite for the 'anywhere' desk is the availability of a communications infrastructure. For the service to be accepted, it is very likely to be important that free terminals with control elements and monitors are always available, or are at least available within a very short time. While in Germany only 13 percent of the people surveyed mentioned their fear that this might not be the case, 30 percent in Brazil and Korea fear that terminals might not always be available for all users.

In many countries, there is no widespread fear of unhygienic conditions at the terminals. Only ten percent of German respondents are afraid of contracting illnesses from using the controls on public terminals – in contrast, this is actually the third most prevalent worry in China, where 37 percent marked this aspect.

FIG. 27: Ratings for individual aspects of »the 'anywhere' desk«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



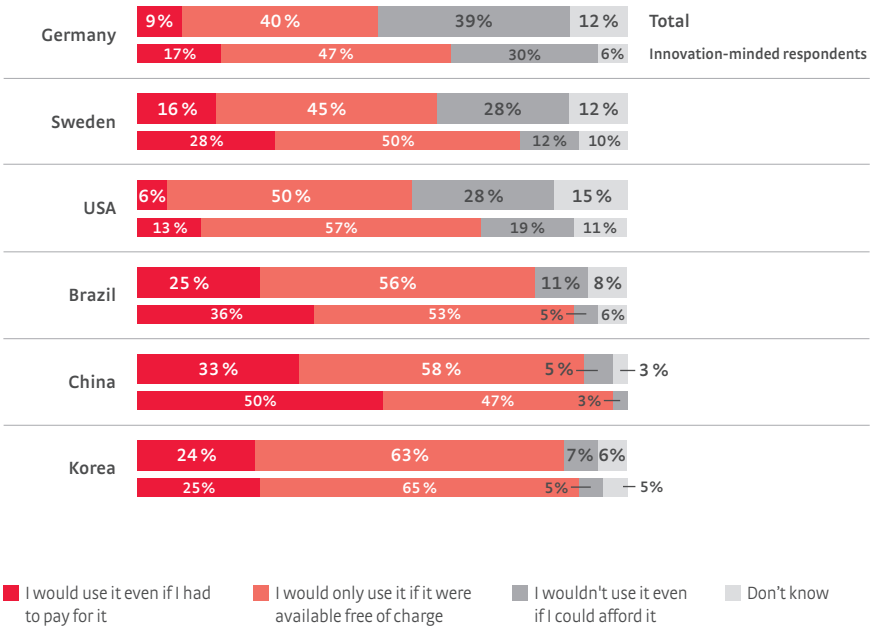
	DE	SE	USA	BR	CN	KR
Likeable	3.6	3.4	3.2	2.4	2.3	3.2
Realistic	3.0	3.0	2.6	2.6	2.5	2.4
Relevant	3.6	3.4	3.3	2.6	2.4	2.9
Transparent	2.9	3.1	2.6	2.5	2.2	2.9
Unique	2.3	2.6	2.5	2.0	2.1	2.9
Attractive	3.4	3.2	3.2	2.3	2.2	2.7

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=305, Sweden (SE) n=299, USA (USA) n=305, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=301

FIG. 28: Willingness to pay for »the 'anywhere' desk«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=308, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=297, Korea (KR) n =299;
Innovation-minded respondents: Germany (DE) n=99, Sweden (SE) n=95, USA (USA) n=87, Brazil (BR) n=85, China (CN) n=101, Korea (KR) n=89

The 'anywhere' desk concept is most popular in Brazil and China – and earns the worst rating in Germany.

The ratings for this scenario differ greatly on the aspect of general likeability: in Germany the concept is only fairly well liked (average value 3.6; see FIG. 27), whereas in China and Brazil it is very well liked (average 2.3 and 2.4). The assessment of the scenario's attractiveness produces similar results: Germany trails behind again with an average of 3.4, while China and Brazil head the field (average 2.2 and 2.3). The result for perceived relevance is very similar (average value for Germany 3.6, for China and Brazil 2.4 and 2.6).

On the other hand, uniqueness is given an average value of 2.3 in Germany, which is not significantly worse than the ratings in Brazil and China (average 2.0 and 2.1). This means that the average German, Chinese and Brazilian respondent rates the 'anywhere' desk very new and unique – whereas the US American, Swedish and Korean respondents consider it only slightly new and unique (average 2.5, 2.6 and 2.9). The result for closeness to reality is comparatively similar in all countries. The highest rating for realism comes from Korea (average 2.4), whereas the scenario is seen to be slightly less realistic in Germany and Sweden (average 3.0 in both cases).

Willingness to pay for the 'anywhere' desk varies greatly from one country to another.

Only six percent of the US Americans state that they would be willing to pay for this scenario (see FIG. 28), in Germany only nine percent of all respondents would be willing to open their wallets to pay for the 'anywhere' desk. As many as 25 and 24 percent of respondents in Brazil and Korea would use this service even if they had to pay for it, and in China a full one third expressed the same opinion (33 percent).

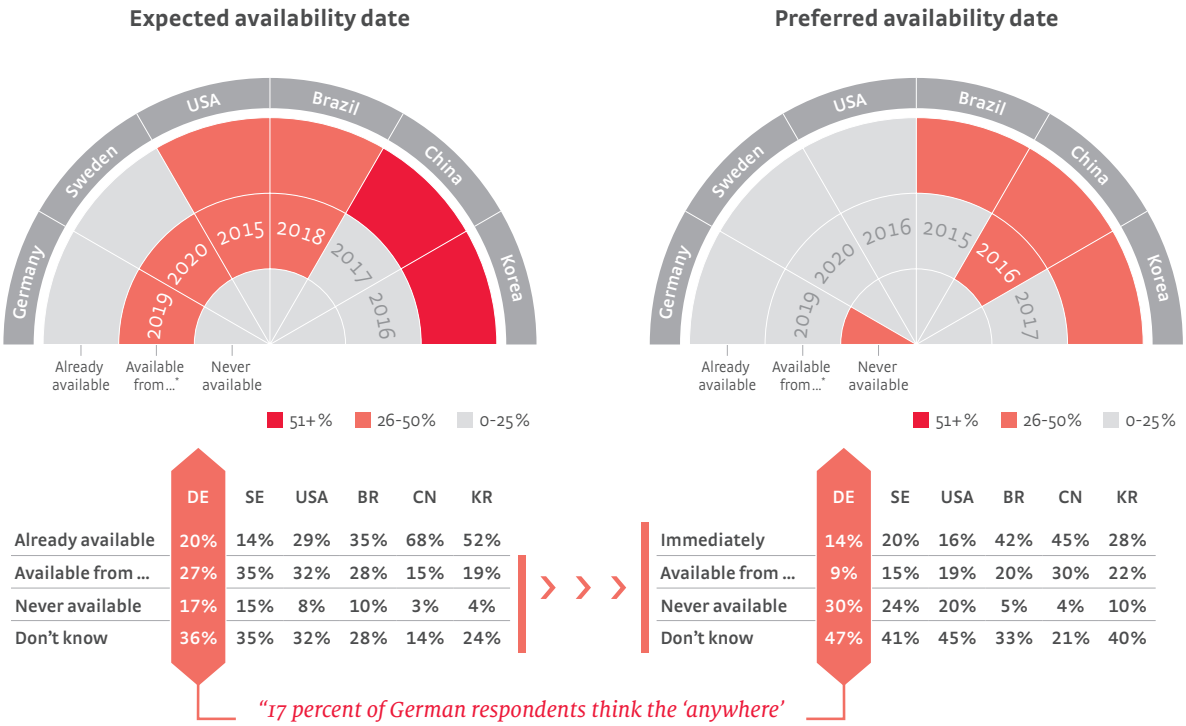
Respondents were also given the chance to state whether they would use the desk if it were made available to them free of charge. This is the category that was answered most frequently in all countries. In Korea, 63 percent of respondents would use the service if it were provided free of charge, in Germany, by contrast, only 40 percent. This is the usage model of choice across all the countries surveyed. It is evident that the third answer category is also very popular, above all in Germany, with 39 percent of all people surveyed stating that they would not use the 'anywhere' desk even if they could afford to pay for it – with the result that they take a skeptical stance on the overall scenario and would refuse to use it. In China and Korea, however, this group is the smallest – only five and seven percent in these countries would not use the desk even if they had sufficient money to pay for it.

The ratings for availability of the 'anywhere' desk vary greatly in the different countries.

While the majority of respondents in China and Korea consider that the 'anywhere' desk is already available in 2011 (68 and 52 percent; see FIG. 29), many respondents in Sweden, the USA and Germany think that this will only be the case in a few years' time (35, 32 and 27 percent). Moreover, 17 percent of the German respondents believe that there will never be anything like an 'anywhere' desk. All respondents who stated that they do not expect availability of the 'anywhere' desk until 2012 and later, or never, were then asked when they would like it to be available to most people in their country. 30 percent of German respondents, 24 percent of Swedish and 20 percent of US American respondents expressed the hope that this scenario would never be available for the majority of people in their country. In contrast, the most frequent response in China, Brazil and Korea is that they would like it to be available immediately (45, 42 and 28 percent).

FIG. 29: Expected availability date for »the 'anywhere' desk« vs. preferred availability date for »the 'anywhere' desk«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	20%	14%	29%	35%	68%	52%
Available from ...	27%	35%	32%	28%	15%	19%
Never available	17%	15%	8%	10%	3%	4%
Don't know	36%	35%	32%	28%	14%	24%

	DE	SE	USA	BR	CN	KR
Immediately	14%	20%	16%	42%	45%	28%
Available from ...	9%	15%	19%	20%	30%	22%
Never available	30%	24%	20%	5%	4%	10%
Don't know	47%	41%	45%	33%	21%	40%

"17 percent of German respondents think the 'anywhere' desk will never become available – and the majority hope that it will never become available."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=305, Sweden (SE) n=299, USA (USA) n=305, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=301;
Preferred availability date: Germany (DE) n=248, Sweden (SE) n=257, USA (USA) n=221, Brazil (BR) n=208, China (CN) n=100, Korea (KR) n=145

"New functionalities for mobile devices are undergoing dynamic evolution."

Interpretation

The 'anywhere' desk is a beneficial function to elucidate interdisciplinary technical and social problem areas.

The 'anywhere' desk received top ratings for uniqueness in all the countries surveyed. At the same time this scenario is not considered very realistic despite the fact that the underlying technology base is already available. This assessment and the explicit wish for *"anytime, anywhere"* access to personal data *"without a PC or laptop"* reflects the need and the desire for the functionality this scenario provides (see FIG. 23). This is, however, diametrically opposed by the blocking factor of respondents' concerns that their data could be misused (see FIG. 26). Although this fear has been expressed in current public discussions on the subject of data security, it also acts as a blockade for a product that aims to improve functionality in this area in order to generate benefit for customers.

Nonetheless, these security and trust requirements and the conditions required for their fulfillment cannot be fully met by a single product. This aspect is also an element of the fundamental conditions that are needed on the way to a digital society. A suitable protective framework and mechanisms governing sensitive areas will have to be agreed and include functions of the state, healthcare systems, infrastructure protection, electronic payments and the handling of all personal electronic artifacts that are already part of our day-to-day lives.

The main focus in the future will not only involve developing the technology required for such security functions and making them available as soon as possible but also documenting them, raising users' awareness for the added value they deliver and even highlighting them as the differentiating factor for individual products.

Think global – act local and global.

Given the increasing changes in the private and working lives of people in the countries surveyed, it is not surprising that the core elements of this functionality receive a positive rating. Being able to access data and programs anytime, anywhere goes hand in hand with the communication needs evolved for today's world, namely being "available anytime, anywhere" and "always on." The German respondents therefore appreciate that this is achievable with the smartphone, already an element of our day-to-day lives, without the need for additional weight or equipment and with even greater convenience than before (see FIG. 23). The functionality of the 'anywhere' desk, which addresses the aspect of dealing with personal or corporate data, must give very high priority to security and trust aspects. It therefore comes as no surprise that the security aspect of this scenario is given special attention in the answers and opinions about this product.

The varying regional assessments of this functionality's relevance allow for different interpretations. It could possibly be that the formative practice of existing IT structures produces inactivity on the innovation front: the respondents from China, Brazil and Korea, all relevant IT growth countries without nationwide IT structures in place, attach relatively high relevance to this functionality (ratings between 2.4 and 2.9; see FIG. 27). Respondents from the USA, Sweden and Germany give it a lower rating for relevance (between 3.3 and 3.6). This makes it clear that the presence of 'anywhere' functions in new locations such as the back of plane seats, in trains, ships, tables, apartment walls and TV monitors coupled with PC-less homes needs scenarios to be detailed in order to communicate the benefits offered by this concept.

Flanking conditions and drivers.

The positive reactions to the 'anywhere' desk reveal its relationship with the general trends accompanying the mobilization of ICT solutions at various levels and supporting deployment of the 'anywhere' desk. The functionalities offered by mobile devices are currently subject to meteoric further development in terms of computing power, storage space, energy consumption and management as well as the format factor, to name just a few aspects. This will make it possible to embed a growing number of day-to-day functions in mobile devices in order to provide users with applications for payments, ID cards and various other forms of access. The basis for

doing so will be improved functions for network access (mobile broadband), near field communication and new security architectures. Another trend we are already experiencing is the move away from keeping data, application software and services on local computers. This is already possible through today's cloud architectures and cloud services. Coupled with virtualization and the further evolution of these cloud concepts, the 'anywhere' desk will satisfy a vast range of operating requirements: choice of virtualized computer systems (including mobile devices), freely selectable data locations, program usage and various forms of security presets.

Virtualization, in particular, simplifies the provision of various types of user interfaces for the 'anywhere' desk. The 'anywhere' desk is completely free of the elements we find on a real computer: no fan warnings, no filter changes and no drive settings, since the local computer has been substituted. The user interface can be based on the traditional interfaces offered by Windows, UNIX or iOS, or on intuitive, modern visualization and interaction concepts that harmonize with individual system configurations.

A core element of the changes that are taking place in our leisure- and work-time habits under the influence of ICT is the mobilization of various areas of our daily lives and the processes associated with this change (see Volume 2 of the 2009 study: International Delphi Study 2030). The 'anywhere' desk is one forward-looking example, since it anticipates the changes that will take place in the technical equipment used in business enterprises and in our homes. Enterprises are continually looking to lower the investment and operating costs of standard office workplaces and, at the same time, to secure optimal workplace quality with state-of-the-art technology. However, structures in offices as well as meeting and conference rooms should be such that they can adapt to changing communication and interaction needs. Smart spaces concepts illustrate these needs at the user interaction level: monitors as display units with increasingly smart input systems in any format integrated in walls and in or on tables must be operable by one or more users. Input devices range from keyboard and mouse to touch, voice and gesture control. The smart spaces serve as single workstations or can be used for normal office work and communication in group situations. The concept of the 'anywhere' desk embeds a personal mobile device in this smart space by connecting it to any available display and input configurations. In the simplest case, this will be with a monitor, keyboard and mouse on the desk where users will sit to work.

Integration of these embedded systems in house and home furniture coupled with the fact that more and more monitors are now available will spawn a trend toward smart spaces in our homes. Here again, one of these monitors plus an available keyboard or even the TV monitor can be connected to the user's mobile device to provide an 'anywhere' desk at different places in the home – without the need to have a computer installed!

Reservations and barriers.

Most of the concerns that were voiced revolve around the aspect of data security. In Germany, 63 percent of respondents, the largest group, expressed this fear, and in Brazil as many as 34 percent did the same. Reservations involving the costs of usage played a relatively minor role among respondents, with 21 to 39 percent mentioning this aspect. A small number stated that they were worried about operation of the 'anywhere' desk (seven percent in Germany; 13 percent in both China and Korea; see FIG. 26). The conclusion we can draw from this is that operation of the concept presented here appears plausible and usable to the large majority of respondents, which is a highly positive message for a concept that is seen to be relatively unique (see FIG. 27).

A complex picture emerges on the background factors to willingness to pay for the 'anywhere' desk (see FIG. 28), due to the fact that the whole picture must always be mapped to the business model together with subjective and objective estimates of its added value. Respondents were not given any indication of the potential usage costs. Nonetheless, the following aspects should be considered when evaluating the survey results. The business models for leading Internet services offer end-user usage 'for free,' since they finance it through the use of access information – not infrequently taking advantage of gray or borderline areas in the legislation of individual states. However, this stands in direct opposition to the main concern that personal data will be handled confidentially, an aspect that was named by the majority of respondents and that is fundamental to the concept. It can be assumed that the development of new business models will involve a whole plethora of costs. These will be incurred chiefly in development and operation, program usage, data room usage and backup functions, security during access, and storage of data and communications. If these costs are considered in the business model, the new service will have to be marketed in such a way that willingness to pay grows as the added value becomes increasingly recognized and accepted by customers, although the dilemma here will be the low subjective value of confidential dealings with personal data. Another approach could be to cover costs through business models in which third parties can be offered added value if they provide financing, without loss of integrity in data handling. Even if a mixed approach is adopted, the degree of willingness to pay that is ultimately achieved is bound to depend to a major extent on how the new benefits are communicated to users. This process may not yet be complete and is likely to require a longer incubation period.

The answers to the questions relating to willingness to pay for the 'anywhere' desk reveal that willingness tends to be lower in the USA and Germany than in China, Brazil and Korea. At the same time, the innovation-minded survey participants in all countries demonstrate greater willingness to pay for this scenario (see FIG. 28). This may be due to a conditioned 'for free' mentality or to saturation with solutions marketed as highly innovative in which participants have invested only recently. It could also be the case that the advantage to be gained from using the new concept rather than existing solutions has not been made sufficiently clear. Countries without the high level of ICT penetration found in the USA, Sweden or Germany tend to have a far clearer picture of the advantages they stand to gain.

The concerns about data security were concentrated on the following aspects: where will data be located, is it physically safe there, is it possible to prevent other people gaining access to data and using it for exploitative purposes? The span of potential problems arising from this question catalog covers an unusually broad range of issues. The process of making technical solutions convenient, secure and affordable may require in-depth intervention in existing software architectures or even go as far as 'security and privacy by design.

As shown above, one of the barriers to usage is the fear that personal data could be misused, above all in locations outside people's personal sphere of influence. A second barrier could develop from the lack of willingness to pay for this scenario in the USA and Germany, as described above, if industry does not succeed in linking willingness to pay to the additional mobility and security value, or in refinancing it through additional secondary benefits.

Economic and social aspects for Germany.

One striking result is the reticence on the part of the German respondents to use the new solution. Only 15 percent would definitely try out the 'anywhere' desk; at the same time, however, 15 percent also stated that they were sure they would not test the concept (see FIG. 25). German people have a reputation for lack of curiosity in new things and new experiences, a trait that, for two reasons, could increasingly become a disadvantage. The first is obvious if we compare the situation with the global acceleration in technology developments and market growth in the newly industrialized countries. Here, the greater willingness to give new solutions a chance is based on cultural differences as well as on different retarding forces, such as a lack of established economic interests in the environment of shifting markets. The second is that a growing number of products worldwide is systematically brought to market at an early phase (beta products) in order to speed up product development on the basis of market experience and user feedback. This is an anticipatory approach that most Germans are not yet able to apply to product perception and selection and buying habits, so that they may suffer time-to-market disadvantages when positioning products. This applies in particular to ICT-based solutions.

An additional economic aspect of this future scenario is the need to communicate the idea that intelligent environments at work and at home, 'smart spaces,' used in conjunction with smartphones offer innovation potential to the participating industries. Besides this, it is vital to emphasize that the security requirements named here could represent a relevant focus for Germany's software industry, since this study once again reveals major international potential for such expertise.

Summary and recommendations.

The security aspect of handling personal data in ICT solutions that serve people's daily needs, as highlighted in this study, has not so far resulted in an overall role involving further development on the technical, scientific or even cross-disciplinary sides. This is the case although the importance of data privacy and its key role in a digital society has been the subject of discussion for many years and is anchored in the constitution (informational self-determination). Measures have only been initiated in individual areas where it was considered necessary to improve efficiency and reduce costs so that added value expectations could be raised in the long term (health card, ID systems, administration process optimization). Cross-disciplinary initiatives were rolled out to counter the immediately apparent risks resulting from the growing vulnerability of ICT-based systems, one such being the national strategy for the protection of critical infrastructures (Nationale Strategie zum Schutz von Kritischen Infrastrukturen) issued by the Federal Ministry of the Interior and the associated activities of the cyber defense center.

From a social viewpoint and the personal need to protect personality and personal data over and beyond the informational self-determination explicitly anchored in the constitution, no success has so far been made in developing suitable measures to enforce this requirement. If this were achieved, the need for protection could be raised at least to a level equivalent to that now prevailing for merchandise, industrial plant and the maintenance of economic functions. A national strategy for the protection of personal data could supply orientation for technical functionalities.

The blocking aspects of security in dealings with private digital artifacts was made particularly clear in this scenario. Clarification appears to be required on the issue of how informational self-determination can be ensured on the operational side as well as on how to prevent third parties finding and accessing personal data so that attempts at identity theft or virtual aggression against individuals can be thwarted.

On the basis of this future scenario, the survey shows that the process by which our ideas and products make their way via the growth markets will only offer us suitable opportunities if we pursue it proactively. Now, and to an even greater extent in the future, German industry will only derive leads for a small number of IT solutions out of local market needs in Germany. In the future, more growth can be expected from an approach that takes account of the needs in growth countries and subsequently adapts them to the needs of the local market.

“Interactive information and communication systems (e. g., smart displays) will be standard in central public locations by 2024 at the latest and will be used on a regular basis by over half the population of Germany (e. g., city information systems, shopping assistant, etc.).”

(Result from the second phase of the study, thesis 17)

FIG. 30: Visualization of »the digital city service office«

The digital city service office.

FIG. 31: Evaluation of individual aspects of »the digital city service office«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

I have to relocate occasionally and then get oriented in the new city. It is very tedious having to take care of bureaucratic formalities and learn how to find my way around, and I wish there were an easier way.

21-30%

The digital **city service office** now supports me with a comprehensive, **customer-tailored spectrum of services and information.** The digital city service office is an online platform that sorts information by specific situations (such as organizing a **relocation, childcare** and schools, local recreation possibilities) and displays the **appropriate information** and services. I can deal with **bureaucratic formalities online or reserve a personal appointment (e.g., to re-register my car).** My **new ID card identifies** me **uniquely,** ensuring secure use of the services. While I'm there, I can look at pictures of my new neighborhood and get recommendations, such as my new neighbors' favorite restaurants. I can do all of this either from my computer at home or with an **app** on my smartphone. A very helpful feature is that my smartphone can use my current location to show me which important facilities are nearby, such as the closest pharmacy or post office. This makes it much easier for me to find my way around.

31-40%

41+%
of respondents marked this.

Liked Viewed critically

Percentage ranges are visualized in different font sizes

Basis: all people surveyed about this scenario, Germany (DE) n=301

> **“Timely involvement of future users is vital to ensure that development and implementation of the technology required for these platforms is geared to citizens needs.”**

Dimension

Online services are already taken for granted in numerous areas of our lives. Day in, day out, banking transactions, insurance contracts and purchases are all handled through electronic channels. Providers also try to bundle their services in customer-oriented packages in order to make it as easy as possible for their customers to find and use the right products and appropriate services. When it comes to handling administration formalities, however, many citizens still choose the traditional path which requires major effort to find one’s way around the web of bureaucracy (see eGovernment MONITOR 2011). This future scenario portrays a vision of citizen-oriented organization for electronic services offered by public authorities, overcoming the boundaries between state and additional private services and focusing exclusively on the requirements of a specific life situation and thus on the user’s interests.

Solution-oriented service bundle.
The digital city service office uses the life situation involved in relocation to demonstrate how administration services from various public agencies can be bundled into a solution-oriented service package without citizens having to find out which administrative formalities a relocation involves and which public office provides these services. In addition, services not directly or exclusively provided by public agencies are offered (e. g., offers of childcare facilities or sports clubs). In an ideal situation, all services can be used electronically, which gives users independence of opening hours, enabling them to save time and take care of most of the formalities before they actually move.

Open government innovation.
Most of the technical basis required to implement the digital city service office is already available: web portals can structure and present the services offered by public authorities according to various criteria. It will be necessary to further develop concepts for life situations in such a way that integrated services can be handled across organization boundaries and include offers from non-public offices with relevance to the same context. End-to-end online handling will require the integration of infrastructures for electronic authentication and signature such as are offered by the new ID card.

Timely involvement of future users is vital to ensure that development and implementation of the technology required for these platforms is geared to citizens’ needs. Open innovation and customer integration are concepts that are already used successfully in private enterprise and should be adapted to cater for the public sector.

Description

Respondents are extremely open to the idea of a digital city service office.

On average, the Chinese and Brazilian respondents are most likely to try out the digital city service office (average value 1.7 and 1.8; see FIG. 32). 45 and 42 percent of respondents in these countries state that they would definitely try this service, whereas only 14 percent would do so in the USA, a fact clearly reflected by the average value of 2.9. This means that on average the US Americans are unsure whether they would try out the concept. German respondents also prove slightly less open for the digital city service office in the country ranking (average value 2.4).

As can be assumed, the innovation-minded respondents in all countries are much more willing to try out this future scenario. 66 percent of the innovation-minded respondents in China stated that they would definitely try out the service office – in Germany the figure is still as high as 37 percent of the innovation-minded respondents.

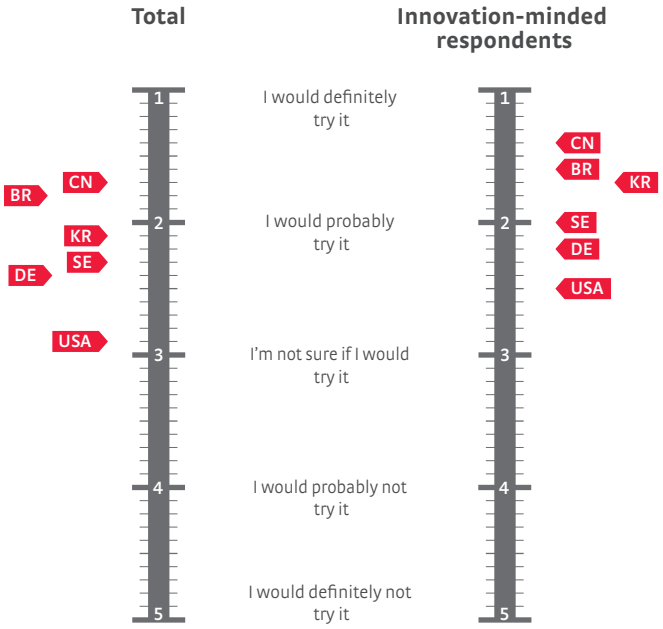
In the assessment of the individual future scenarios, respondents were again asked to mark all the passages in the description that they particularly liked or that they viewed critically.

More than 31 percent of the respondents in Germany marked the core concept of the digital city service office as positive.

At least 31 percent of the Germans like the fact that they can use the digital city service office to deal with *"bureaucratic formalities online (e.g., re-register my car)"* (see FIG. 30). The *"city service"* concept itself and its *"custom-tailored spectrum of services and information"* is given a positive rating by respondents in Germany. And the fact that the service helps to find and *"organize"* a *"childcare facility"* and provides the *"appropriate information"* was marked as good by 21 to 30 percent of the Germans. However, several aspects were also considered critical. The phrase *"new ID card [...] identifies me uniquely"* was considered critical by at least 21 percent of the respondents in Germany, and the *"new IC card"* by as many as 31 to 40 percent. This shows that Germans still tend to be skeptical toward the new ID card, which enables unique identification on the Internet. Moreover, 21 to 30 percent of respondents marked the word *"app"* as critical.

FIG. 32: What respondents think about a trial with »the digital city service office«

"How likely is it that you would try this future scenario?"



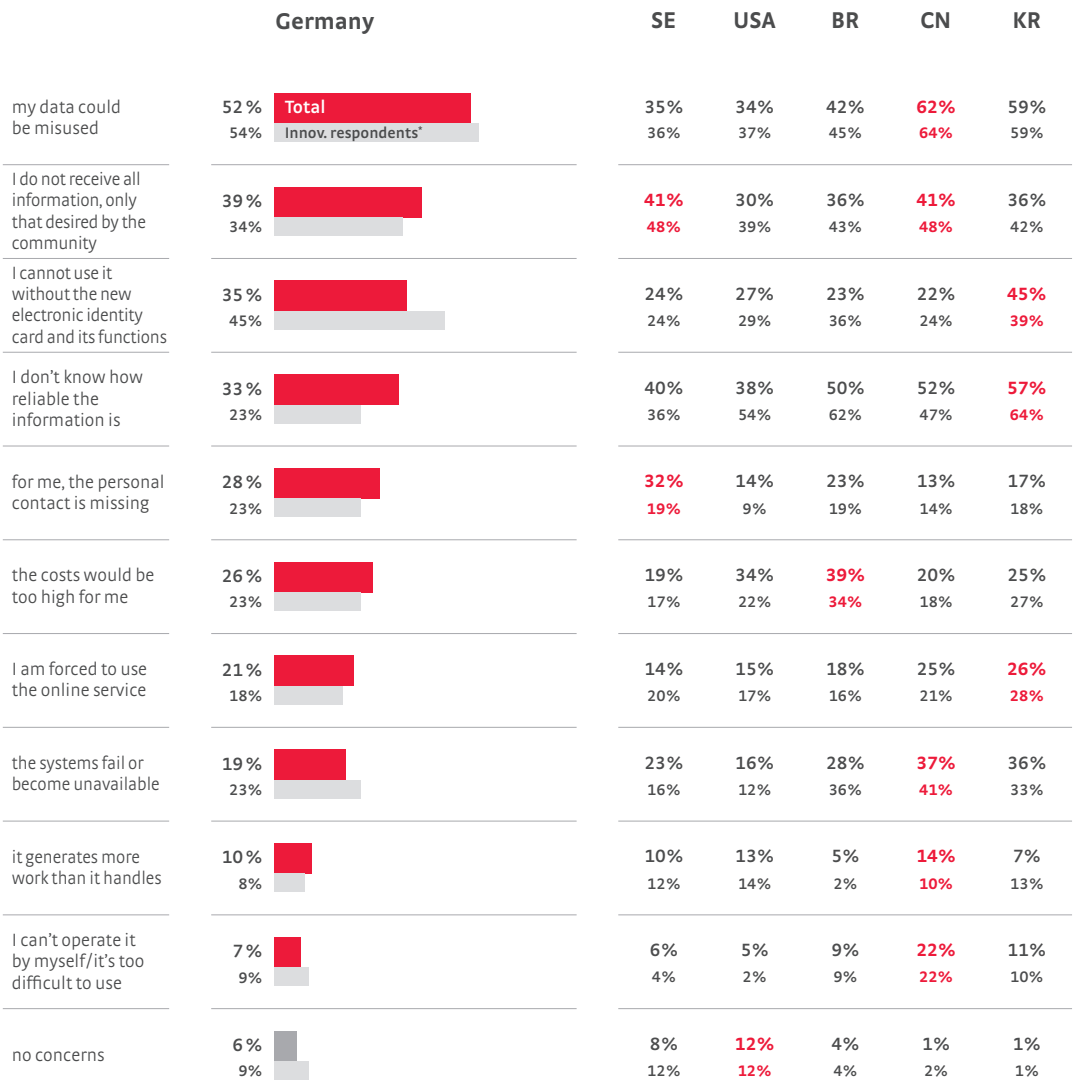
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=301, USA (USA) n=304, Brazil (BR) n=301, China (CN) n=301, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=95, Sweden (SE) n=88, USA (USA) n=90, Brazil (BR) n=80, China (CN) n=96, Korea (KR) n=86

FIG. 33: Respondents concerns about »the digital city service office«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=301, USA (USA) n=304, Brazil (BR) n=301, China (CN) n=301, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=95, Sweden (SE) n=88, USA (USA) n=90, Brazil (BR) n=80, China (CN) n=96, Korea (KR) n=86

In Germany, the greatest worry about use of the digital city service office involves data misuse.

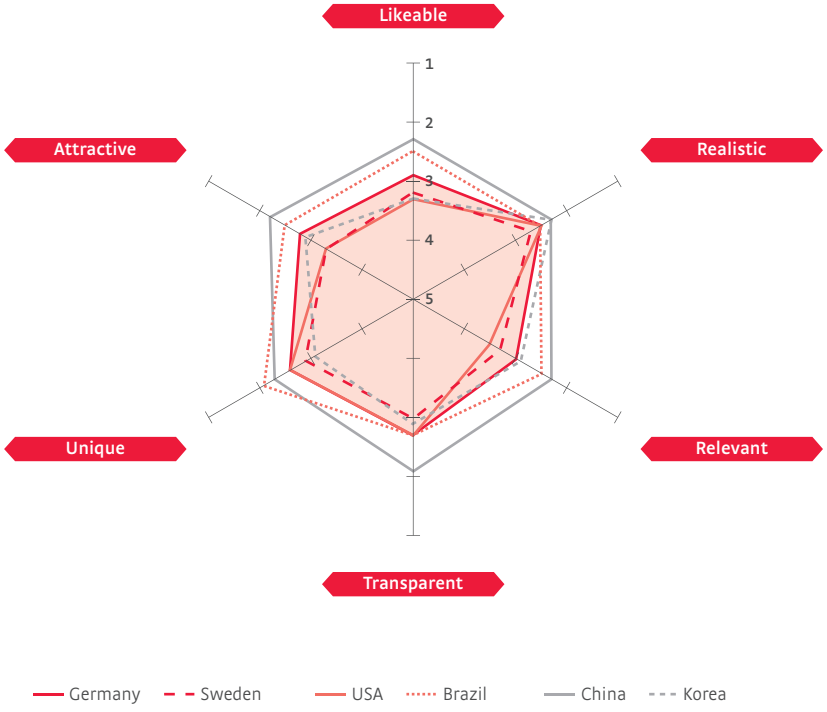
Every second German quoted data misuse as an issue they feel concerned about in this future scenario (52 percent, see FIG. 33). This is congruent with the fact that they marked the new ID card as critical – respondents seem to be afraid that it will be used to enter and store personal data – which could lead to misuse. This is also the greatest concern in China and Korea (62 and 59 percent). Around every third respondent is alarmed by the fact that users might only receive the information that public authorities wish to distribute. In Germany, 39 percent quote this worry, as many as 41 percent in Sweden and China, but only 30 percent in the USA. In Germany, 35 percent of respondents are concerned that they would not be able

to use the service without the new ID card. Perhaps they do not plan to obtain the new ID card or view it critically but would, nonetheless, like to take advantage of the city office services. When the online city office is launched, it would therefore be important to explicitly name services that can be used without, or only used with, the new ID card. The services offered by the city service office might even encourage many Germans to apply for the new ID card.

Every second respondent in Korea, China and Brazil is worried that information provided over the Internet might not be reliable (57, 52 and 50 percent) – in Germany only every third respondent (33 percent) expresses this concern. Using the digital city service office would mean that users have no personal contact with public authority administrators – 28 percent of Germans say they would miss this contact, a concern that is also relatively widespread in Sweden (32 percent).

FIG. 34: Ratings for individual aspects of »the digital city service office«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



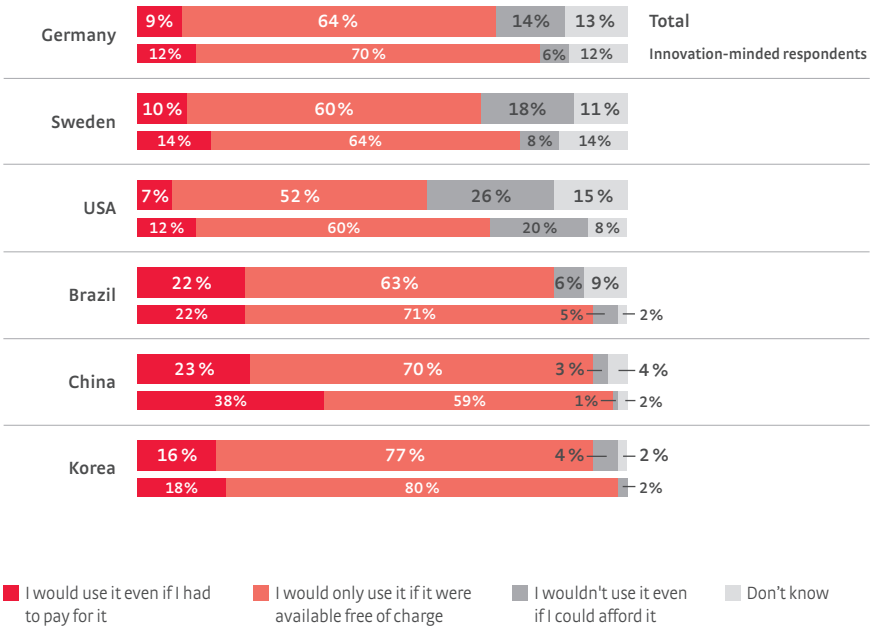
	DE	SE	USA	BR	CN	KR
Likeable	2.9	3.2	3.3	2.5	2.3	3.3
Realistic	2.5	2.7	2.5	2.5	2.3	2.3
Relevant	3.0	3.3	3.5	2.5	2.3	2.9
Transparent	2.7	3.0	2.7	2.7	2.1	2.9
Unique	2.6	2.9	2.6	2.1	2.3	3.1
Attractive	2.8	3.3	3.3	2.5	2.2	2.9

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=301, Sweden (SE) n=301, USA (USA) n=304, Brazil (BR) n=301, China (CN) n=301, Korea (KR) n=302

FIG. 35: Willingness to pay for »the digital city service office«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=301, USA (USA) n=304, Brazil (BR) n=301, China (CN) n=301, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=95, Sweden (SE) n=88, USA (USA) n=90, Brazil (BR) n=80, China (CN) n=96, Korea (KR) n=86

This future scenario is most popular in China and receives the worst results in the USA and Korea.

On average, this scenario is very popular among the Chinese respondents (average value 2.3; see FIG. 34). Trailing behind on likeability are the USA and Korea (average value 3.3); Germany lies in between with a value of 2.9. The scenario is also considered most attractive and most relevant in China (average value 2.2 and 2.3), whereas these factors again receive the worst ratings in the USA (average 3.3 and 3.5). However, these are not the only results to show up major differences in an international comparison, respondents' opinions also very greatly on other aspects of the online city service office. The scenario is, for example, considered very new and unique in Brazil (average 2.1) but only slightly new and unique in Korea (average 3.1). In the comparison, assessments of how realistic the digital city service office is vary only slightly in the different countries, with values ranging from an average of 2.3 in China and Korea to 2.7 in Sweden, the difference therefore being relatively small.

Great fluctuations in willingness to pay for the digital city service office in an international comparison.

In China, 23 percent of respondents state that they would be willing to bear the cost of using the service, whereas only seven percent would do so in the USA (see FIG. 35). In Germany, only nine percent of all respondents would

be willing to pay for it. Noticeably higher in all countries is the number of people who would use the scenario if it were offered 'for free.' This group is smallest in the USA (52 percent) and biggest in Korea (77 percent). The skepticism shown toward this future scenario on virtually all counts by the US American respondents is also reflected in the large number of people who would not use the online city office service even if they could afford it. Every fourth US American actually states this opinion (26 percent). Only three percent agree with this in China, and Germany lands in mid-field with 14 percent. It can be observed that the innovation-minded respondents in almost all countries are more willing than the total number of respondents to use this scenario free of charge, or even to pay for it – a result that comes as no great surprise.

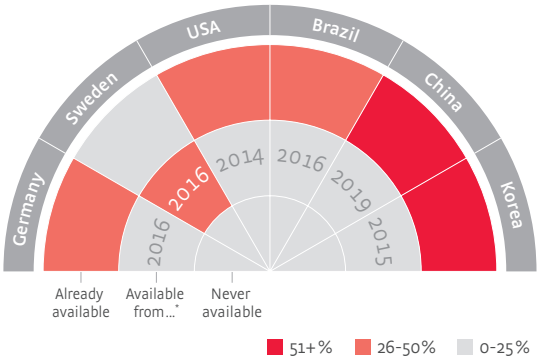
All countries except Sweden expect the online city office to be available by 2011 at the latest.

The majority of respondents in Korea and China assume that the digital city service office will be available for the majority of people in their country in 2011 (69 percent in both cases; see FIG. 36). This is also the prevailing opinion in Germany (30 percent), whereas the majority of Swedish respondents do not expect it to be available for a few years (28 percent), on average in the year 2016. Most countries would like the scenario to be available "Immediately" – with the exception of the USA. This again shows, as did previous results, that the digital city service office is viewed extremely critically by the US Americans – many respondents hope that it will never become available to the majority of people in their country. Moreover, the majority is unsure when they would like it to be available.

FIG. 36: Expected availability date for »the digital city service office« vs. preferred availability date for »the digital city service office«

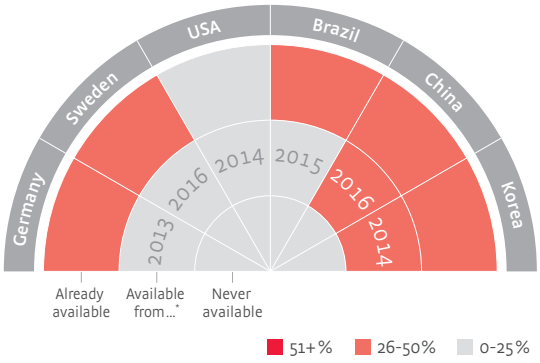
"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"

Expected availability date



	DE	SE	USA	BR	CN	KR
Already available	30%	25%	43%	45%	69%	69%
Available from ...	25%	28%	19%	17%	14%	15%
Never available	6%	11%	6%	3%	3%	4%
Don't know	39%	35%	32%	35%	15%	12%

Preferred availability date



	DE	SE	USA	BR	CN	KR
Immediately	32%	27%	14%	46%	37%	36%
Available from ...	11%	16%	14%	15%	31%	27%
Never available	13%	17%	19%	5%	3%	10%
Don't know	44%	40%	54%	34%	30%	27%

"69 percent of the Korean respondents expect the digital city service office to be available by the end of the year at the latest – by contrast, many respondents in the USA hope that it will never become available."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=301, Sweden (SE) n=301, USA (USA) n=304, Brazil (BR) n=301, China (CN) n=301, Korea (KR) n=302;
Preferred availability date: Germany (DE) n=207, Sweden (SE) n=226, USA (USA) n=182, Brazil (BR) n=163, China (CN) n=95, Korea (KR) n=95

“The results show that people’s trust must be won before they can be convinced to use the public authorities online offers.”

Interpretation

The digital city service office represents a vision that bundles electronic public administration information and services to suit customers’ individual needs and situations. On the technical side the vision is not so far off, since we already have numerous examples of private online services and shops which base their operations on user profiles and context analyses. These concepts have already been adapted for public services under the header “life situations” but, from a citizen’s viewpoint, only a fraction have already rolled out. Another important aspect for the further development of state service offers that are geared to users’ needs is end-to-end online handling, which will be made possible through the use of electronic authentication and signature media. The technological and methodological prerequisites for implementation of the digital city service office are already fulfilled, legal and organizational issues still need clarifying and the principles of user orientation applied to public services.

But does the quotation from Markus & Keil “if we build it, they will come” (1994) also apply to public administration, i. e., the assumption that users will welcome a new online service if it has a coherent design, is state of the art and paves the way for more efficient processes? So far it does not, as the latest findings on acceptance and use of e-government services demonstrate (see eGovernment MONITOR 2011). The results of this survey show that people’s trust must be won before they can be convinced to use the public authorities’ online offers.

Easy and solution-oriented.
The overall concept that bundles public services into user-friendly online service packages received good ratings from most respondents, who consider the example presented to them to be worth at least a try. With the exception of respondents in the USA, the answers given by survey participants in the different countries grouped around an average of 2, reflecting the fact that a personal trial is at least probable. Above all, the innovation-minded respondents in Brazil and Asia were sure that they would try out such an offer, quoting average values between 1.4 and 1.7 (see FIG. 32).

Many citizens associate visits to public administration offices to date with excessive red tape. One of the reasons for this is very likely to be that they make such visits less frequently than, for example, visits to their bank and that the requirements for transparency and ease of use are therefore much higher. Today's online services often do not fulfill the requirement for ease of use (see eGovernment MONITOR 2011) and are therefore comparatively rarely used. It is therefore not surprising that "ease of use" lies well ahead among the positively rated aspects of this example and was marked by over 40 percent of respondents. Besides this, over 20 percent of respondents like the idea that information and services can be structured and offered to suit individual situations, i. e., in the sense of life situations, and that information can be provided beyond the relatively narrow context of public administration. In contrast, the scenario is also viewed critically by over 30 percent of respondents if services can only be accessed via identification media such as the new ID card. Respondents fear that their data could be misused, and that the state agencies would only make some – a desired subset – of the relevant information available (see FIG. 33).

Trust through transparency.

The key barriers to a digital city service office all relate to trust, trust in the reliability of the technology and trust in the provider of the online offer (see also Akkaya et al. 2010). When it comes to reliability of the technology, disparity arises among the different countries. While this risk is only named by an average of 16 percent (USA) to 23 percent (Sweden) of respondents, availability of the requisite technology is certainly an issue in Asia and South America, namely for 28 percent (Brazil) to 37 percent (China). With regard to the question about trust in the capability of the state as provider to protect personal data from misuse, the groupings are different: this barrier is named first and foremost by citizens in China and Korea in around 60 percent of the answers. German participants take a mid-range position with 52 percent naming this aspect, while in Sweden, the USA and Brazil only between 34 percent (USA) and 42 percent (Brazil) view this aspect critically (see FIG. 33). The results of the survey suggest that people are not confident that the state can deploy technology-based innovations competently. On the other hand, they do believe that it can utilize the options offered by technology for its own interests. As many as 40 percent of respondents in Germany, Sweden and China actually fear that public administration would not make all the relevant information available but only the facts that the provider (local authority, district, etc.) is willing to reveal.

An interesting point that emerges in evaluation of the results is that many of these barriers are named primarily by innovation-minded respondents. This can be ascribed to their greater technology affinity and thus technology skills, which obviously goes hand in hand with increased awareness for the risk of the technology being misused.

In order to strengthen trust in the state as a provider of innovative and useful online services, the central issues would appear to be transparency about the technologies used, the criteria and methods applied to select and structure the information and services, and the quality assurance measures in place. Trust can also be strengthened if citizens are directly involved in the design, quality assurance and further development of online services, as defined by the concepts of customer integration and open government.

Germans are careful but optimistic.

Germans have a reputation of being particularly skeptical and reticent to use e-government services. This prejudiced opinion is not fully confirmed by the results obtained by the survey. Although many of the German respondents react just as critically as the respondents from other countries to many of the barriers that were queried in the survey, they never lead the field with their worries. The German respondents actually appear to have a comparatively high level of trust and positive experiences with the information services provided by public authorities: only 33 percent (innovation-minded respondents: 23 percent) fear that the information provided by the online services could be of dubious quality. These figures are a good deal higher in the other countries, from 40 percent (Sweden) to 57 percent (Korea). Even more critical are the innovation-minded respondents in Korea (64 percent).

On the question of how likeable and how attractive they find the future scenario presented here, the German respondents hold a mid-range position with their ratings in a comparison between the different countries – 2.9 for likeability and 2.8 for attractiveness. Overall, however, the assessments lie in a narrow corridor between 2.2 and 3.3, so that the average value is only fair (see FIG. 34). This vision receives the most positive ratings in Brazil (2.5 for attractiveness and likeability) and China (2.2 for attractiveness and 2.3 for likeability), whereas the USA (3.3 for attractiveness and likeability) and Sweden (3.3 for attractiveness and 3.2 for likeability) have conspicuously poor ratings. These assessments are also reflected in their willingness to pay for this type of online service: most people expect the state to provide such a service free of charge. Brazil and China are the only countries that express a clear willingness to pay for it, with ratings of over 20 percent in both countries. In contrast, several respondents actually state that they hope the vision of the digital city service office will never become reality (see FIG. 35 and 36).

In Brazil and China the digital city office provides real help when problems occur.

The different ratings given to the importance of the online city services indicates that the explanatory approach could account for some of the other results: Brazil and China are the only countries that rate the relevance of the example presented in the survey with values well below 3. These are also the two countries with the most positive response to the digital city service office in the questions about a trial, the assessment of the scenario's attractiveness and their willingness to pay for it. People in these countries find the idea of being able to handle official matters conveniently online not only a pleasant proposition but also appreciate that it could actually help to solve problems in certain life situations. In the industrial nations Germany, Sweden and the USA, the vision is also assessed positively but the provision of city services through traditional channels and the current availability of online services do not seem to be so inadequate that the advantages experienced by respondents would outweigh their concerns. This finding is also supported by the ranking of these countries in the United Nations E-Government Development Index (see United Nations E-Government Survey 2010): while Korea, the USA, Sweden and Germany figure among the top 20 countries surveyed, Brazil lands in 61st place and China comes 72nd. This index also reflects the fact that China and Brazil have a lot more catching up to do. As the basis for its assessment, the E-Government Development Index analyzes the availability of telecommunications infrastructure, media skills among the population and the range of public services available online.

Further development of citizen integration – open government innovation methods and concepts.

In order to develop and implement a digital city service office vision that meets citizens' needs regarding ease of use, security and accessibility, users should be explicitly involved in the design and further development processes. Open government is thus applied to the entire lifecycle and to all citizen-related aspects of publíc services. This begins with citizen crowd sourcing, collecting and evaluating the first design ideas, discussing details of the concrete form of services with the online community, and goes right through to generation of 'mash-ups' of content supplied by public administration, citizens and associations, followed by collaborative quality assurance for city services in real operations.

Adapting customer integration and open innovation concepts used for comparable tasks in private enterprise to different administration and cooperation cultures is a challenge that currently needs addressing. This is the only way to establish the degree of transparency and user centricity necessary for trust and acceptance.

Summary and recommendations.

The digital city service office could be implemented on the basis of technologies already available today – this is the view taken by respondents in most countries, from over 40 percent (USA, Brazil) to almost 70 percent (China, Korea; see FIG. 36). Implementation is therefore long overdue. This could be one of the reasons why the overall result is not as enthusiastic as might have been expected. Added to this, most people only rarely come into contact with public authorities, so that, at first glance, having a convenient and easy-to-use online solution does not appear as relevant as in other areas of life such as shopping and banking.

However, when a situation occurs in which citizens do have to rely on public services, e. g., when unemployed or a parent is dependent on care or social support, the search for the relevant information and services is a relevant stress factor. In life situations such as these in which citizens are dependent on orientation and support, information and services from the public authorities (and ideally from other organizations in the context of this life situation) should be offered in a format in which they are problem-oriented, easy to find and easy to use.

This method of structuring and preparing content is not only beneficial to citizens as the end-customers of public services, it also supports seamless communication between the processing channels, so that use of a public service can start online and, if needed, be completed together with a case manager or single point of contact in the traditional city office or call center.

To make this possible, functional organization structures must be relinquished to a greater extent than has been the case so far in favor of organization along process and service chains. To give public authorities a credible presence as providers of innovative services, new skills profiles will also be needed, combining specialist and technical expertise. Opening up to the needs, requests and ideas of citizens should not be confined to high publicity scenarios that only have little impact, but must be integrated as a systematic part of the city service design lifecycle.

"In order to develop and implement a vision of the digital city service office, users should be explicitly involved in the design and refinement processes."

Chapter 3
Entertainment and storage.

The lifetime data safe.

My personal TV.

Alongside their gainful employment, people want to be able to organize their leisure time to suit their own interests. In the future, ICT will play a dominating role in the organization of this time quota, as shown in the examples that follow. The need for entertainment is particularly prevalent and is an area where ICT solutions take full advantage of their broad creative scope.

The main focus is on the personal environment, which is set to mutate into a strictly organized interpersonal network as a result of work-related mobility requirements, changing family structures and lifestyles, new role allocation and care responsibilities. ICT already enables people to fulfill these changing needs very efficiently – and will do so to an even greater extent in the future.

Virtually all areas in which free time is spent on sports, hobbies or travel have been enriched through ICT. Examples of this include ICT-based fitness equipment and services, digital photos and videos, e-books and electronic travel guides, which are now all omnipresent. And the use of electronic media and communications to coordinate leisure activities is also not new to us.

The role individuals play in society and in social life will change vastly as a result of ICT-supported functions in social networks, communities, chats and blogs. It is virtually impossible to estimate the impact that the resulting forms of individual and social behavior will have on society. This applies equally to personal interests as well as to social, societal and political engagement. Alongside the advantages of borderless communications, several problems are looming with regard to the aspect of informational self-determination (see Volume 2 of the 2009 Study: International Delphi Study 2030), above all relating to identification and authentication for access to personal data. We still do not have the technical, legal, organizational and economically balanced solutions needed to satisfy the need of individuals for the security of their personal data in a digital society. The possibilities of manipulation, cyber mobbing and identity theft in respect of people's electronic identities, the propagation of personal data, the initiation or organization of expressions of interest and opinion, e-government, electronic participation or even electronic elections urgently require suitable countermeasures to be installed.

The following two pictures of the future address two important needs in conjunction with ICT and media in our private lives.

For the most part, the society of the future will generate collections of digital information and certificates, i. e., data inventories of a vast size. This presents private individuals as well as institutions and organizations of all shapes and sizes with the question of what to do with this data over the long term. The storage, retention, searching for and reading of data for which programs, operating systems and computers are no longer available already represents a huge problem. An archiving function such as **a lifetime data safe**, which is easy to use and fulfills the needs for high security, fast access and cost effectiveness, is indispensable for the digital society of the future.

The need for entertainment and games already comes in several guises. Aspects of manipulation via games as an event have always played a role here. In the future, the scope will extend from receptive media consumption toward a greater interactive form of consumption. Entertainment offers use all media formats and channels in the course of the progressive convergence process. In the future, limitless mobility and unrestricted access by devices will dispense with the need for an explicit space or defined time for media consumption.

My personal TV addresses this requirement segment and the possibilities it offers. Here we see clearly how, alongside the traditional media (print, radio and television, audio and video), the prevailing convergence into a digital, hybrid medium takes control and revolutionizes user behavior and the business models in all lines of media entertainment. During this process, entertainment will evolve into a mass market with increasing personalization and specialization of users' requirements. Entertainment, information, advertising, experience and social networks are therefore set to join forces in a single interactive and individualized value, mood and emotions management system.

The lifetime data safe.

FIG. 37: Evaluation of individual aspects of »the lifetime data safe«

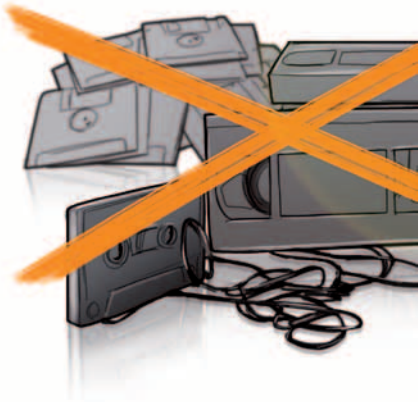
"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

Computer technology continues to advance relentlessly, always with new programs, data formats and operating systems – but I will still need to be able to access my data and documents in the future, no matter how old it is. It will therefore be increasingly important for my personal data (photos, music, text documents, certificates, etc.) **to be stored safely and securely for the long term**, and that I will be able to **read and retrieve it on all future devices.**

The data safe offers lifelong storage of and access to my data, independently of data formats, software vendors and hardware manufacturers. The data safe allows me to store, search, read and synchronize data, independently of the source programs or computer models, on secure central or distributed storage media. As a result, my electronic data will still be available in ten or even thirty years – even if the original programs and operating systems no longer exist.

The data safe also has features for managing my data: I can assign an expiration alert to certain data, for example, or set a specific activity note. This will ensure that I do not store too much data, while ensuring the maximum possible level of protection. The data safe will also help me to migrate my data safely to a new computer. I can rest assured that my data is stored securely and will be available for my whole lifetime.

21-30%



41+ %

31-40%
of respondents marked this.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=293

FIG. 38: Visualization of »the lifetime data safe«

"Large sections of people's lives will never be digitized automatically in real time with personal devices and services (images, sounds, geographical data, vital functions, etc.), i. e., recorded, archived and indexed." (Estimation by Germany experts)

(Result from the second phase of the study, thesis 16)

“A generation is growing up whose memories are available almost exclusively in data format.”

Dimension

A digital archive, no more complex than a shoe box.

Many people have been taken by surprise to find that the data they stored on diskettes and hard disks or burned to CDs has not survived. This occurred because the data media were no longer readable, because the technology was out of date or because the programs or operating systems which were used to read or play the data no longer exist. Despite the fact that the promise of a glorious digital age in which digital documents can be found and accessed immediately anytime and anywhere has come closer, a secure and confidential archive which serves users’ needs over the long term is not yet available.

The wish to remember – in the digital age.

For over a decade, more and more artifacts of day-to-day life have been stored in digital format. What is more, a generation is growing up whose memories are available almost exclusively in data format. Gordon Bell suspected that this would be the case at the beginning of the millennium, when he launched his MyLifeBits experiment at Microsoft, in which an individual’s information stream is stored for their entire lifespan (see Bell 2009).

A lifetime data safe must cover three main aspects:
(1) Store digital artifacts reliably and securely,
(2) It must be possible to find and read artifacts anywhere and for a long time (at least 100 years),
(3) Support smart retrieval methods, which are also suitable for future interaction technologies.

During a first stage, the data safe could be available as an appliance that people integrate into their home networks and that operates like a private cloud over the broadband line. Encryption and redundancy ensure that the solution is secure and reliable. However, it will not be possible to achieve maximum reliability with an appliance alone. Furthermore, the data safe must be able to do much more than the hierarchical file systems that we know from PC operating systems. This means that the data safe will have to be a cloud-based solution in which the following criteria must be fulfilled:
(1) Flexibility: data occurs continually, so that the data safe must grow automatically in line with needs.
(2) Conversion: the artifacts may have to be converted automatically to archive-secure formats in order to guarantee long life. These can only be formats that are standardized and open.
(3) Migration: the data contained in the data safe must be migrated automatically when the technology is renewed and, at the same time, comply with security criteria.
(4) Retrievability for digital artifacts among tera- to petabytes of data: one of the most important properties of the long-term data safe – or digital archive – is that information can be retrieved. The data safe must manage this without the user having to organize or index the data beforehand. No user who possesses large volumes of data would be able, or want, to do this anywhere near adequately. To do this, the data safe will have to rely on meta data, so that different types of retrieval, including semantic networks, can be supported. Semantic meta data are useful in answering queries such as: “Show me the New Year’s Eve photos from the year in which I went skiing to Zillertal with my friend Fred.” This will require new interaction between short-term memory for day-to-day data and the long-term data archive. The retrieval mechanisms must be designed so that they will also continue to function with future modes of interaction, which will be subject to rapid change. They include virtual smart spaces, in which information retrieval is supported with 3D presentation and with which users interact without text, e. g., with gestures. This aspect links the technology as well as the content of the data safe to the semantic web.
(5) Security in the cloud: national and international legal standards must be in place to ensure that the right of informational self-determination can be exercised at any time. This involves the permanent deletion of data or specification of an expiration date on which deletion will automatically take place, and the right of property and right of disposition over the data after death. Distributed data storage in the cloud must be used to exclude the possibility of ‘hostage-taking’ by third parties.

The data safe will ultimately only be accepted by users if they can trust its legal, economic and technology features in the long term!

Description

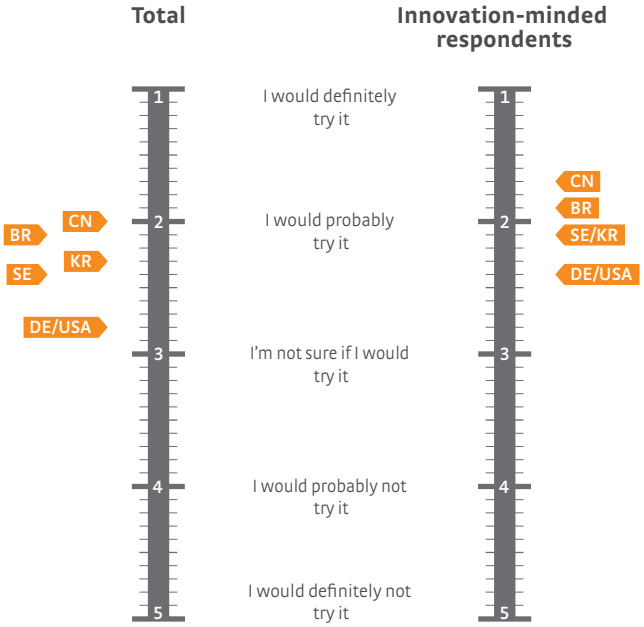
Respondents from most countries think that they would probably try the lifetime data safe.

Willingness to try out this future scenario is highest in China and Brazil (average value 2.0 and 2.1; see FIG. 39). On average the Korean and Swedish respondents also stated that they would probably try out the data safe – the average value for all respondents in this case was 2.3 and 2.4. The scenario receives the worst results in Germany and the USA, where an average value of 2.8 indicates that the German and US American respondents are not sure whether they would undertake a trial. Whereas only twelve percent of the German respondents stated that they would definitely try this scenario, every third respondent in Brazil would try it (31 percent).

As expected, the innovation-minded respondents are most willing to undertake a trial. 22 percent of this group in Germany say that they want to try out the lifetime data safe – in Brazil the willingness to do so is particularly high in this group (42 percent). The innovation-minded Chinese are the most willing to test the lifetime data safe with a rating of 1.7.

FIG. 39: What respondents think about a trial with »the lifetime data safe«

"How likely is it that you would try out this scenario?"



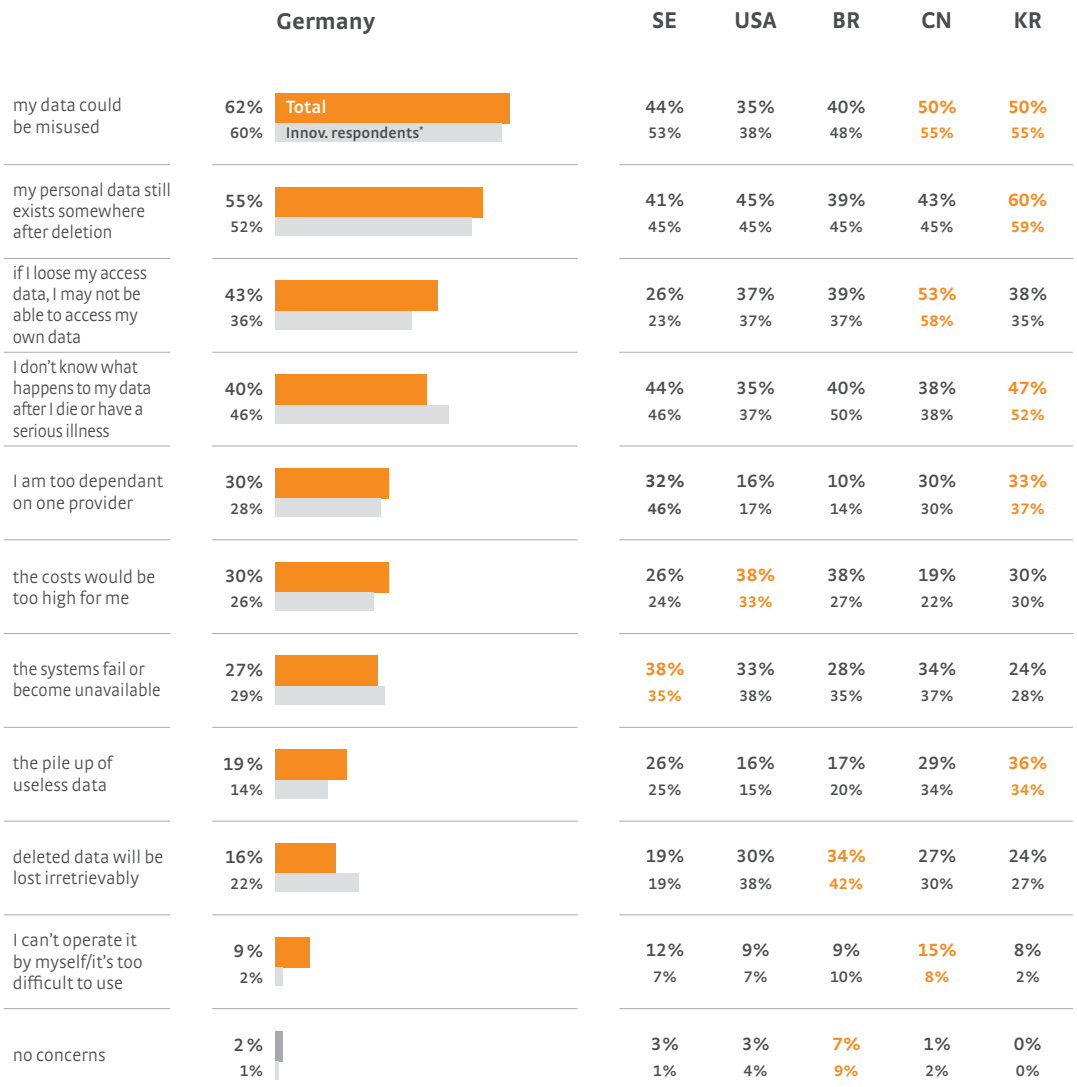
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=293, Sweden (SE) n=304, USA (USA) n=294, Brazil (BR) n=303, China (CN) n=299, Korea (KR) n=301;
Innovation-minded respondents: Germany (DE) n=80, Sweden (SE) n=100, USA (USA) n=89, Brazil (BR) n=84, China (CN) n=74, Korea (KR) n=79

FIG. 40: Respondents' concerns about »the lifetime data safe«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=293, Sweden (SE) n=304, USA (USA) n=294, Brazil (BR) n=303, China (CN) n=299, Korea (KR) n=301;
Innovation-minded respondents: Germany (DE) n=80, Sweden (SE) n=100, USA (USA) n=89, Brazil (BR) n=84, China (CN) n=74, Korea (KR) n=79

Asked to mark the passages in the text for this scenario that they particularly liked, at least 31 percent of respondents marked *"lifelong storage [...] access to my data, independently of data formats, software vendors and hardware manufacturers"* – showing that the core function of the lifetime data safe receives a very positive response (see FIG. 37). In addition, 21 to 30 percent of respondents marked the phrases *"stored safely and securely for the long term," "read and retrieve it on all future devices"* as positive. No passage in the text was viewed as critical by more than 20 percent of the respondents.

For a future scenario that focuses on lifelong storage and availability of data, it is not surprising that the concern regarding data misuse is stated in all countries. This concern is particularly prevalent in Germany, where 62 percent of all respondents and also 60 percent of the innovation-minded respondents marked this phrase (see FIG. 40). In the USA, however, only 35 percent of the people surveyed share this concern. Associated with this concern about data misuse is another concern, namely that personal data could still exist somewhere after deletion. 55 percent of the German respondents voiced this concern, a figure that is only exceeded in Korea, where 60 percent of the respon-

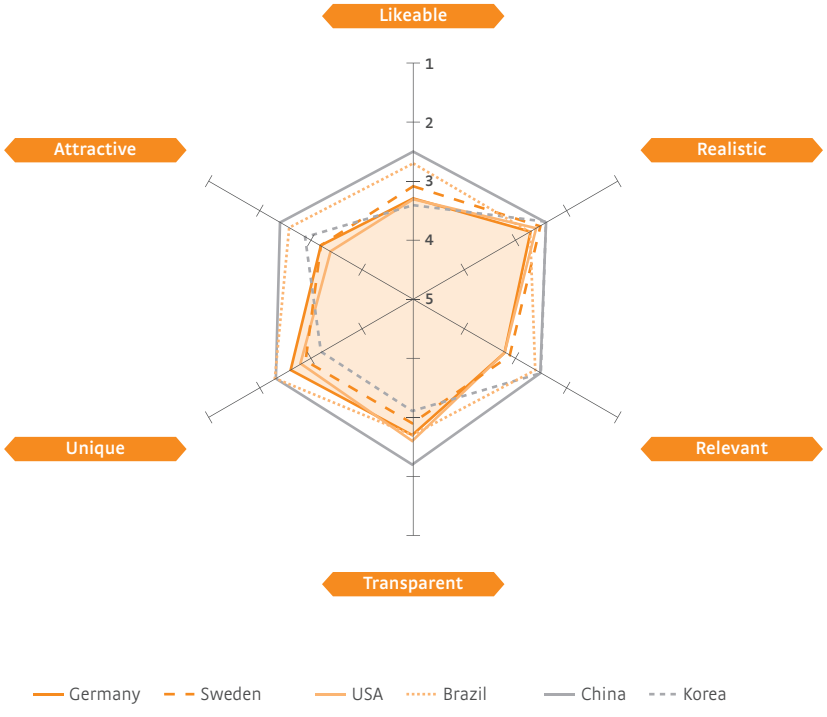
dents stated the same. This scenario would face a very precarious situation if access data were lost and, as a result, those data stored for a lifetime were no longer accessible – this is a concern stated by 43 percent of all German respondents but only by 36 percent of the innovation-minded respondents. The innovation-minded respondents in Germany appear to have more faith that the problem could be solved. China is the country in which the most respondents worry about access if access data is lost, with every second respondent (53 percent) marking this passage.

Another concern that is quoted with similar frequency in the different countries is about what will happen to personal data after its owner has died.
This uncertainty is quoted by 40 percent of the respondents in Germany, by 47 percent in Korea and even by as many as 35 percent in the USA. It can be observed across all countries that this fear is equally strong, if not stronger, among the innovation-minded respondents. In Germany, this concern is marked by 46 percent of the innovation-minded respondents, in Korea by as many as 52 percent.

Whereas every third German respondent additionally fears being dependent on one provider, this concern is only voiced by every tenth respondent in Brazil (30 and 10 percent). High costs and the failure or non-availability of technology are also named as concerns by 30 and 27 percent of all respondents in Germany. The fear of high costs is, however, quoted even more frequently in the USA and Brazil (38 percent in each case) – the concern that the technology could fail is also more common in Sweden (38 percent) than in Germany (27 percent).

FIG. 41: Ratings for individual aspects of »the lifetime data safe«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



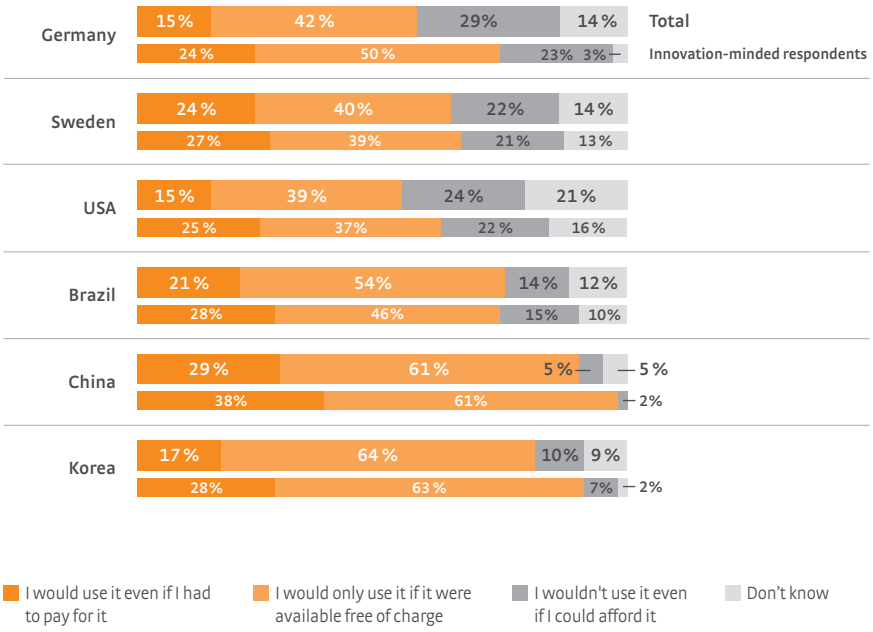
	DE	SE	USA	BR	CN	KR
Likeable	3.3	3.1	3.3	2.7	2.5	3.4
Realistic	2.7	2.5	2.6	2.7	2.4	2.4
Relevant	3.2	3.1	3.2	2.6	2.5	2.5
Transparent	2.7	2.9	2.6	2.7	2.2	3.1
Unique	2.6	2.9	2.8	2.3	2.3	3.2
Attractive	3.2	3.2	3.4	2.6	2.4	2.9

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=293, Sweden (SE) n=304, USA (USA) n=294, Brazil (BR) n=303, China (CN) n=299, Korea (KR) n=301

FIG. 42: Willingness to pay for »the lifetime data safe«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=293, Sweden (SE) n=304, USA (USA) n=294, Brazil (BR) n=303, China (CN) n=299, Korea (KR) n=301;
Innovation-minded respondents: Germany (DE) n=80, Sweden (SE) n=100, USA (USA) n=89, Brazil (BR) n=84, China (CN) n=74, Korea (KR) n=79

A natural fear associated with this future scenario is the unnecessary collection of vast amounts of data over long periods of time. The Korean respondents, in particular, express this concern (36 percent), whereas in Germany this aspect is only named by 19 percent of all respondents. And only 16 percent of the German respondents are worried that deleted data will be lost irretrievably, whereas this fear is voiced by 34 percent of the respondents in Brazil.

The lifetime data safe is not very well liked by respondents.

In a comparison to the other countries surveyed, the lifetime data safe comes off worst in Korea, with an average value of 3.4 – the Chinese give it the best rating of 2.5 and in Germany the scenario is only rated "fairly good" for likeability (average value 3.3; see FIG. 41). Attractiveness and relevance are given similar ratings in the individual countries. With an average value of 3.2, Germany tends to give the lifetime data safe a rather bad rating compared to the other countries.

On average, the lifetime data safe is considered very or fairly realistic. It is seen as most realistic in China and Korea with an average value of 2.4 but even the countries that find the description of the lifetime safe the least realistic (Germany and Brazil) assign it an average value of 2.7. The assessment of this scenario's uniqueness varies between 2.3 (Brazil and China) and 3.2 (Korea). Germany rates the lifetime data safe not so new and unique (2.6) and therefore takes a mid-range position in comparison to the other countries.

Willingness to pay for using the lifetime data safe is similarly high and varies less strongly across the surveyed countries in contrast to the other future scenarios.

Respondents in the USA and Germany are least willing to pay to use the lifetime data safe (15 percent); twice as many respondents in China state their willingness to do so (29 percent; see FIG. 42). Willingness to pay is much higher among the innovation-minded respondents across all countries, ranging from 24 percent (Germany) to 38 percent (China). While by far the largest percentage of respondents (63 percent) would use the lifetime data safe in Korea if it were provided free of charge, only 39 percent of all respondents would do so in the USA. In Germany and Sweden, too, only 42 and 40 percent of respondents would use this scenario free of charge. In Germany, Sweden and the USA, the group of those who would not do so even if they were sufficiently well off, is fairly high. In Germany, 29 percent of the people surveyed would not use the lifetime data safe even if they

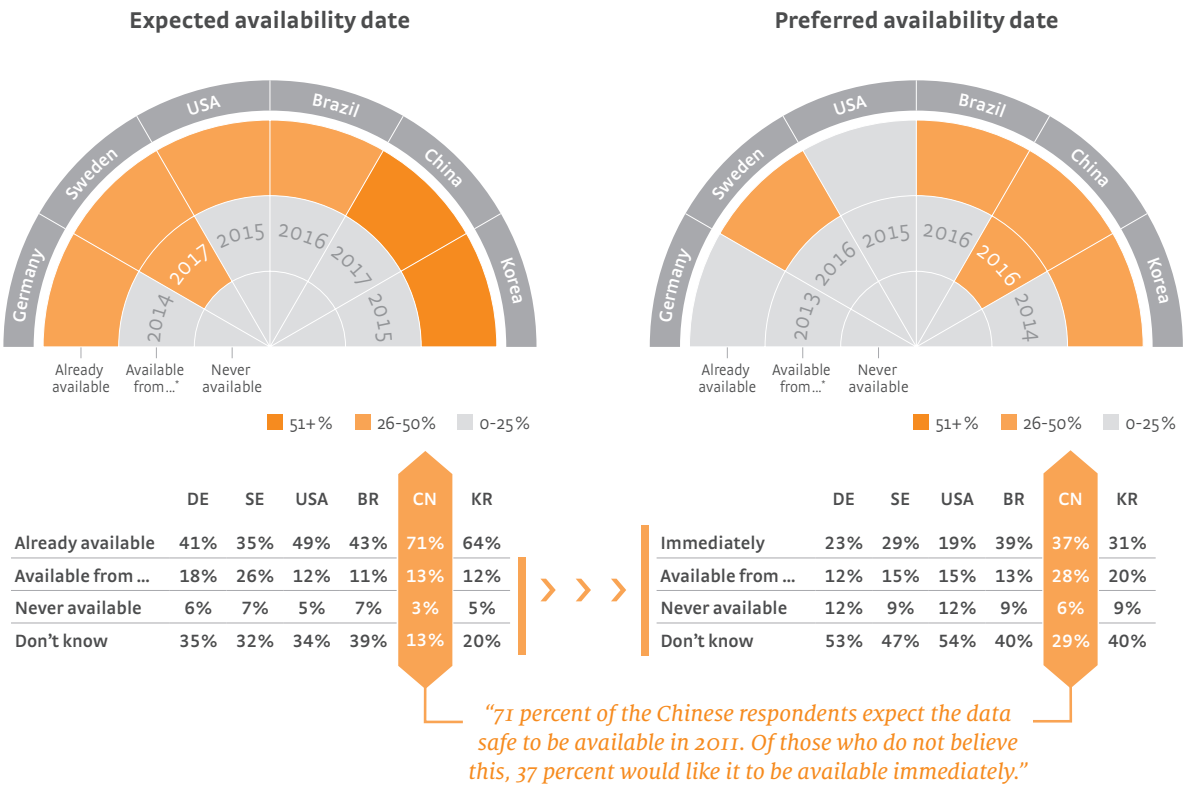
could afford to do so. 24 percent of the US Americans share this opinion, in Sweden as many as 22 percent – but in China only five percent of respondents agree with them. This again illustrates the skepticism that exists toward the lifetime data safe in Germany, Sweden and the USA.

The majority of respondents in all countries assume that the lifetime data safe is already available, or will become available in 2011.

This is the opinion of 71 percent of the respondents in China, but in Sweden of only 35 percent (see FIG. 43). Another 26 percent of the Swedish respondents assume on average that the lifetime data safe will be available from around 2017, another seven percent do not expect it to be available ever. Asked when they would like the lifetime data safe to be available to the majority of people in their country, the most frequent answer in all countries is *"Immediately"*. However, the majority of respondents in Germany and the USA do not know when they would like this future scenario to be available.

FIG. 43: Expected availability date for »the lifetime data safe« vs. preferred availability date for »the lifetime data safe«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	41%	35%	49%	43%	71%	64%
Available from ...	18%	26%	12%	11%	13%	12%
Never available	6%	7%	5%	7%	3%	5%
Don't know	35%	32%	34%	39%	13%	20%

	DE	SE	USA	BR	CN	KR
Immediately	23%	29%	19%	39%	37%	31%
Available from ...	12%	15%	15%	13%	28%	20%
Never available	12%	9%	12%	9%	6%	9%
Don't know	53%	47%	54%	40%	29%	40%

"71 percent of the Chinese respondents expect the data safe to be available in 2011. Of those who do not believe this, 37 percent would like it to be available immediately."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=293, Sweden (SE) n=304, USA (USA) n=294, Brazil (BR) n=303, China (CN) n=299, Korea (KR) n=301;
Preferred availability date: Germany (DE) n=169, Sweden (SE) n=193, USA (USA) n=162, Brazil (BR) n=165, China (CN) n=85, Korea (KR) n=108

"Users' data privacy requirements should be seen as drivers, not barriers."

Interpretation

The lifetime data safe: a need and a challenge for technology and society.

The highly positive rating given for closeness to reality and uniqueness underlines the lifetime data safe's importance for the future. When it comes to likeability, the scenario is not rated so well (see FIG. 41). This is probably due to the opinion that the lifetime data safe is more of a necessary utility than something which will improve convenience and lifestyle. A detailed analysis across the regions reveals different views about the point in time when the data safe will be realized. This indicates varying assessments for the features and the quality of the digital data safe, based on the different social structures. The majority of respondents from China, for example, expected the data safe to be implemented in 2011 (71 percent). The majority of respondents in all other countries are also convinced that the lifetime data safe is already available, or would become available in 2011; the greatest overall pessimism is shown by the respondents in Sweden (see FIG. 43). A closer analysis shows that development work will have to be carried out by various disciplines, including the technology side, at all levels of society before people will trust the lifetime data safe.

Lifetime data safe – sooner rather than later.

The respondents prove extremely willing to reflect on the lifetime data safe concept. It is noticeable, however, that Germany and the USA fall behind China, Brazil and Korea (see FIG. 39). The concept obviously touches a nerve among German respondents: the passages they marked in the text for this scenario include the *"lifelong storage"* and *"access to my data, independently of software vendors and hardware manufacturers"* (see FIG. 37). The question of data readability on future devices is based on the deficits experienced in today's PC systems where, for example, text files that are more than ten years old can no longer be accessed with today's software. Data abuse is one of the respondents' chief concerns (see FIG. 40), reflecting the state of affairs in today's commercial social networks, which are currently staking a claim as a lifetime archive. Apparently, people are beginning to realize that the devices they will use in the future will no longer be classic and portable PCs and that they will work with various different types of equipment, which may not even be recognizable as IT devices.

The "Memex for the rest of us".

The idea of being able to archive and retrieve all of one's data is very old and dates even further back than the monastic libraries of the Middle Ages. It was catapulted into the modern era shortly after World War II by Vannevar Bush, who described a hypothetical machine in his article, the Memex (see Bush 1945), which collects all kinds of data and makes it available to users in a number of different ways. The memex is a theoretical predecessor of the World Wide Web. The lifetime data safe will take us a big step closer to achieving this vision.

The current drivers behind this future scenario are the following: firstly, the availability of large volumes of storage space at low cost, which can be implemented under the aspect of total cost of ownership at the lowest cost in the cloud. This offers flexible adjustment to demand, high resilience, automatic hardware migration and, in the future, even greater energy efficiency than is offered by the self-managed solution. Gordon Bell has reflected on the total volumes that would be necessary (see Bell 2001) – these figures are hardly alarming nowadays. Another driver is the penetration of IT in all life situations: digital artifacts no longer occur solely on PCs or notebooks. Mobile devices, cameras and other third-provider systems produce personal artifacts at various times and in various places. We are currently moving toward the digital society, in which certificates, IDs, reports, health records, etc., will successively only exist in digital format.

On the way toward the basic function of the lifetime data safe.

The wish for simple, automated consolidation of all types of digital documents is apparent when we look at the systems used for data synchronization today. Furthermore, the inadequacy of today's unstructured storage in situations where we need to search for the right data at the right time is another driver. A distributed approach to storage promotes reliability. An integrated versioning concept and mechanisms for offline use of archive content could be additional, trust-building measures. Retrievability includes the readability of data at any future time. Many of the data formats in use today are more or less proprietary, and whether or not they will be readable in the future depends on the licensor's business policy. One approach is to use open standardized data formats which are designed for the logical longevity of digital archiving: examples of this include the TIF format for images and the PDF/A variant for archive-safe PDF files.

A major barrier to this concept in Germany is the digital divide that exists in society. This type of digital archiving concept requires that all users are able to use broadband lines to access their lifetime data safes. Politics and business have not yet managed to define a basic provisioning mandate for broadband networks, a step that has been taken successfully in other countries, first and foremost in the Asia/Pacific region.

Users' requirements for data privacy should not be seen as barriers but as drivers (see FIG. 40): almost as expected, the German respondents see data abuse as the most critical issue, the US Americans (where the Post Privacy era was launched) were most uncritical. Users need to be able to trust the lifetime data safe and, in particular, be confident that their data is deleted irreversibly. As a consequence, operators may not have any 'hidden agenda' governing the usage of user data. The concern about what will happen to personal data after its owner has died is fueled by the inglorious approach taken by social networks on this issue. A legal framework is therefore required for a mandatory hereditary right to data. This is associated with compulsory user authentication, which was recognized by the survey respondents: today's authentication is based exclusively on the electronic credentials which a user is allocated upon registration. If these are lost, access to the data is also irretrievably lost. However, it is vital that – if data is lost or someone has died – authentication or retrieval of electronic credentials is possible.

Evolution to a universal long-term archive.

The functions of a lifetime data safe, which serves as a universal long-term archive, must develop on an evolutionary basis. This applies in particular to the methods that are applied to finding the right documents at the right time. This is an aspect that also plays a role in many people's working lives, where they are confronted with the collaborative use of archives in (virtual) workgroups. The digital data safe solution should also cover the handling of data in the workplace. Here, it is closely associated with the aspect of knowledge management. Semantic technologies will be the only way to find the right documents at the right time. Semantic networks with a simple ontology relating to day-to-day life will be able to support users with a context-related recommendation system: semantic networks, discussion about and use of which has been confined to academic circles to date, occur at best as standalone solutions in corporate IT installations and must now be freed of their fetters and opened up for usage by normal IT users with no special training. A key role here is played by the fact that meta data is acquired largely automatically. Firstly, and luckily, much of the meta data is generated automatically, e.g., relating to who has created or changed artifacts when, where and in what context. Furthermore, we will require technologies that understand document contents, a field that is currently experiencing a strong push. This covers understanding texts as well as analyzing images and videos, including the increasingly prevalent area of face recognition.

This technology naturally also harbors risks that we can barely envisage today. Will these software tools suddenly give everyone a technology they can use to spy on others and would it therefore have been a dream tool for secret services not so many years ago? Nonetheless, we cannot close our minds to these technologies, since they are set to enter our lives no matter what approach we take. It will therefore be vital to use the technology in a highly responsible way. We must take these issues into account right from the start in the design of the lifetime safe and not, as has happened so often in the past, simply address problematic issues when the pressure on users becomes high enough.

Different IT developments in individual regions.
With regard to new usage and interaction paradigms with the virtual data world, we in the industrialized countries of the 'old' world are still surprised to note that the mobile device is advancing as the prevailing means of accessing information and communications technology in the emerging countries. The extremely high penetration of mobile devices in these countries, which include Africa (where it is far higher than penetration with classic IT, PCs and notebooks), means that the mobile device is set to help overcome the digital divide in these countries (see Greengard 2008). Consequently, there is scarcely any IT infrastructure in people's homes in which a lifetime data safe could be integrated. On top of this, many infrastructures are digital from the outset and people have no reservations about using them. Interaction with the virtual world will primarily take place through mobile devices. The development horizon is more forward-looking in many aspects than it is here in Germany. Instead of building one-way solutions in one or another direction, we should commit ourselves far more strongly to partnerships and collaborate on further developing suitable solutions. This will include a comprehensive exchange in both directions between students and young engineers. If we do not push ahead with this, the other countries could overtake us.

Multicultural concept.
The list of concerns voiced by the participants highlights some cultural differences. In the USA, for example, questions about data abuse and privacy are just as important as the question of what happens to data after someone dies (see FIG. 40). The Brazilian respondents (34 percent) are twice as afraid of data being irretrievably lost as the Germans. Despite these regional differences, there is an overall consensus that a data safe system will have to offer extensive solutions yet allow individual users to make decisions regarding their usage. A multicultural approach is all the more important since most markets include users with immigrant backgrounds

"The lifetime data safe is a basic functionality of future ICT systems."

Contact with future issues for different locations.
The economic importance of secure, lifetime data safes lies principally in the availability of functionality for their users. If they use the data safe in a private environment, no direct added value is created. A business model must therefore be developed that operates with the cost and function benefits that users stand to gain compared with classic PC-based solutions. A political economic framework will be required to ensure that the technology does not suffer a fate similar to that of PKI (Public Key Infrastructure): everyone wants it, demands it, but no-one has a financial interest in its operation.

Ongoing social change.
The classic IT paradigm (once again) is facing an upheaval. This time, it includes drivers outside the classic industrial nations. We must accept that the classic PC concept is shifting (see trends such as tablet computers, cloud computing and the 'anywhere' desk scenario) with the result that PCs will only be deployed in specific professional applications in the future. IT will no longer take place on our desks or TV sets but will penetrate our lives more or less invisibly.

The question about how to overcome the digital divide will gain urgency as a key enabler of this future scenario in Germany, especially if the topic is addressed more successfully in the less developed countries than it is here. In addition, the new technologies require even more intensive debate on the aspects of privacy and informational self-determination.

Germany and Europe already have the know-how needed for this scenario in the areas of information systems, automatic content analysis of texts and multimedia data in order to drive research and development in this field. In doing so, we must as far as possible develop universal solutions for an inhomogeneous world, in which different requirements profiles emerge in different cultures. This will include worldwide recognized, open and non-discriminatory standards.

Challenges facing social groups.

At societal level, a vehement dialog is already underway on how data should be handled. How data is treated in social networks today represents only a small part of the problems that arise when documents, life data streams and electronic memories relating to individuals' lives are stored in lifetime data safes. We live with the paradox that awareness for these issues and thus the demand for protection and informational self-determination is growing in some parts of the world while, on the other hand, technology developments and global growth dynamics are making protection and a reconciliation of interests among the parties involved more difficult. As we move toward the digital society, it will only be possible to correlate people's needs, cultural implications, economic targets and technical possibilities by taking an interdisciplinary approach. This may help to detect the social consequences of what is technologically possible at an early stage and, with suitable legislation and standards in place, to prevent misuse and thus social dislocations. Orientation to the needs of users, who include every member of society, must be assigned top priority when it comes to the handling of personal data.

Politics must therefore define and further develop the legal framework for informational self-determination and, at the same time and in collaboration with transnational bodies, create legal provisions to govern the administration of digital inheritances and worldwide enforceability of claims made by users and their heirs.

Summary and recommendations.

The lifetime data safe is a basic functionality of future ICT systems which is welcomed and sometimes even expected by respondents. It must offer functions that go far beyond those provided by today's PC operating systems. This can be implemented in phases so that, once archived, data inventories will migrate automatically to higher evolution levels in the data safe. In view of the long existing IT globalization, we should also meet the challenge presented by lifetime data safe design by ensuring that it can adapt automatically to different cultural requirements. In order to be accepted by users, all the concerns that have been mentioned should be taken into account; this relates in particular to security and reliability, and also includes costs. During the evolutionary phase, the support of advanced technologies will make it possible to locate data precisely. This will later result in sophisticated interaction technologies that are not yet imaginable. This future scenario therefore draws on many key areas of future ICT systems: trust and security, content analysis, semantic networks and meta data, ubiquitous computing and new interaction technologies.

Development of the lifetime data safe will require us to gain a grasp of how to craft attractive, easy-to-use and interoperable products from the results of research. Equally important roles will be played by standardization (archive-safe data formats, security, interoperability) and a regulatory approach that requires users (consumers), business and politics to meet at eye level and to achieve a reconciliation of interests at global level – in the interest of economic success.

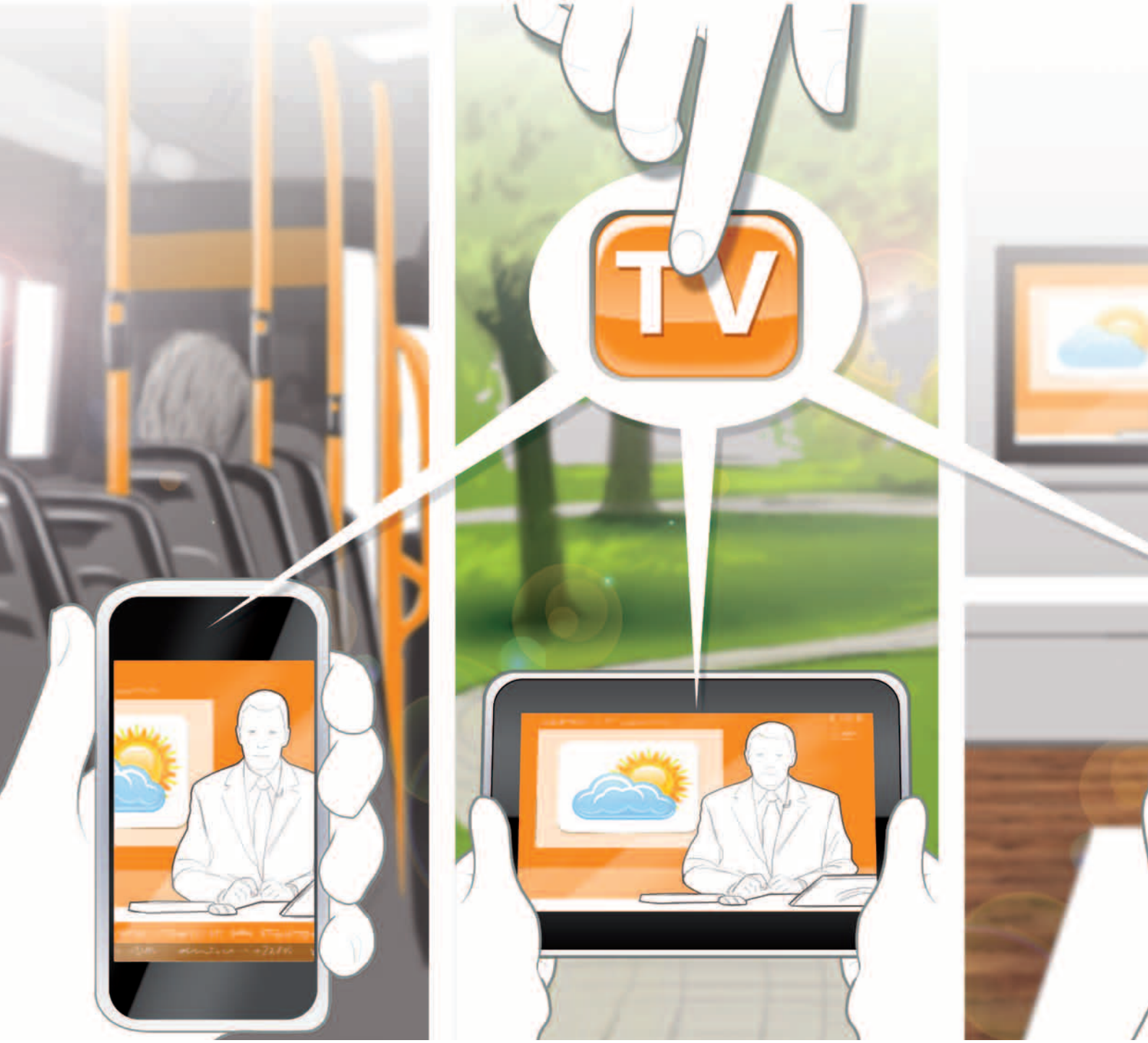


FIG. 44: Visualization of »my personal TV«

"By 2024 at the latest, more than 75 percent of the population in Germany will use a multimedia mobile device as the unifying element for conventional media (books, newspapers, magazines, television and internet) to display text, images, music and videos."

(Result from the second phase of the study, thesis 97)

My personal TV.

FIG. 45: Evaluation of individual aspects of »my personal TV«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

I enjoy watching television to keep up with current events, relax or simply be entertained. But I am often overwhelmed by the variety of channels available, or simply bored.

My personal TV now helps me find and enjoy a **custom-tailored set** of television programs anytime, **anywhere**. My personal TV gives me an entirely new television experience. The system **learns which programs I watch and which topics interest me.** No matter which device I use (TV set, smartphone, or (tablet) computer), my personal TV suggests shows on demand that meet my interests and fit the current situation – for example, feature-length films for my living room or series episodes on the bus.

21-30%

Accessing it couldn't be easier: I simply press the TV button on the remote control or start the app on my smartphone or (tablet) computer and I am connected directly to my personal TV. Of course, I can also **watch shows that I missed when they first aired.** An electronic program guide makes it easy for me to find a program I want. At the same time, I can also use recommendations from friends and other viewers who have already seen the show and rated it. Likewise, I can enter ratings and make recommendations myself.

31-40%
of respondents marked this.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=306

“TV users are not interested in the provision of technology but in the implementation of options, wishes and interests for TV usage.”

Dimension

Is my personal TV the end of television as we know it? The question about the “end of television as we know it” was asked as long ago as 1984 by future researcher Nicholas Negroponte and, over the last 25 years, has been taken to mean the end of television as a medium – especially in the wake of the Internet boom (see Media Perspectives 2009). It is true that TV usage has increased in recent years in most developed countries and that television is used just as frequently as Internet and radio by the young target group. However, it is no longer the television that we knew 25 years ago. Time-shifted, high definition (HDTV), video on demand in conjunction with the broadband network (connected TV or hybrid broadcast broadband TV), portable and on the move (mobile TV) and independence of the TV set are the lines that technology development is taking. All these developments have one thing in common: they eliminate the constraints of television “as we knew it,” which was tied to specific times and places and determined by program placements. Despite the vast improvement in program quantity, the subjective feeling of a medium whose availability should suit today’s life situations leaves much to be desired. This is the context in which we must see the development of my personal TV today.

Wishes and expectations for television as a medium or for the use of moving images are addressed by this scenario in the current future study. TV users are not primarily interested in the provision of technology but in the convenient and efficient implementation of options, wishes and interests for TV usage. Respondents were therefore not asked to assess broadcast, IP-based or hybrid technologies but to give their subjective opinions and expectations relating to whether or not the technology for my personal TV is already available.

The different countries have different television markets (e. g., with regard to the role played by public broadcasting and pay TV), very different demographies (Brazil is, in comparison with Germany, a very young country) and also cultural and economic differences (e. g., people’s emotionality or the meaning of the word ‘personal’), all of which have an impact on the results. The text for the personal TV scenario focuses on the following media development themes:

- Anytime, anywhere usage,
- Converging usage options,
- Navigation through offers/self-learning program guide,
- Experience sharing through communication,
- Giving and receiving recommendations.

Regardless of which concrete options for my personal TV prove to be the most successful, we would like at this point to put forward the thesis that there is just one real ‘killer application’ for television in the future, namely the TV set itself.

Description

The respondents from Brazil stated most frequently that they would like to try my personal TV (average value 1.6)**.**

The Chinese and Korean survey respondents would also probably try out this scenario (average value 1.8 and 2.1; see FIG. 46). In Sweden, the USA and Germany, the average respondent tended to be uncertain whether they would try out this future scenario, with ratings that lie between 2.6 and 3.0. As expected, the innovation-minded respondents are most willing to try out the future vision described here. Their average values lie between slightly and much higher at 1.4 (Brazil) to 2.3 (Germany).

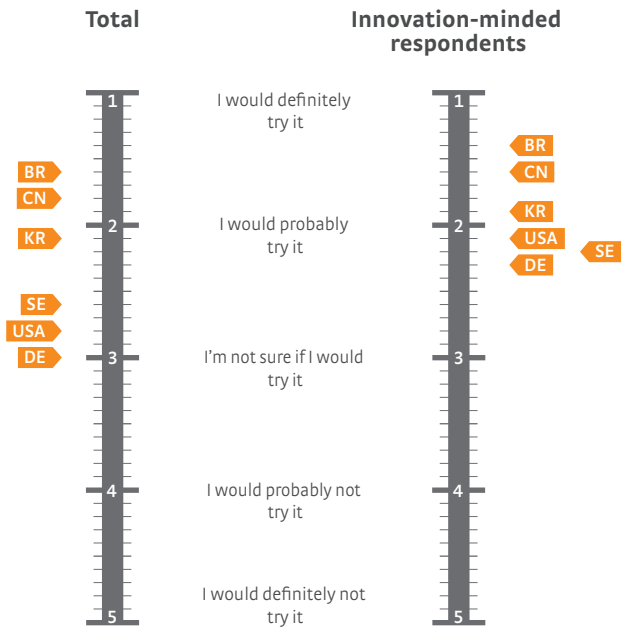
Respondents marked all the passages for this scenario text that they particularly liked and that they viewed critically (see FIG. 45). The fact that 21 to 30 percent of German respondents marked *"custom-tailored [set of programs]"* and *"learns which programs I watch and which topics interest me"* shows that many respondents appreciated the fact that the scenario adjusts to users' personal preferences. Even more Germans (31 to 40 percent) say that they like the possibility of being able to *"watch shows I missed when they first aired."* On the other hand, 21 to 30 percent of all respondents saw the *"anywhere"* aspect as critical. Another 11 to 20 percent marked *"series episodes on the bus"* and *"smartphone and (tablet)computer."* The aspect of being able to watch television anywhere on different devices does not seem to be so well-liked in this country. It is also interesting to note that the same number of respondents who liked the idea that the system learns personal preferences also marked it as critical (21 to 30 percent). There are many conceivable reasons for this.

This future scenario again shows that the greatest concern of German respondents is the possible misuse of data.

49 percent marked this aspect (see FIG. 47). As many as 54 percent of the innovation-minded respondents also expressed this opinion. This could be one possible explanation of why the passage *"learns which programs I watch and which topics interest me"* in the future scenario was marked critical by 21 to 30 percent of respondents. Whereas half the respondents in Germany are worried about data misuse, the corresponding figure for the other countries is no more than one third of respondents (China and Korea),

FIG. 46: What respondents think about a trial with »my personal TV«

"How likely is it that you would try this future scenario?"



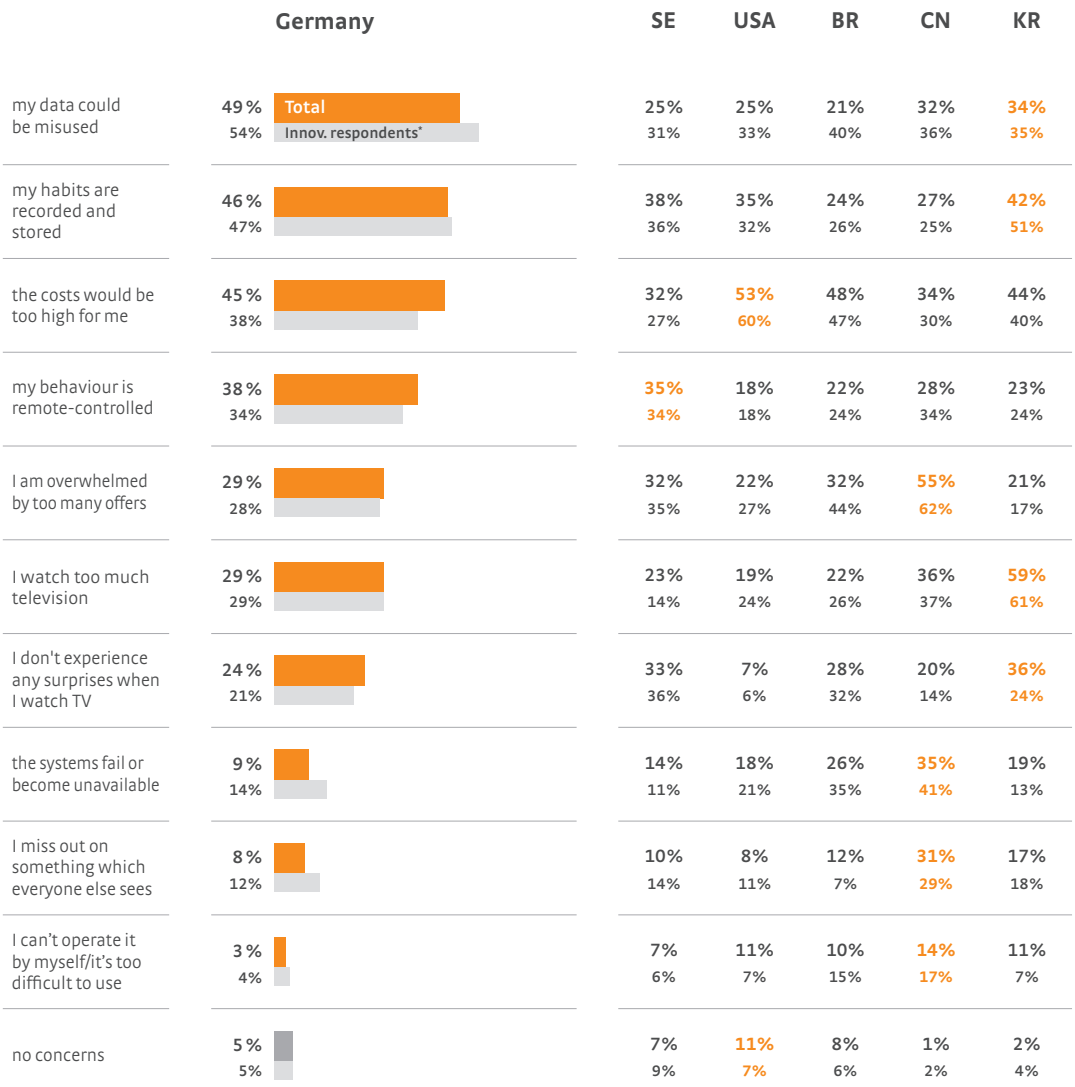
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=306, Sweden (SE) n=299, USA (USA) n=294, Brazil (BR) n=305, China (CN) n=299, Korea (KR) n=300;
Innovation-minded respondents: Germany (DE) n=79, Sweden (SE) n=80, USA (USA) n=87, Brazil (BR) n=85, China (CN) n=103, Korea (KR) n=86

FIG. 47: Respondents' concerns about »my personal TV«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=306, Sweden (SE) n=299, USA (USA) n=294, Brazil (BR) n=305, China (CN) n=299, Korea (KR) n=300;
Innovation-minded respondents: Germany (DE) n=79, Sweden (SE) n=80, USA (USA) n=87, Brazil (BR) n=85, China (CN) n=103, Korea (KR) n=86

or even as low as a quarter (Sweden and USA). In Brazil, only every fifth person shares this concern (21 percent). A similar fear ranks in second place among German respondents. 46 percent of them state that they would be worried that personal television would capture and store their individual habits. This is also a concern of the Korean respondents (42 percent). In Brazil, this fear is shared by fewer people (24 percent).

45 percent of respondents in Germany are worried that the costs would be too high.

However, only 38 percent of the innovation-minded respondents shared this opinion. In the USA, it is above all the innovation-minded respondents who fear high costs (60 percent). An analysis of all respondents in the USA shows that the cost aspect is very important in this country (53 percent). In Brazil, the worry about costs being too high is the concern most frequently voiced (48 percent).

In China, the majority of respondents are worried that they will continue to be flooded with offers (55 percent). This concern is shared by only 29 percent of the people surveyed in Germany. The majority of Korean respondents fear that the possibility of having personal television would lead to excess viewing (59 percent),

whereas only a third of the Germans state the same (29 percent). No more surprises during viewing is mentioned by only 24 percent of the German respondents. As few as seven percent of the US American respondents marked this passage, in Korea, by contrast, 36 percent.

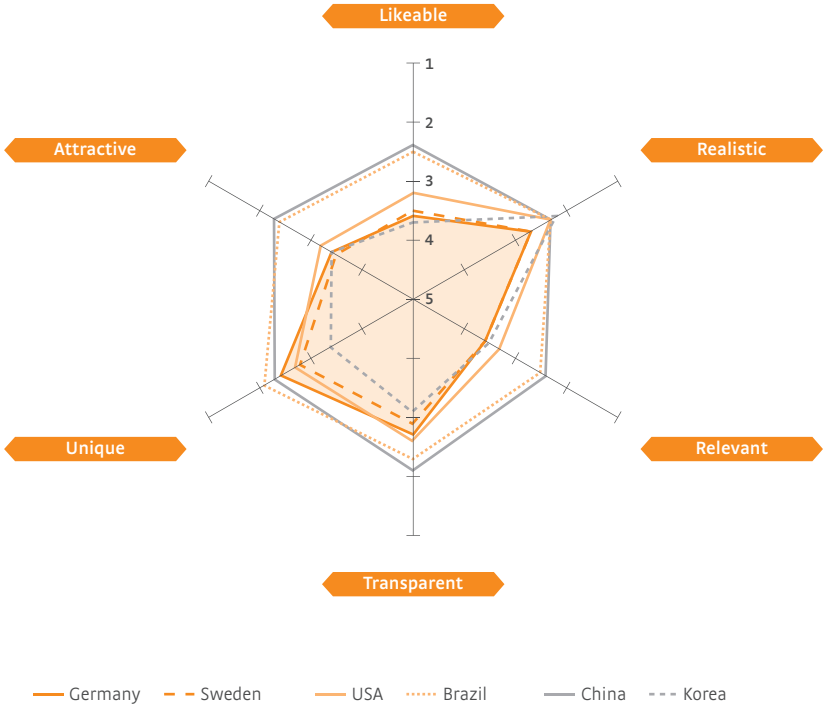
Interestingly, only a few respondents expect to have problems operating my personal TV.

In Germany only three percent of respondents fear that operation would be complex, a worry that is most widespread in China (14 percent).

This picture of the future appeals most to the Chinese respondents, who assign personal television the highest rating (2.4) for general likeability (see FIG. 48). In Germany and Korea, however, the idea proves less popular. Average values of 3.6 and 3.7 show that my personal TV is not so well liked in these countries. The opinion about personal relevance is similar to that on general likeability in all countries. In the countries where this picture of the future is better liked, it also tends to be considered relevant. In Brazil and China, personal television is therefore seen to be far more relevant than it is in Germany.

FIG. 48: Ratings for individual aspects of »my personal TV«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



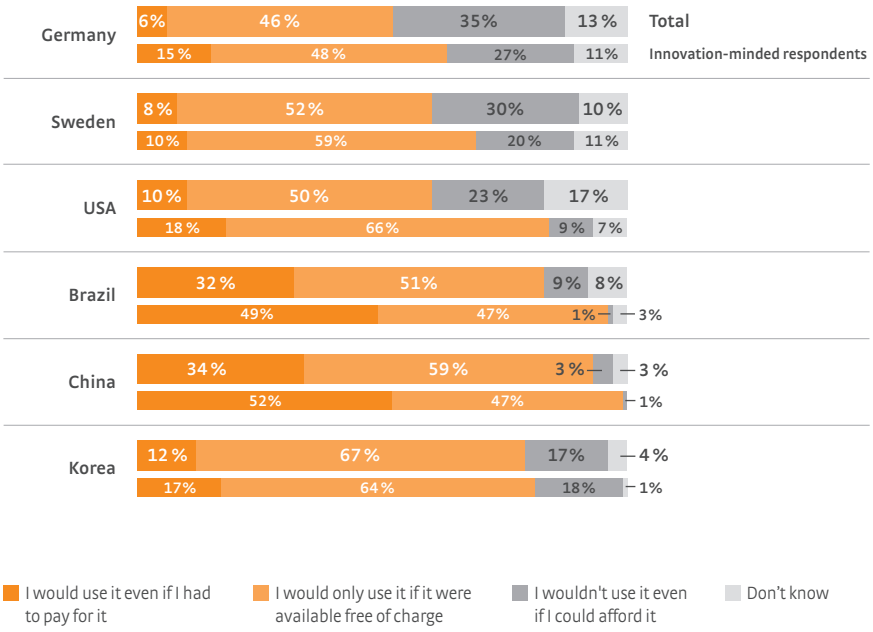
	DE	SE	USA	BR	CN	KR
Likeable	3.6	3.5	3.2	2.5	2.4	3.7
Realistic	2.7	2.7	2.3	2.3	2.3	2.2
Relevant	3.6	3.6	3.3	2.5	2.4	3.5
Transparent	2.7	2.9	2.6	2.3	2.1	3.1
Unique	2.4	2.8	2.7	2.1	2.3	3.4
Attractive	3.4	3.5	3.2	2.4	2.3	3.4

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=306, Sweden (SE) n=299, USA (USA) n=294, Brazil (BR) n=305, China (CN) n=299, Korea (KR) n=300

FIG. 49: Willingness to pay for »my personal TV«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=306, Sweden (SE) n=299, USA (USA) n=294, Brazil (BR) n=305, China (CN) n=299, Korea (KR) n=300;
Innovation-minded respondents: Germany (DE) n=79, Sweden (SE) n=80, USA (USA) n=87, Brazil (BR) n=85, China (CN) n=103, Korea (KR) n=86

Seen overall, this scenario is rated on average between very and fairly realistic. In Korea it is considered very realistic with an average value of 2.2, in Germany and Sweden as realistic.

The respondents in China state most frequently that they have understood this future scenario (average value 2.1). The Koreans lie far lower, with an average value of 3.1.

On average, respondents rate my personal TV between very and fairly new and unique. It is considered the most new and unique in Brazil and China (average values 2.1 and 2.3). The result for attractiveness is similar and the likeability rating is also highest in these two countries (2.4 and 2.3), whereas the idea comes off worst in Sweden, where it receives an average value of 3.5.

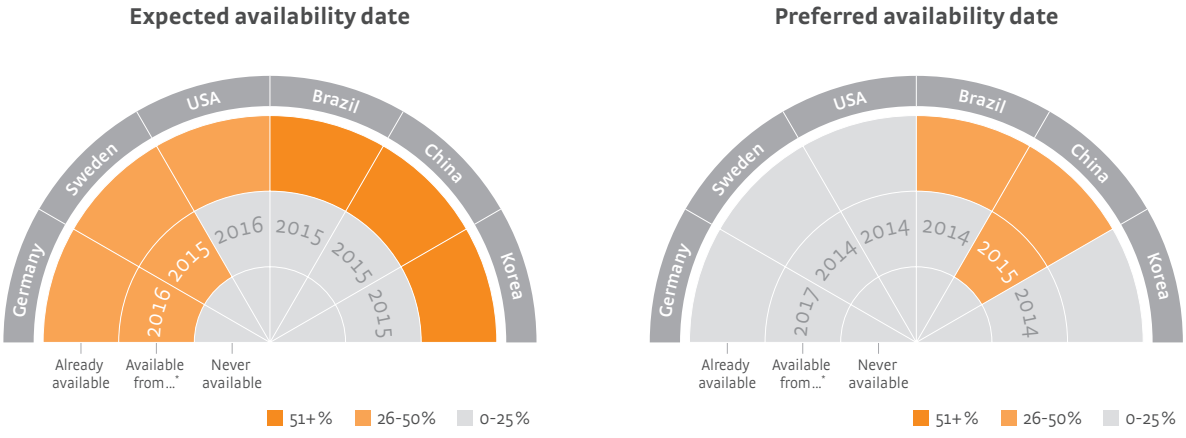
In Germany, Sweden, the USA and Korea, only a few respondents state that they would pay for a personal TV service (six percent in Germany to twelve percent in Korea; see FIG. 49)**.**
As expected, this percentage lies slightly higher among the innovation-minded users: in Germany, 15 percent of the innovation-minded respondents are prepared to pay for personal television, in Korea 17 percent and in the USA 18 percent. This trend is also reflected in the two countries where a large number of respondents would be willing to pay for this future scenario, Brazil and China. In both countries a comparatively high number of respondents are willing to pay for usage, corresponding to the high average likeability and the positive rating for attractiveness, in Brazil 32 percent and in China 34 percent. Among the innovation-minded respondents, the figure is as high as 49 and 52 percent.

Around half of all users would be prepared to use my personal TV if it were provided free of charge.
In Germany, 46 percent of respondents state this opinion, in Korea 67 percent. In Germany and Sweden, the number of people who would not even use this scenario if they could afford it is comparatively high. 35 percent of the German respondents and 30 percent of the respondents from Sweden would not even consider using personal television if they had the cash available – around one third of respondents seem to rule out usage completely on account of various misgivings (see FIG. 47).

The majority of respondents in China, Korea and Brazil assume that the personal TV service is already available in their country or that it would become available to the majority of people in 2011 (see FIG. 50)**.**
A majority of respondents in all countries state that some kind of personal television already exists, in Germany the figure is only 32 percent. Asked when they would like my personal TV to become available, most respondents answered *"don't know."*

FIG. 50: Expected availability date for »my personal TV« vs. preferred availability date for »my personal TV«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	32%	27%	48%	53%	78%	67%
Available from ...	26%	28%	18%	16%	10%	12%
Never available	9%	11%	5%	5%	1%	4%
Don't know	34%	33%	30%	26%	12%	17%

	DE	SE	USA	BR	CN	KR
Immediately	17%	23%	21%	34%	36%	21%
Available from ...	10%	11%	11%	19%	30%	17%
Never available	23%	17%	17%	7%	1%	16%
Don't know	50%	49%	51%	40%	34%	46%

"78 percent of the Chinese respondents assume that personal television already exists in their country – the rest hope that it will soon become available."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=306, Sweden (SE) n=299, USA (USA) n=294, Brazil (BR) n=305, China (CN) n=299, Korea (KR) n=300;
Preferred availability date: Germany (DE) n=207, Sweden (SE) n=215, USA (USA) n=167, Brazil (BR) n=150, China (CN) n=67, Korea (KR) n=98

“My personal TV will succeed if the new options generate value for users and do not unnecessarily eliminate their present benefits.”

Interpretation

My personal TV describes options for television of the future from a consumer standpoint. The technology for some of the options already mentioned – in particular in the case of IP-based TV services – is already available, but tends to be used by a handful of technology-friendly modernists. Further developments in the technology can be characterized as eliminating the restrictions of conventional television, as ‘new freedoms’ in usage of the medium. As in other areas of personal life, preferences here vary, since some people experience restrictions as a positive ‘guide’ that provides orientation. The news at 7:00 p.m. or the ‘Tatort’ thriller at 8:15 p.m. on Sunday may be experienced as a positive structural framework in day-to-day viewing. My personal TV will be successful if the new options generate value for users and do not unnecessarily eliminate their present benefits. This background knowledge makes it easier to understand the results shown in this section.

The German respondents have an ambivalent attitude toward the self-learning function of my personal TV.

The most positive rating for my personal TV in Germany is allocated to the motive of not wanting to miss programs (see FIG. 45). This result shows that an everyday need put in general terms has the greatest relevance. In contrast, the reference to availability of television anywhere tends to be viewed critically. Even though the technology for mobile television is already available, i. e., functions and appropriate bandwidth, the pilot projects in Germany which have not been implemented (e. g., DVB-H) or not completed successfully (Digital Multimedia Broadcasting) show that there is no independent demand potential for mobile television at present. As substantiated by other research projects (see, for example, ESPN 2010), people have a basic principle when it comes to television: they simply choose the best available screen and this is usually a big TV set providing excellent sound and vision in their own homes. Their response to the fact that learning systems suggest a selection of programs for viewers is ambivalent. These two critical findings may, at first glance, be surprising, since anywhere availability and intelligent up-front information could be the means of choice for ensuring that viewers

do not miss their favorite programs. In the context of other research results, the findings are, however, highly plausible: the action options at a rational level obviously take too little account of the fact that television is about emotions (mood management) and that viewing 'takes place' spontaneously depending on individual situations. Users of my personal TV only want as much interaction with the medium as is necessary for them to keep control over program selection.

Relevant barriers for my personal TV are not the result of technology and do not relate to specific media.

The drivers and barriers for my personal TV can be traced to a broad range of reasons associated with the future scenario itself as well as with respondents' general fears and expectations. A very general fear relating to new technology developments can be subsumed under the metaphor of the 'transparent' person. The findings of the Future Study show that these arguments are particularly relevant in Germany (see FIG. 47). This barrier has a subjective as well as an objective side. Lack of knowledge or uncertainty about what could happen and, possibly, concrete (media) knowledge and experience of data abuse all play a role here. Suitable marketing activities would undoubtedly bring a change; nonetheless, it is slightly alarming to find that the innovation-minded respondents, in particular, have more than an average fear of data misuse during my personal TV usage. Since it is the innovation-minded group who are usually opinion leaders in the market, overcoming the fear of data misuse for my personal TV will be key to the success of this scenario. Possible barriers that were revealed in the survey were based on the aspects of navigation and orientation. There is no doubting the fact that my personal TV will have to help viewers find the best programs to suit their personal tastes from a seemingly endless offer. Opinions vary on the question of whether this solution should simply provide guidance or also (pre-)select programs. 29 percent of the German respondents doubt whether my personal TV will help them avoid the confrontation with the huge range of channels and programs.

38 percent are worried about being "remotely controlled," almost a quarter believe that personalization could mean that they don't experience any surprises when they watch televison (see FIG. 47; concept: Schönbach 2008). People also expect my personal TV to be associated with (additional) costs even though this factor is not mentioned in the description. Almost half the respondents in Germany fear that the costs could be too high for their personal budgets. In a differentiated analysis of willingness to pay, only six percent would pay for my personal TV, 46 percent expect the service to be available free of charge (see FIG. 49).

The technology required for my personal TV presents a problem to only a small minority of the German population. Nine percent doubt whether the technology is failsafe – here again the innovation-minded respondents are slightly more skeptical – and only three percent believe that they do not have the technical skills needed to operate personal television. Since this result depends to a certain extent on previous experiences with modern technology, it serves to prove the existence of a high level of state-of-the-art technology and user competency.

The results show that the barriers relevant to my personal TV are not the result of technology or specific to certain media but phenomena that are frequently observed as technology progresses. People set great store by the word 'my' in personal television; it is, so to speak, the prerequisite for accepting the television as personal. Another barrier is the argument that the cost of my personal television could be too high.

In an international comparison, the German respondents are far less willing to try out my personal TV.

A frequently heard statement is that Germany is the land of ideas, but that it could do better in implementing these ideas within the country itself. If we take, for example, digitization of television, Germany only takes a mid-range position in Europe (see ASTRA Satellite Monitor 2010) and uses video-on-demand services comparatively rarely. In a comparison of the six countries, the German respondents are least willing to try my personal TV (see FIG. 46). The BRICK countries that participated in the study – Brazil, China and Korea – show the greatest willingness to try it. In a differentiated analysis, we observe that stronger links with the technical platforms used for moving images – i. e., television and Internet – correlate positively with the willingness to undergo a trial. Nor is it surprising to establish that the innovation-minded respondents would be more willing to try my personal TV than the average population. The differences between the innovation-minded respondents and the rest of the population vary greatly from one country to the next. The difference in Germany and the USA is 0.9 and 1.0 points, whereas in Korea, Brazil and China it is only 0.2 to 0.4 points. The variance between the different countries for a trial with my personal TV is not very great in the different age groups. Nor does the education aspect reveal any connection to willingness to give my personal TV a try. It can be concluded for all countries that – in comparison with other technology developments – there is no specific 'avant-garde' for my personal TV. This shows, on the one hand, the risk that there may be no push for my personal TV from this avant-garde and, on the other hand, that further television developments will progress in the mainstream. The vastly different results received from the six countries should, from a German standpoint, be viewed critically: willingness in the BRICK states surveyed to try out my personal TV is actually higher among the non-innovation-minded respondents than among the innovation-minded respondents in Germany.

Data security and costs are critical aspects.

Failure of the technology was considered unlikely and this fact, coupled with a largely positive opinion about respondents' own skills, shows that respondents have virtually no doubts about the technical implementation of my personal TV. They view the framework conditions critically, above all in the areas of data security and costs (see FIG. 47). This rating can be seen as a general problem facing society as a result of other experiences (see the present discussions about personal data on Facebook) rather than relating to this specific future scenario. In consequence, the problem cannot simply be solved within this segment but will require further efforts to be made in order to improve the climate in Germany. Legislation is a necessary and effective means of addressing data privacy issues, but is certainly not adequate on its own. Providers are, on the other hand, basically free to set any prices they wish for my personal TV. Transparency and straightforward rate plans would help to minimize the existing reservations with regard to the costs of personal television.

Commercial relevance of personal television.

Media continues to be a global growth sector. Since time is a factor that limits media usage, growth in this sector will shift in the mid-term and in line with the development status in individual countries from simple penetration growth to a growth in quality. My personal TV is bound to be one of the growth areas for television. In Germany, my personal TV can build on an excellent infrastructure comprising content and technical coverage. The degree to which my personal TV can be monetized remains to be seen. However, until the reservations regarding data misuse and (unwanted) profile creation can be resolved, these factors will put the brakes on both demand and development. To protect its position in intra- and inter-media competition, personal television will advance to represent a necessary quality of service for the television medium.

Summary and recommendations.

For users, television is a network product, in which the value of the medium increases with the volume of offers. This user view may collide with providers' financial considerations, especially when it comes to generating unique selling features in the market. Developments in other countries, e. g., Great Britain, show, however, that one of the reasons why interactive television is so successful there is that all providers use the 'red button' to access interactive TV services. The application of technical and access standards to my personal TV may therefore help bring technology innovations to market successfully, and to generate trust in technology innovations among users.

The technology options, in particular the use of IP-based services, make my personal TV a logical enhancement of today's television service. Users are extremely sensitive on the subject of their privacy. In order to position this concept successfully, it will be necessary to base the concept on clear, easily comprehensible ideas relating to concrete day-to-day needs. Television is leisure time, so that situation-related usage will continue to dominate in the future. My personal TV will only be successful if it makes television a more enjoyable experience for users than it has already been for the last 60 years.

"Media continues to be a global growth sector."

Chapter 4
Living.

The automatic energy manager.

The healthcare assistant .

As a living space and environment, the home is the center of social coexistence, a place where people find personal identity and a sense of belonging, but also privacy and security. Only at the most superficial level does "living" just mean the home or its furnishings. Security, protecting privacy, satisfying social and personal needs and the desire for self-fulfillment are fundamental physiological needs. Thus living comprehends many "layers" of needs that are constantly undergoing change due to shifts in social, cultural, economic and technological environments and influences. Information and communication technologies (ICT) trigger changes in needs, but also help in large measure to satisfy needs and to do so on an individualized basis.

Looking at the needs of a person through the different phases of their life, such as education, starting a career, the family phase, and retirement, through to needing nursing care, it is easy to see the fundamental changes that take place in an individual's basic living requirements. Socio-cultural developments also give rise to new focal issues: the demographic change in population development calls for the home to be further developed as a "third healthcare location." The main anchor points in the home will be wellness and prevention equipment, communication links for diagnosis and therapy, mobilized medicine, and improved care structures. Every kind of home, whether rented apartment, town house or villa, will be supported by ICT.

Both of the following pictures of the future crucially address changes in the way we are living: **the automatic energy manager** for new uses of energy and resources and **the healthcare assistant** at home for new concepts in the area of healthcare and nursing care.

Rising energy prices around the globe and the restructuring of energy policy increase the need for a low-cost, secure energy supply. As the general conditions change, there is also a growing desire to influence the selection of resources available. Thus future automatic energy managers will influence both the energy sources used, and the monitoring and management of need.

Major structural changes in the energy networks (smart grids) are being set in motion by the desire for partial autonomy of heating and electricity supply, which can only be managed by ICT. The use of "smart meters" as intelligent, digital electricity meters is the basis for all kinds of control and assistance functions.

The home will take on huge social importance as the third healthcare location. Prevention and fitness equipment will increasingly become a general fixture in the home. Generation-appropriate living functions will reduce the length of stays in hospitals and care homes; the home also appears to be a suitable care location for chronic or prolonged illnesses. ICT-supported implementation of the functions necessary for this in apartments and houses will shape the future picture of our homes. In addition to the prophylactic monitoring of vital signs, these functions also make it possible to implement personalized care and emergency management within the home. This is a component of round-the-clock care and will be standard medical practice in the future. The topic will be illustrated with the help of the healthcare assistant.

Highlighting this complex spectrum of future living needs illuminates the growing innovation potential arising through ICT, as well as the interactions, wishes, opportunities, and risks that ICT can make identifiable at an early stage and easier to assess for the acting forces in the market and society (housing sector, home owners, and local authorities).

In particular, by shifting perspective from a view of smart technology to smart, needs-driven use of technological potential, new contexts and scope for innovation can be identified.

ICT is the tool for more extensively customizing functions and products according to these needs and for establishing new causal relationships between hitherto disjointed need areas across all functions.

The automatic energy manager.

FIG. 51: Evaluation of individual aspects of »the automatic energy manager«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

As part of the energy turnaround, electricity prices are expected to increase. I want to support this evolution to cleaner sources, but keep my **energy costs as low as possible** at the same time.

21-30%

There is now an automatic energy manager that **monitors** and controls my energy budget, **helping me to reduce me energy costs.** It also optimizes the use of my **energy generators** and energy storage units. The energy manager is a **software** product that is **linked with all of my electronic devices and electrical appliances** and **controls** my **complete electrical energy use.**

31-40%
of people surveyed marked this.

The software is **simple** to install and use. For example, I can configure the energy manager to switch on my dishwasher **when electricity is cheapest** – that is, at a time when a lot of electricity is being generated (through wind turbines and solar power, for example). **This helps the environment and saves money at the same time.** Electricity produced by my own generation equipment (such as solar cells or a combined heat and power unit) is sold as my household electricity. If I have electricity storage units (such as storage batteries or an electric car), it stores energy at times when electricity is particularly cheap or when I am producing a surplus. The energy from these storage units is used with priority when electricity gets more expensive. This enables me to **reduce** my **enermgy costs significantly.**

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario; Germany (DE) n=300

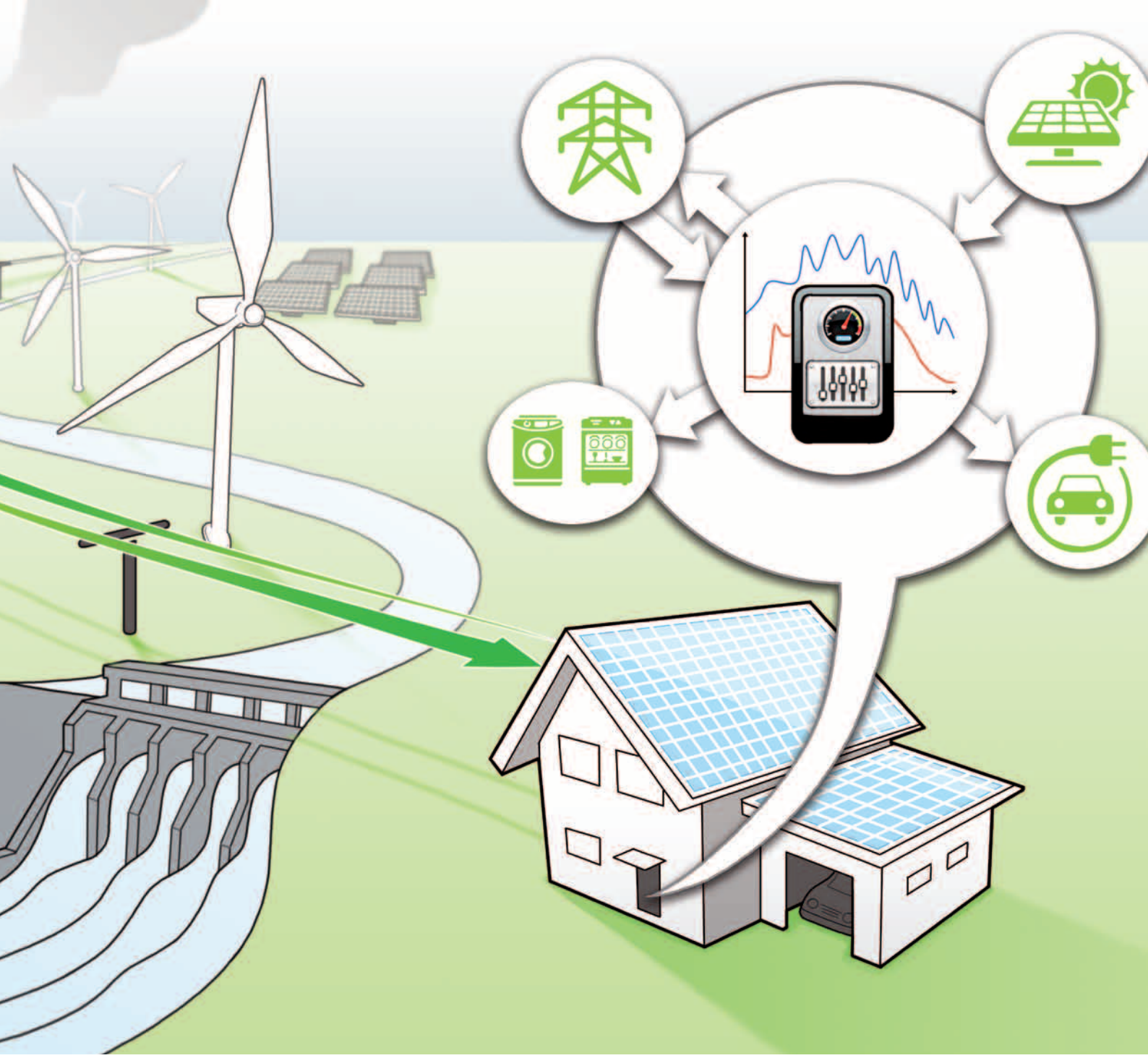


FIG. 52: Visualization of »the automatic energy manager«

"In Germany, household appliances (e. g., washing machines) will be integrated in smart supply networks (smart grids) by 2024 at the latest, which will control them in an energy-efficient way."

(Result from the second phase of the study, thesis 118)

“End customers now have the option of minimizing their energy costs by adapting their consumption or generation behavior to the price development.”

Dimension

The shortage of conventional fuels (oil, coal, etc.) and the expansion of renewable energies pose new challenges for the energy industry. In the future, this will mean that the electricity supply fluctuates according to the weather, which will impact on energy prices. This will result in new rate plans with variable prices for energy consumption. In terms of energy generation, offers such as photovoltaic systems, combined heat and power (CHP) plants and energy storage will help in the future to balance out energy supply and demand.

End customers now have the option of minimizing their energy costs by adapting their consumption or generation behavior to the price development. For instance, they can delay a laundry cycle until a time interval when prices are cheaper, or adjust their heating consumption such that the CHP energy can be fed in at a high price. To do this, however, the end customer needs to bear in mind a lot of information: weather forecasts, energy prices, but also technical details and the consumption figures of the appliances to be used.

This is where the automatic energy manager comes in, providing convenient, efficient support. It is a software product that is linked with the electronic devices and electrical appliances, as well as with energy storage units (e. g., electric car) and controls the complete electrical energy use, drawing on all kinds of internal and external sources of information. For example the energy manager can analyze and prepare all information about consumption and generation and give recommendations for action. The information can be retrieved and displayed via a wide range of terminal equipment, such as smartphones or tablet computers.

Autonomous systems and standards are the key.
The energy manager is an information system that controls smart devices via in-house communication (smart home) and can read smart meters and sensors, (e. g., for temperature). This requires standardized communication protocols (e. g., BACnet), plug and play mechanisms, and control algorithms. Standards (e. g., IEC standards) are especially crucial if the energy manager also acts as a gateway for network operators or external energy service providers to retrieve consumption and generation.

The energy manager is an autonomous system that makes automated decisions and uses artificial intelligence processes, such as rule-based systems, constraint-satisfaction problems, or diagnostic methods. These processes operate on the basis of logical, physical and chemical models and with parameters such as device properties, (thermal) load profiles, user preferences and consumption habits. These models are supplied with information from a wide range of sources (sensors, external services, etc.) or from learning processes.

Services provided via a web portal can be used to easily furnish the energy manager with improved or new functions and detailed information. Service portals and flexible software architecture play an important role here from a technical perspective. Because personal data are recorded, processed and communicated, encryption and data privacy are also crucially important issues.

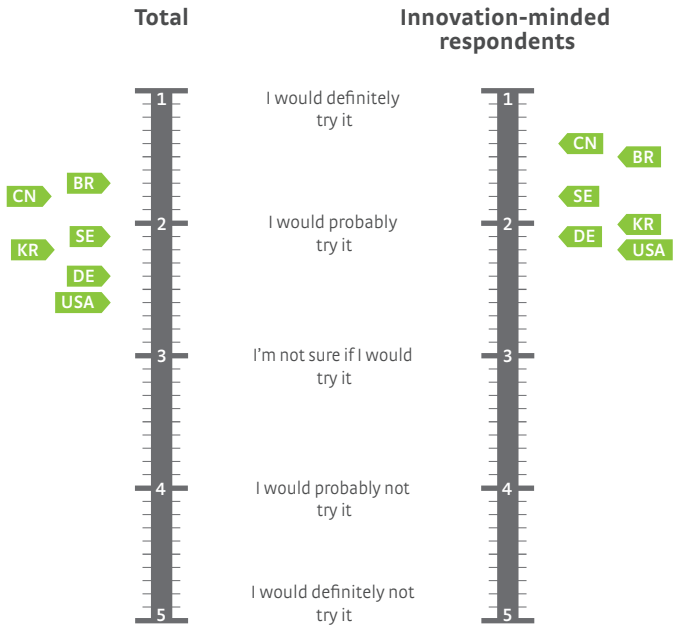
Description

Compared with other countries, German respondents tended to view the scenario critically.
In Germany, only around a quarter of people surveyed would definitely try the automatic energy manager; compared with one in two in Brazil (23 percent and 49 percent respectively). This picture of the future is generally rated very positively by Brazilians, with an average value of 1.7, closely followed by China with an average value of 1.8 (see FIG. 53). Respondents in Germany and the United States expressed much more negative attitudes (average values 2.4 and 2.6). One third of German respondents would probably try out this scenario (35 percent). By contrast, however, 21 percent are not sure if they would try it at all; in the USA this figure is as high as 28 percent of people surveyed. Even innovation-minded German respondents give an average value of just 2.1. By comparison, innovation-minded Chinese respondents were much more likely to think about a trial, with a value of 1.4.

All respondents were asked to mark text in the description of the automatic energy manager that they liked or that they would tend to view critically.

Germans primarily rated positively the option of reducing energy costs while at the same time protecting the environment.
The Germans marked as positive that the scenario *"monitors"* my energy budget and optimizes the use of *"my energy generators,"* because *"this helps the environment and saves money at the same time"* (at least 21 to 30 percent; see FIG. 51). In addition, this makes it possible to *"keep energy costs as low as possible,"* which helps *"to reduce energy costs"* (at least 21 to 40 percent). By contrast, the Germans viewed critically the fact that the automatic energy manager is a *"software product that is linked with all of my electronic devices and electrical appliances"* (21 to 30 percent). 21 to 30 percent of the Germans also viewed negatively the fact that the energy manager *"controls my complete electrical energy use."* Possibly respondents fear that using the automatic energy manager will mean they no longer have any control over their own energy use.

FIG. 53: What respondents think about a trial with »the automatic energy manager.«
"How likely is it that you would try out this scenario?"



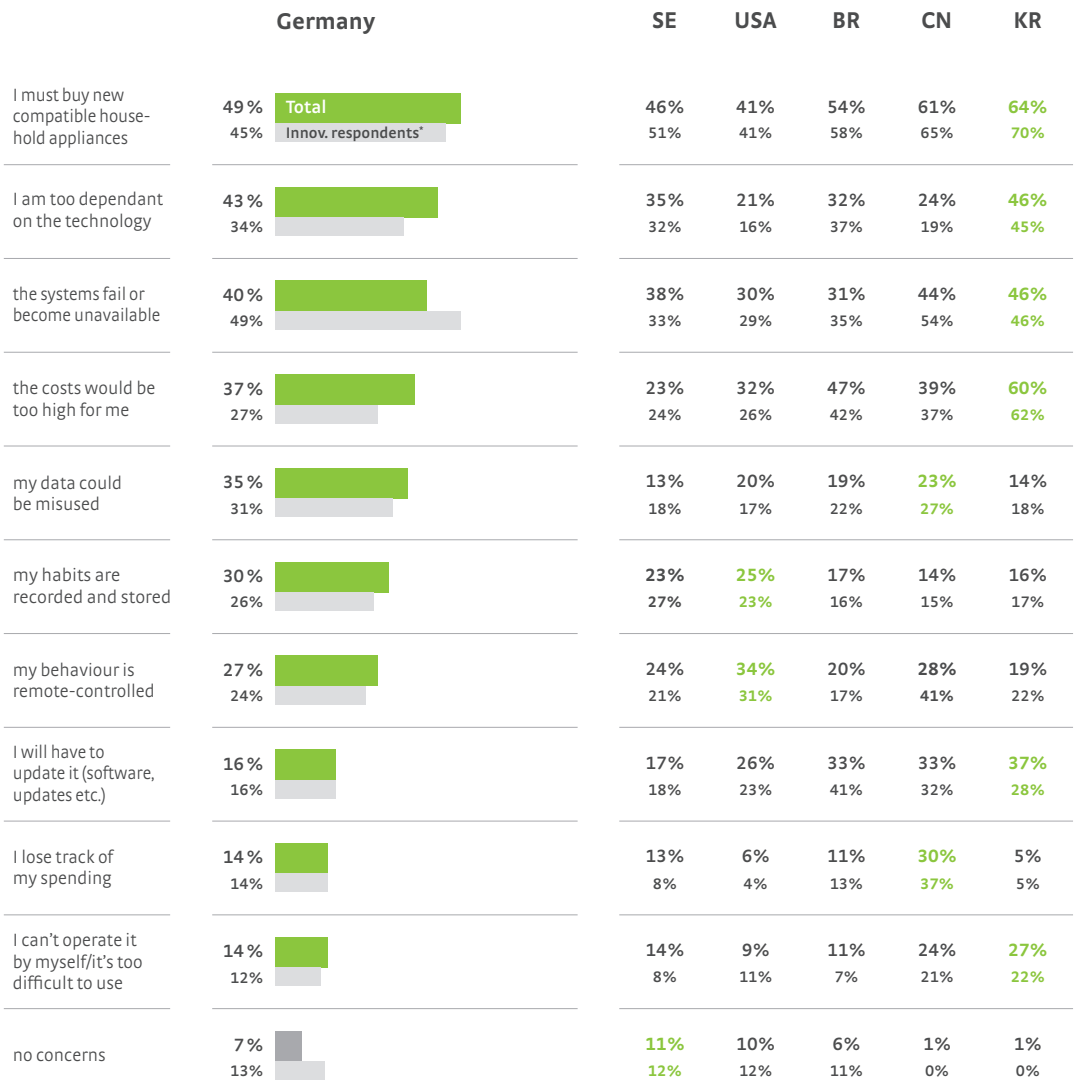
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=300, Sweden (SE) n=302, USA (USA) n=301, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=86, Sweden (SE) n=95, USA (USA) n=91, Brazil (BR) n=83, China (CN) n=76, Korea (KR) n=98

FIG. 54: Respondents' concerns about »the automatic energy manager«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=300, Sweden (SE) n=302, USA (USA) n=301, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=86, Sweden (SE) n=95, USA (USA) n=91, Brazil (BR) n=83, China (CN) n=76, Korea (KR) n=98

In all countries, the most widespread concern among respondents is that they will have to buy new compatible household appliances.

In Germany, 49 percent are concerned about this; in Korea, China and Brazil this figure is even higher (64 percent, 61 percent and 54 percent; see FIG. 54). It is interesting that the results for innovation-minded respondents differ little from those for all respondents and, in Korea, for example, this fear is even more widespread among the innovation-minded, at 70 percent. The second greatest concern among the Germans is possibly becoming much too dependent on the technology (43 percent). In Korea almost as many as one in two are concerned about this, while in the USA, only one in five expressed such a fear (46 percent and 21 percent respectively). Likewise, 46 percent of Koreans fear that equipment could break down or become unavailable; 40 percent of Germans also specified this concern. Among innovation-minded Germans, as many as 49 percent share this concern. The second greatest concern among the Koreans is that the costs would potentially be too high (60 percent); a concern shared by only 23 percent of Swedes. Another important consideration, that data could be misused, was checked by 35 percent of the Germans, while this concern was only stated by 13 percent in Sweden and 14 percent in Korea. Accordingly, it is hardly

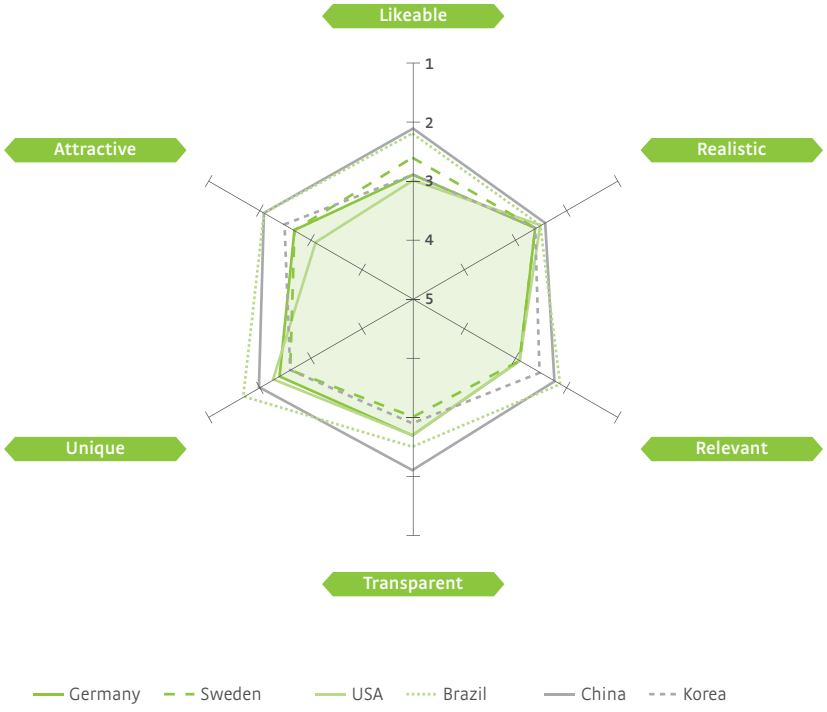
surprising that, compared to other countries, Germany is most concerned that their habits could be recorded and stored (30 percent), while in China this is feared by only half as many (14 percent). However, the Chinese are all the more worried that their behavior could be controlled from afar (28 percent). The Brazilians and Koreans are somewhat more relaxed about this problem (20 percent and 19 percent), while in the USA, 34 percent named it as a concern.

In an international comparison likeability levels for the automatic energy manager vary greatly.

In China and Brazil, the respondents liked the scenario quite a lot, with average values of 2.1 and 2.2, whereas respondents in the USA, Germany and Korea tended to view the whole thing rather critically (average values 3.0, 2.9 and 2.9 respectively; see FIG. 55). Respondents from all countries gave the scenario similar ratings for being realistic, with average values only ranging between 2.4 (China) and 2.6 (Germany, Sweden and Korea). Brazil and China also gave the best average values with regard to the relevance of the scenario (2.1 and 2.2 respectively), whereas the Germans, Swedes and Americans only rated the automatic energy manager as somewhat relevant, each giving an average value of 2.9.

FIG. 55: Ratings for individual aspects of »the automatic energy manager«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



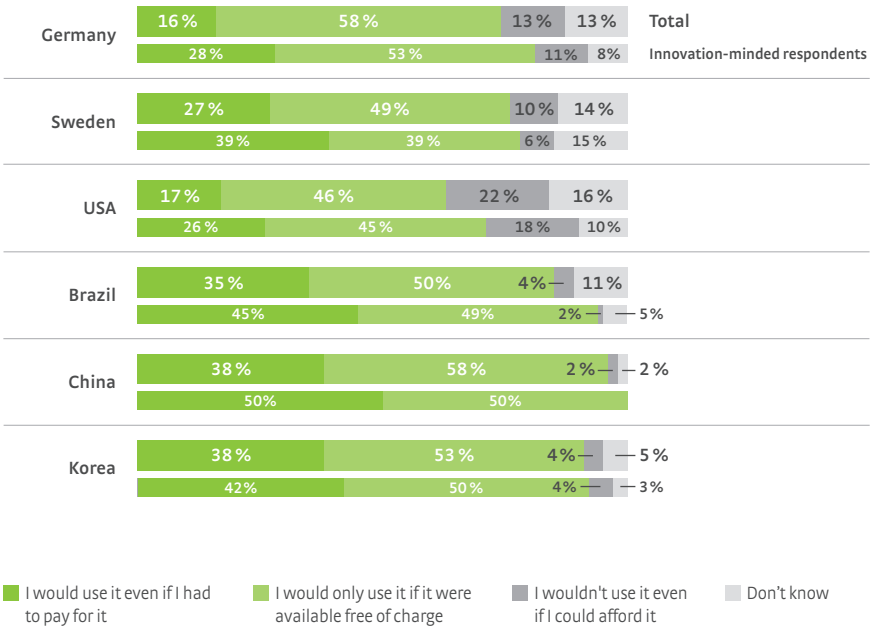
	DE	SE	USA	BR	CN	KR
Likeable	2.9	2.6	3.0	2.2	2.1	2.9
Realistic	2.6	2.6	2.5	2.5	2.4	2.6
Relevant	2.9	2.9	2.9	2.1	2.2	2.5
Transparent	2.7	3.0	2.7	2.5	2.1	2.9
Unique	2.4	2.6	2.3	1.7	2.0	2.6
Attractive	2.7	2.7	3.1	2.1	2.1	2.5

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=300, Sweden (SE) n=302, USA (USA) n=301, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302

FIG. 56: Willingness to pay for »the automatic energy manager«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=300, Sweden (SE) n=302, USA (USA) n=301, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=86, Sweden (SE) n=95, USA (USA) n=91, Brazil (BR) n=83, China (CN) n=76, Korea (KR) n=98

This picture of the future was mainly found to be very new and unique in Brazil (average value of 1.7), whereas the Swedes and Koreans found it to be merely somewhat new and unique (both giving an average value of 2.6). The described scenarios were found to be most attractive in Brazil and China with a value of 2.1, while the USA brought up the rear with an average value of 3.1. However, respondents in Germany and Sweden also find the scenario to be not very attractive compared with other countries (both giving an average value of 2.7).

More than half of Germans would only use the scenario if it was provided free of charge (58 percent, see FIG. 56).

Just 16 percent of Germans say they would be prepared to pay to use the automatic energy manager, compared with as many as 38 percent of respondents in Korea and China. In the USA, by contrast, only 17 percent are prepared to pay, while 35 percent of Brazilians would pay to use the energy manager. As is to be expected, the percentage of innovation-minded respondents who would pay for the automatic energy manager is higher in all countries: in China as many as half of the innovation-minded respondents would pay for it.

Willingness to use the energy manager is much higher if it is provided free of charge. Around half of all respondents would only use it if it was free; this group is largest in Germany and China at 58 percent. In general, it can be said that willingness to pay and general willingness to use the scenario is lowest in Germany and the USA: in the USA, 22 percent of all respondents say they would not use the energy manager even if they could afford it. In Germany, 13 percent expressed this view.

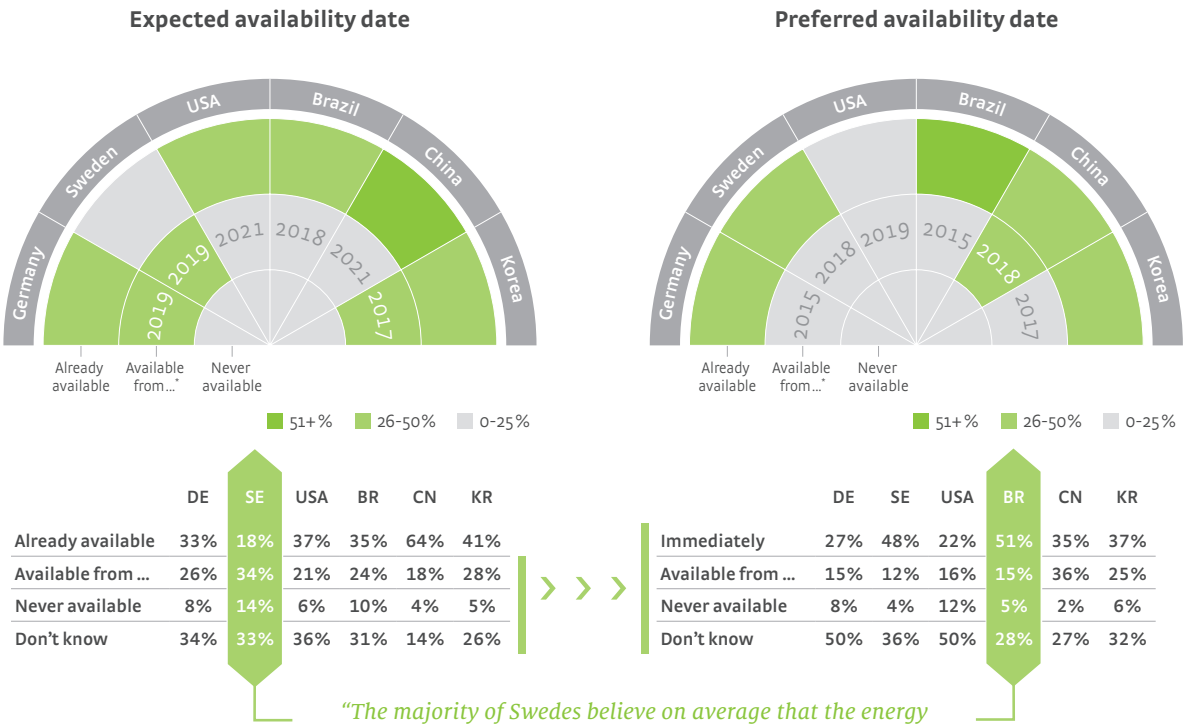
The majority of respondents say that the automatic energy manager is already available (see FIG. 57)**.**

With the exception of Sweden, the most given answer for all countries is that the scenario is already available; in China, the majority (64 percent) think that this is the case, in Germany it's still 33 percent. In Sweden, however, 34 percent of all respondents believe that the scenario will not be available until coming years – on average in 2019. Furthermore, a whole 14 percent of Swedish respondents believe it will never be available to the majority.

All respondents who believe the automatic energy manager is not yet available this year were additionally asked when they would wish it to become available. With the exception of the USA, a large number of respondents in all countries gave the answer "immediately." In both Brazil and Sweden, half the respondents said that the scenario should become available immediately (51 percent and 48 percent respectively).

FIG. 57: Expected availability date for »the automatic energy manager« vs. preferred availability date for »the automatic energy manager«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	33%	18%	37%	35%	64%	41%
Available from ...	26%	34%	21%	24%	18%	28%
Never available	8%	14%	6%	10%	4%	5%
Don't know	34%	33%	36%	31%	14%	26%

	DE	SE	USA	BR	CN	KR
Immediately	27%	48%	22%	51%	35%	37%
Available from ...	15%	12%	16%	15%	36%	25%
Never available	8%	4%	12%	5%	2%	6%
Don't know	50%	36%	50%	28%	27%	32%

"The majority of Swedes believe on average that the energy manager will not become available until 2019 – the majority of Brazilians would like it to become available immediately."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=300, Sweden (SE) n=302, USA (USA) n=301, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302;
Preferred availability date: Germany (DE) n=200, Sweden (SE) n=246, USA (USA) n=198, Brazil (BR) n=198, China (CN) n=113, Korea (KR) n=183

“Environmental awareness and personal contribution to the evolution to cleaner energy sources are important elements in marketing and disseminating the service.”

Interpretation

Reduce costs – protect the environment.
Reducing costs is a very strong motivation for private persons to use new technologies. This is also clear in the scenario of the automatic energy manager: 31 to 40 percent of German respondents highlighted *“reducing energy costs”* as positive. The importance of costs also figures highly among the concerns in the survey (see FIG. 51 and 54): fears of having to buy new (expensive) household appliances or that costs will become too high due to the automatic energy manager are very prevalent. At the same time, other topics such as complicated operation tend to raise minimal concern in this scenario.

Thus the willingness to become active and, e.g., change electricity supplier or use the smart energy manager depend hugely on the actual savings potential. For the future, experts expect rising electricity prices that also vary according to the offer. How high they will actually be, especially how wide ranging the variable rates and how large the resulting savings potential, cannot be precisely predicted at present. However, as the results show, the savings potential is crucial for the willingness of users to try out the energy manager and, if necessary, to spend money on additional appliances and software or services.

Even though energy costs will be one of the main drivers, environmental awareness and personal contribution to the evolution to cleaner energy sources are important elements that should be used for clever marketing and dissemination of the service. At least 21 percent of Germans noted *“helps the environment”* in the scenario as positive (see FIG. 51). The fact that the personal attitude to this topic must not be underestimated, can be seen, for example, in the pronounced enthusiasm for sorting trash in Germany. If the automatic energy manager were to be linked to municipal plans for regenerative energy supply and active citizen participation were offered, this could substantially improve acceptance, at least in Germany.

Energy manager: I’m already familiar with it.
At first glance, it appears strange that there is widespread belief that an automatic energy manager is already available (see FIG. 57). It seems likely that technologies already in use today, e.g., control by automatic timer and motion sensors or automatic temperature regulation, might be seen by respondents as energy managers. Thus advertising suggests smart appliances are already available and usable today. This could also explain why the energy manager scenario is rated as not particularly novel in several countries. As such, the marketing must make it clear that the opportunities and possibilities of the “real” energy manager will only become effective in future markets with highly variable rates.

Who has the say?
There are also barriers to reducing costs - an important driver for the use of an energy manager. High energy prices alone will not allow the cost of the energy manager to be recouped. Instead, the key issue is the price spread, i.e., the difference between cheap and expensive times, in order to reduce costs by shifting loads. This calls for variable rates and a corresponding technical infrastructure. In Germany, however, such solutions have yet to be introduced.

Concerns about the need to buy new appliances – held by up to 49 percent of Germans and as many as 64 percent of Koreans (see FIG. 54) – can be counteracted with technical concepts that furnish conventional household appliances with minimal energy manager functions, e. g., using low-cost plug adapters. But offers of low-cost loans for the purchase of new appliances are also an option as financial incentives, or even a kind of scrapping premium, as occasionally already offered by local authorities in Germany for switching to energy-efficient appliances. In addition, users should be shown clearly and in an easily comprehensible way how they will recoup the necessary investments through the savings they will make. Such cost calculations are certainly communicable, as can be seen from the widespread use of solar roofs in Germany.

The survey uncovered a generally critical view of the fact that the automatic energy manager controls energy use independently. Presumably, the respondents have the feeling that this means the user's will is ignored. 21 to 30 percent of Germans rated the text *"controls my complete electrical energy use"* as negative (see FIG. 51). The consequence must be that users are given a simple solution for understanding the decisions of the energy manager and, if desired, to override them. In this way, the user can take over control at any time. For this purpose, the energy manager requires a simple, clearly set out user interface for operation and information, e. g., on current savings. It is also important for the acceptance of the energy manager that, at all events, the normal electricity supply continues if the energy manager fails.

In Germany in particular, the energy manager is also seen as sensitive in the context of data protection and privacy (see FIG. 54). More than a third of the German respondents (35 percent) fear that their data could be misused, another 30 percent are concerned that their habits could be recorded, stored and presumably then also analyzed without their permission. It is therefore necessary to proactively address fears about insufficient data protection and a lack of privacy, which can likely only be dispelled with proven secure technical solutions in conjunction with absolute information transparency. The high degree of sensitivity in Germany to the issue of data protection and data security hinders discussions and slows down change processes. Nevertheless, the strong protection of individual rights to privacy in Germany is a value that ought not to be sacrificed, but rather can serve as a model for other countries.

Is there a psychological strain?

In a comparison of countries, it is clear that dependence on a technical solution is more keenly felt in Germany (43 percent) and Korea (46 percent) than, for example in China (24 percent) or the USA (21 percent). This is probably a question of basic attitude toward technology. It is also revealed in the fundamental skepticism of the Germans (40 percent) as well as the Koreans (46 percent; see FIG. 54), about whether the systems are actually failsafe. This means there is a need for politics and society to take positive action to quell these concerns, because the impending evolution of the energy markets will bring with it a great deal of technical change on the ground. It is worth noting that respondents are comparatively unwilling to pay to use an energy manager service: together with the USA, Germany gave the lowest score in this regard (see FIG. 56). On the other hand, the Germans were less concerned about having to buy new appliances than respondents from countries with lower disposable incomes in some cases. The limited willingness to pay may be due to the fact that electricity costs are currently comparatively moderate and could change if the savings attainable were high.

My contribution to an energy turnaround.

Although the wish to reduce costs quite clearly dominates, a "green" conscience and, especially in Germany, a personal contribution to an energy turnaround constitute a social aspect worth exploiting in this area. Precursors to the energy manager, e.g., an energy price portal could be very helpful for the social acceptance of the changes related to an energy turnaround. It can be seen from various citizens' projects currently run by local authorities on local regenerative energy use that the willingness of citizens to engage with changes rises immensely if they are actively involved. This includes current information and transparency. The later switch to an increasingly automatic system then becomes a voluntary step. Gradual migration in this way would instantly remove any fear of users about the technology making incomprehensible decisions.

Energy turnaround – an export hit.

The switch to renewable energies is only commercially viable if smart grids allow a better balance between supply and demand, thereby allowing optimized use of the existing grid infrastructure. Expanding the electricity grid based on peak loads is not financially feasible. The energy manager, whether fully automatic or initially partly manual, is an important tool for adapting consumption to the supply and indirectly controls the load through savings incentives. In particular if electromobility becomes popular, electricity volumes used by consumers will rise sharply. At the latest then, it will become necessary to directly or indirectly control consumer behavior in order to ensure network stability and make good use of available electricity volumes. With its phase-out of nuclear power, Germany is positioning itself as a pioneer in the new energy world and can expect good export opportunities for "green" technologies as a result. The energy manager can make a major contribution. However, if it is to be commercially viable, the technology development must be accompanied by standardization and bureaucratic and regulatory hurdles must be further dismantled.

What is to be the role of politics, business, science and society?

For many citizens, electricity as a product is not transparent. At present, electricity comes in top quality from the socket and is always available in Germany. Presumably, the majority of respondents are aware that the energy turnaround and the related use of renewable energies will impact on this situation. It is likely, however, that the actual problems entailed in the integration of a fluctuating supply and which the energy manager, among other things, is to resolve, are currently largely unknown to citizens, and are thus also incomprehensible. As such, respondents' concerns in all countries are instead focused on additional costs for new

"The movement toward using renewable sources such as sun and wind supports the global trend of greater energy self-sufficiency."

appliances, dependence on technology, or unreliability of the technology (see FIG. 54). It is the responsibility of politics and society to give a face to the product electricity and its finite nature and to make clear the need for an actual evolution to cleaner energy sources and what the technical social and political consequences of such an evolution will be.

For acceptance, it is crucial that municipal plans are promoted with the close involvement of citizens. "People's wind turbine" and "community power plants" are key phrases in the current discussion. It is not about complete energy autonomy for a community, but rather greater independence, local energy generation, local balancing and local, transparent rate setting.

In the future, without measures such as the automatic energy manager, it would only be possible to continue guaranteeing reliable provision through expensive network expansion, which in rural areas is often unprofitable and difficult to carry out. This context must be made clear through politics and appropriately communicated to citizens. Accordingly, model regions that promote regional interests and can act as role models for other communities should be supported and promoted by public relations activities.

Summary and recommendations.

In order to ensure in the future a regenerative electricity supply with the same degree of reliability enjoyed today, a number of changes still need to be made. The fully automatic energy manager is one element of this. However, it requires a whole chain of infrastructural measures, and thus comes not at the start, but at the end of the energy turnaround. It is therefore important that migration concepts are put in place that provide people with intensive information on how to make the most of variable rates and allow initial appliances to be integrated into the concept using cost-effective upgrades (e. g., plug adapters).

Germany must succeed in positioning itself as a pioneer. But, as the experience of the last few years has shown, the necessary infrastructure work gets more and more difficult to carry out. It is therefore essential to actively involve citizens in the changes. Testing of variable rates, e. g., in the e-energy model regions in Germany, shows that, as a first step, providing users with clear, up-to-date information about the energy price and the price forecast, e. g., via a portal, can arouse interest and enthusiasm. Gradual introduction through an initially manual solution "cost saving as a game" is therefore conceivable, especially in Germany.

The standardization of solutions and especially interfaces must continue to be promoted. The regulatory framework should also be revised for the implementation of concepts such as "Microgrid" or virtual power stations. Intensive technical development, and above all public relations activities must be dedicated to data protection.

The movement toward using renewable sources such as sun and wind supports the global trend of greater energy self-sufficiency. It also opens up prospects for less developed regions: on the one hand, they can sell energy as a raw material and thereby become somewhat less dependent. On the other, as a result of the availability of energy, other modern infrastructures, from water supply through to the Internet, can follow suit. Energy provides a fertile breeding ground for further-reaching changes and potential improvements.

The healthcare assistant.

FIG. 58: Evaluation of individual aspects of »the healthcare assistant«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

21-30%

When I grow old or become less mobile, I still want to **be able to live in the familiarity and comfort of my own home for as long as I can** despite my health problems.

31-40%
of people surveyed marked this.

The new healthcare assistant can help: a small, mobile robot that can look after me around the clock. My new healthcare assistant has everything **I need, such as meals, drinks, my medicines** or a **trash can.** It **regularly** brings me cold and warm **meals** (**pre-prepared meals**, that it warms up for me) and **reminds me to drink enough liquids.**

Every few days, my healthcare assistant is checked by a service that clears out trash and out-of-date food and medicine and restocks it in accordance with my preferences. If supplies of certain foods run low, it orders them for me automatically on the Internet. My **doctor also updates his instructions over the Internet,** enabling my healthcare assistant to **order (and replenish) my medicines automatically and have them delivered.** Of course, it also makes sure I get the right dosages at the right times, and records all the medicines I take. The healthcare assistant **plugs itself into a power socket automatically to recharge** its batteries.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=305

"'Round-the-clock' care of individuals (senior citizens, patients) in their own home by means of ICT systems will be the medical healthcare standard in Germany by 2024 at the latest."

(Result from the second phase of the study, thesis 126)

FIG. 59: Visualization of »the healthcare assistant«

“The healthcare assistant helps people to keep their independence for longer.”

Dimension

Healthcare assistant allows individuals to stay in their own homes.
The healthcare assistant helps individuals who are finding it increasingly difficult to cope with everyday life at home to keep their independence for longer.

It works from the everyday needs of an individual. The important thing is to ensure that these needs are met, and not necessarily that everything continues in exactly the same way as before.

This can be illustrated, for instance, with eating and drinking. It is important that individuals have enough to drink, and that they like the drinks – not that they are first prepared by someone in the kitchen.

The components used are tried and tested and cost-effective.
The healthcare assistant rigorously follows this approach: it is good if it is high-quality and easy to use, and if it helps the person through the day cost-effectively and reliably.

Drinks are freshly prepared, the water reserve is kept cool for one to two days, fresher than it would be from the faucet. Food is pre-cooked, e. g., in a hotel kitchen and kept cool in the healthcare assistant until it is prepared. The food and drink offered are therefore of high quality, but easily prepared and handled.

The food and drinks required for one or two days are kept cool in the healthcare assistant in containers made for the system. The handling technology of the healthcare assistant is very simple because only known objects are moved to and fro between known places. This means it can move cups, plates or cutlery around very reliably. To serve up, the healthcare assistant places food or drinks on its rotating tray, which it then swivels toward the user. After use, it clears away everything from the table. The rubbish is disposed of by means of a slider, which is also very simple.

Most people who want to use this assistant are likely to be in need of care. The assistant is then used under the supervision of the carer who comes to the home daily.

This carer also prepares the medicines. They are then offered by the healthcare assistant at the right time of the morning, midday or evening, before or after the meal, in a portion cup, if necessary with liquid. The healthcare assistant is completely reliable in this regard, and all its actions can be saved and traced.

All its activities are monitored through sensors in the system, which records a full picture of the user and their movements and activities. This allows the healthcare assistant to effectively interact with the user, e. g., to raise the alarm if the person should fall or become suddenly motionless. It shows its notifications on a display, which can also serve as a video telephone.

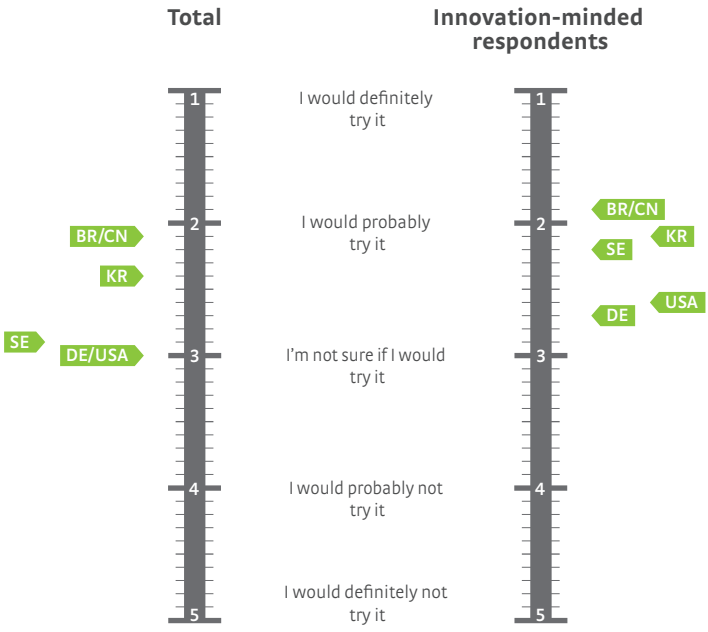
Description

Germany and the USA tend to be less open to the healthcare assistant.
Both German and U.S. respondents gave an average value of 3.0, saying that they were not sure if they would try out the healthcare assistant (see FIG. 60). In these countries, just 14 percent of respondents said they would definitely want to try out the scenario, compared with 37 percent in Brazil. This can also clearly be seen in the average value of 2.1, which puts Brazil (together with China) at the top of the country ranking on this question.

Contrary to expectations, innovation-minded respondents show little willingness to try it out. In Brazil and China, the average value for innovation-minded respondents was just 0.2 points more positive in regard to a trial, in Germany just 0.3 points. In Sweden, by contrast, the difference between all respondents and the innovation-minded is substantial (average value for all respondents: 2.9, average value for innovation-minded respondents: 2.2): unlike the more uncertain group of all respondents, the innovation-minded in Sweden would probably try out the healthcare assistant.

The respondents were asked to mark text for each scenario that they particularly liked or would view critically.

FIG. 60: What respondents think about a trial with »the healthcare assistant.«
"How likely is it that you would try out this scenario?"



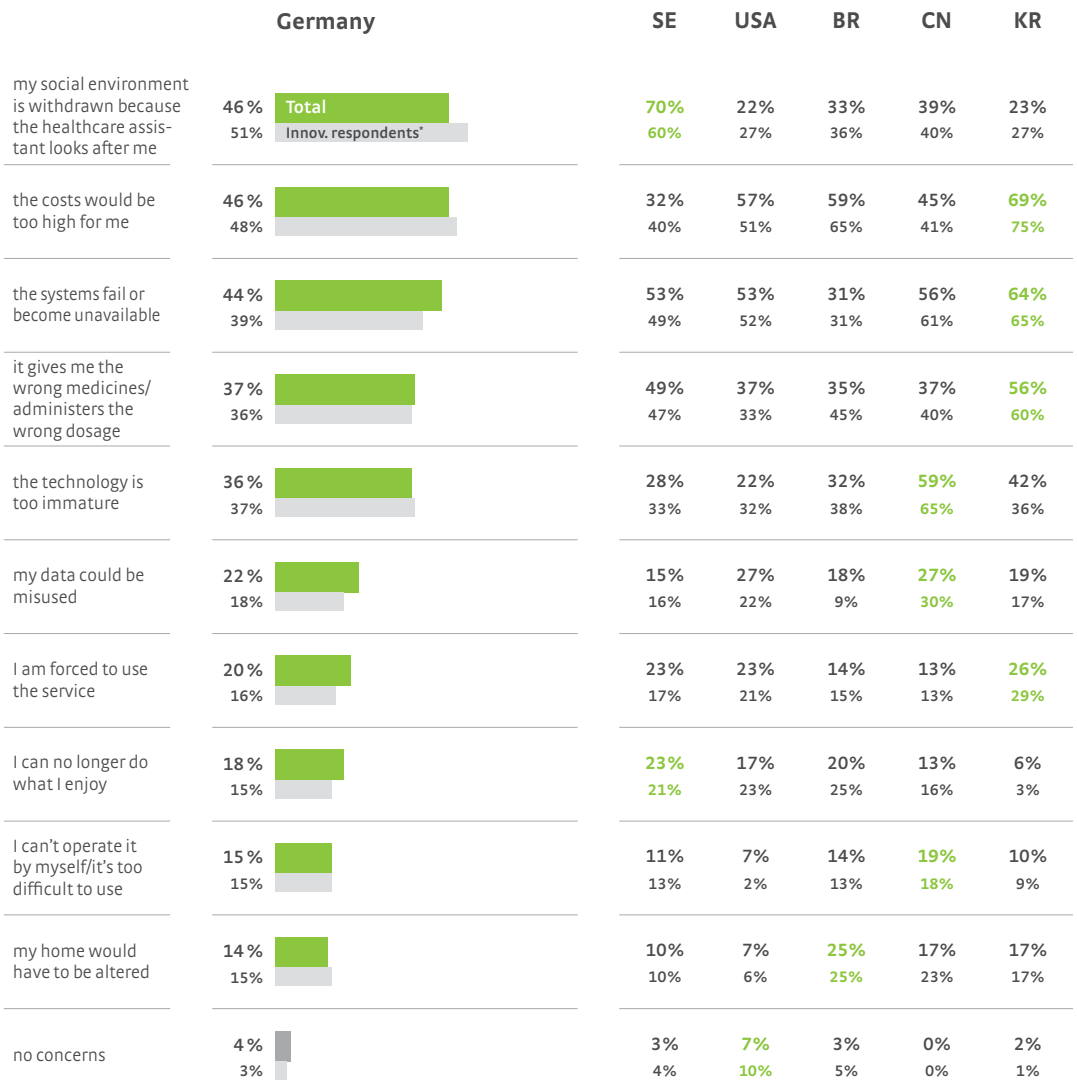
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=305, Sweden (SE) n=304, USA (USA) n=305, Brazil (BR) n=302, China (CN) n=303, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=89, Sweden (SE) n=88, USA (USA) n=99, Brazil (BR) n=95, China (CN) n=99, Korea (KR) n=92

FIG. 61: Respondents' concerns about »the healthcare assistant«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=305, Sweden (SE) n=304, USA (USA) n=305, Brazil (BR) n=302, China (CN) n=303, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=89, Sweden (SE) n=88, USA (USA) n=99, Brazil (BR) n=95, China (CN) n=99, Korea (KR) n=92

It is noticeable that the Germany respondents marked many aspects of the healthcare assistant as positive.

Parts of the passage *"to be able to live in the familiarity and comfort of my own home for as long as I can"* were highlighted by up to 40 percent of the Germans – thus the core benefit of the scenario is viewed positively by a large number of respondents (see FIG. 58). But the main service of the healthcare assistant was also highlighted, i. e., that the assistant has a lot that *"I need, such as meals, drinks, my medicines [or a] trash can"* and thus provides *"regular [cold and warm] meals"* and *"reminds me to drink enough liquids"* (all 21 to 30 percent). The German respondents also liked the fact that the healthcare assistant *"plugs itself into a power socket automatically"* to recharge (21 to 30 percent) and that the doctor can update his instructions over the Internet – which puts the assistant in a position to give the right doses of medicines and to replenish them if necessary. Interestingly, just as many respondents rated the latter aspect critically. 21 to 30 percent of the Germans marked critically the updating over the Internet, but also the ordering and replenishing of medicines automatically and having them delivered. *"Pre-prepared meals"* were also marked as negative by 21 to

30 percent of all the people surveyed about this scenario – an aspect that could clearly be improved on.

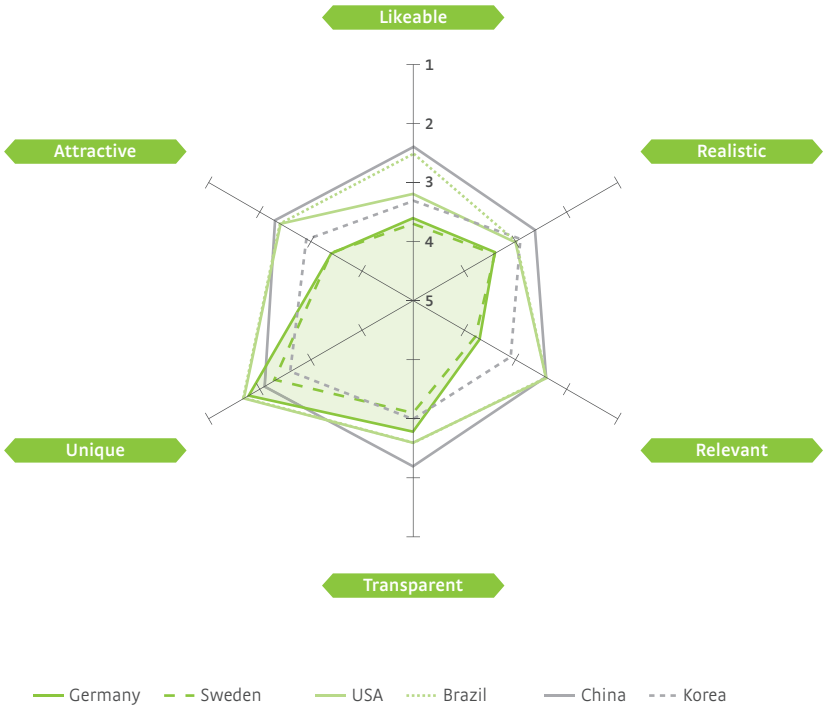
The greatest concern in Germany is the withdrawal of the social environment.

Understandably, many respondents are concerned that their social environment could withdraw if they had a healthcare assistant; 46 percent of Germans indicate this (see FIG. 61). Interestingly, the prevalence of this concern varies widely from country to country. While in the USA only one in five shares this fear (22 percent), in Sweden it is as many as 70 percent. There is already an important finding here, that sensibilities on this issue vary widely internationally and, to ensure success, these sensibilities should be specifically addressed accordingly. Concern about costs is also widespread in Germany, with 46 percent of respondents naming it. In Korea this is actually the main concern (69 percent).

For this scenario in particular, a reliable working of the technology is important. This is also reflected in the respondents answers: 44 percent of Germans indicated a concern that it could break down; in Sweden and the USA it is 53 percent; in Korea it is as many as 64 percent. A related concern is that the technology could be too immature; however, this is not quite so widespread in Germany, where this aspect was only checked by 36 percent of respondents. In China, by contrast, 59 percent of respondents are concerned that the technology may be too immature to take over the described services for people in need of care.

FIG. 62: Ratings for individual aspects of »the healthcare assistant«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



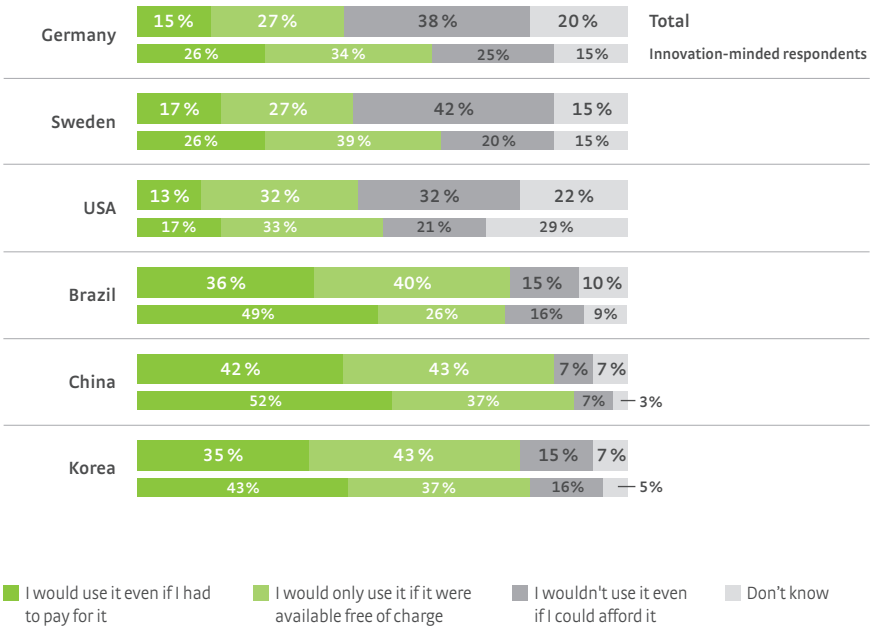
	DE	SE	USA	BR	CN	KR
Likeable	3.6	3.7	3.2	2.5	2.3	3.3
Realistic	3.4	3.4	3.1	3.0	2.6	2.9
Relevant	3.7	3.8	3.6	2.4	2.4	3.1
Transparent	2.8	3.1	2.7	2.6	2.2	3.0
Unique	1.8	2.3	2.0	1.7	2.1	2.6
Attractive	3.4	3.4	3.1	2.4	2.3	2.9

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=305, Sweden (SE) n=304, USA (USA) n=305, Brazil (BR) n=302, China (CN) n=303, Korea (KR) n=302

FIG. 63: Willingness to pay for »the healthcare assistant«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=305, Sweden (SE) n=304, USA (USA) n=305, Brazil (BR) n=302, China (CN) n=303, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=89, Sweden (SE) n=88, USA (USA) n=99, Brazil (BR) n=95, China (CN) n=99, Korea (KR) n=92

In all countries, at least one in three fears that the healthcare assistant could give the person in need of care the wrong medicines or the wrong dosages (e. g., Germany, USA and China each 37 percent) – in Korea as many as 56 percent of respondents are concerned about this. Thus directly after the social aspect and the issue of cost, the reliability of the technology plays an important role for most respondents – communicating this to future users and their families seems to be one of the most important tasks for acceptance of the healthcare assistant in the home.

An international comparison reveals a wide range of ratings of the likeability of the healthcare assistant.

While the Chinese on average like the scenario very much (average value 2.3), it is only somewhat well received in Sweden (average value 3.7; see FIG. 62). The Germans also are less keen on the scenario (average value 3.6); just six percent of respondents say they find it an excellent idea to have a healthcare assistant at home. A similarly varied assessment is given to the relevance of the described future scenario. While the Brazilians and Chinese on average assess the assistant as very relevant (average value 2.4), respondents in the USA, Germany and Sweden find it to be less relevant (average value 3.6, 3.7 and 3.8 respectively).

Interestingly, the scenario is especially deemed to be very new and unique in Brazil and Germany (average value 1.7 and 1.8). Korea, however, finds it to be least new and unique (average value 2.6); the use of household robots is perhaps most widespread here today. Respondents from all countries on average find the description of a healthcare assistant to be somewhat realistic. The values for this vary from 2.6 (China) to 3.4 (Germany and Sweden).

Although the willingness to pay for the healthcare assistant differs substantially internationally, in every country at least one in eight is willing to pay for this service.

In China, 42 percent of respondents are prepared to pay for the healthcare assistant service, whereas in Germany it is just 15 percent, and in the USA only 13 percent (see FIG. 63). Even among the innovation-minded in the USA, no more than 17 percent would be prepared to pay to use the assistant; in Germany willingness to pay among this group is substantially higher, at 26 percent. Another key indicator for acceptance of the scenario is the willingness to at least use the described service if it is provided free of charge. Germany and Sweden recorded the lowest percentages overall here, with just 27 percent of respondents from

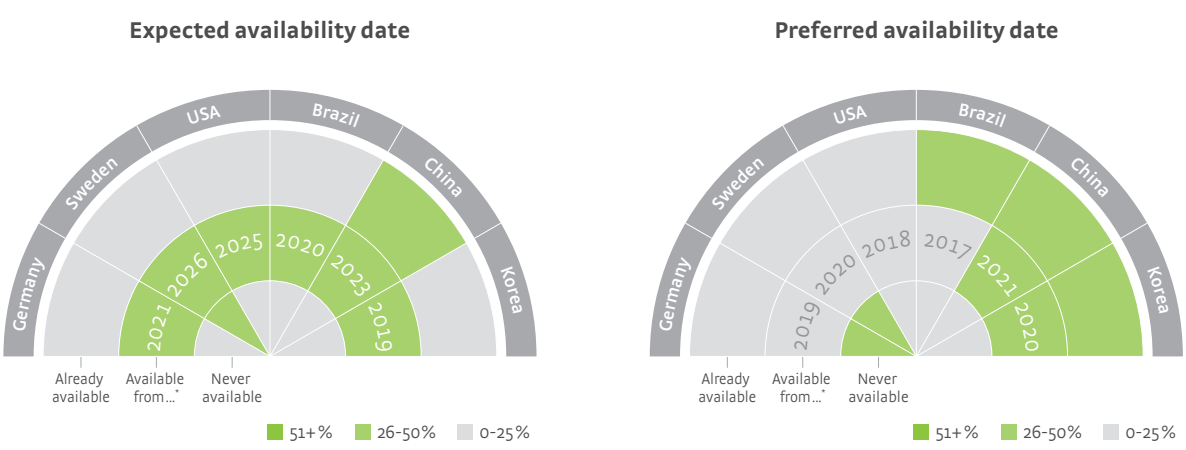
both countries ticking this box. This group is much larger in China and Korea at 43 percent. It is telling that in Germany and Sweden, the majority of respondents say they would not want to use the assistant even if they had enough money (38 and 42 percent, respectively). Among the innovation-minded in both countries, this group is substantially smaller (25 and 20 percent, respectively). In both these countries there still appears to be a high degree of skepticism on the issue of future healthcare at home with the assistance of household robots, which contrasts with significantly higher acceptance in comparable countries.

While almost all countries expect the healthcare assistant to only become available in the future, almost half of the Chinese say it is already available or will still become available in 2011.

47 percent of the Chinese think the assistant will be available by the end of the year at the latest (see FIG. 64). In Germany, by contrast, around one third (35 percent) think this will not be the case for several years yet, on average in 2021. In Sweden, the largest number of respondents even believe that the healthcare assistant will never be available to the majority of people (36 percent). While in Brazil, China, Korea and the USA the hope prevails that the scenario will be available as soon as possible, a large number of respondents in Sweden and Germany do not want the assistant to ever be available for the majority of people in their country; also many do not know when they would like the scenario to be available.

FIG. 64: Expected availability date for »the healthcare assistant« vs. preferred availability date for »the healthcare assistant«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	8%	6%	13%	23%	47%	21%
Available from ...	35%	32%	33%	28%	26%	40%
Never available	24%	36%	22%	19%	6%	11%
Don't know	33%	27%	32%	30%	21%	28%

	DE	SE	USA	BR	CN	KR
Immediately	22%	22%	24%	42%	36%	30%
Available from ...	12%	11%	15%	22%	36%	26%
Never available	28%	38%	22%	10%	3%	10%
Don't know	38%	29%	39%	25%	24%	35%

"47 percent of the Chinese are of the opinion that the healthcare assistant will be available for the majority of people in China by the end of the year at the latest – the majority hopes this will be the case."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=305, Sweden (SE) n=304, USA (USA) n=305, Brazil (BR) n=302, China (CN) n=303, Korea (KR) n=302;
Preferred availability date: Germany (DE) n=279, Sweden (SE) n=287, USA (USA) n=258, Brazil (BR) n=246, China (CN) n=163, Korea (KR) n=244

“It is feared that use of the healthcare assistant will reduce social contact for those in need of care.”

Interpretation

The healthcare assistant – support for supporters.
Thousands of people with mild cognitive impairment live alone at home in Germany. If they become unable to cope with everyday life, they are at risk. Household appliances are used incorrectly, spoiled food is eaten or not enough liquids are drunk. Carers can come to the house on a daily basis and put everything right for the moment. But they can’t stay, they have to move on – there are not enough carers at present. This is where the healthcare assistant can provide support: it stays and can do a great deal not only to help a person cope with everyday life, but also to make it pleasant. The healthcare assistant knows the date and time and brings structure to the day. It can prepare and serve food and drinks, clear away rubbish and its display serves as a video telephone. It offers medicines prepared by the carer at the right time.

The majority of support offered by the healthcare assistant is viewed positively by respondents. The prospect of being *“able to live in the familiarity and comfort of my own home”* seems to be especially attractive to 31 to 40 percent of respondents in Germany. However, surprisingly, the survey shows that citizens of high-tech countries such as Germany and the USA are still scarcely prepared to accept this kind of support, while acceptance is very much higher in Brazil and China (see FIG. 58 and FIG. 60). Presumably, there is an underlying fear among people in the high-tech countries of excessive mechanization, which also shows itself in skepticism about automated restocking (of medicines) over the Internet and the concern about whether a “machine” can dispense medicines correctly.

There is a large and receptive market.
A key finding of the survey is that there is a large and receptive market for the healthcare assistant, namely in China: 42 percent of people surveyed there are prepared to pay for the healthcare assistant service and another 43 percent would use it if it was provided free of charge. In light of the fact that traditional family relationships still dominate the culture of care in China, this openness to innovation is surprising. Furthermore, a large proportion of the Chinese (47 percent) are of the opinion that the healthcare assistant can already be built today.

In contrast, in Germany and Sweden the healthcare assistant is generally viewed with greater skepticism. Although the ageing of society is more advanced here overall and the lack of nursing staff is already evident, respondents in these countries were much less open. They also expect the assistant not to become available until a much later date (see FIG. 60 and 64).

People must be made aware of the supporting nature of the healthcare assistant.
“It is feared that use of the healthcare assistant will reduce social contact for those in need of care.” This barrier, which is particularly high in Sweden (70 percent) and Germany (46 percent), must be counteracted especially intensively before and during rollout. There is also a mistrust in the reliability of the technology – understandably so, given the sensitivity of its area of application. The survey shows that this fear is also widespread in Korea (64 percent; see FIG. 61). In connection with this, the concern *“[that] it would give me the wrong medicines”* is also the most common in Korea. With the exception of Sweden, around half or more of respondents in all other countries also have concerns about the costs. However, the intensity and weighting of this concern varies substantially around the world.

In light of the aging of societies around the world, it can now no longer be assumed that families will provide care. In addition, a lack of staff means that it is no longer possible to provide the required level of support and care at home without technical support. German respondents recognize the great advantage of the healthcare assistant for retaining autonomy at home (see FIG. 58). This basic openness to the main aspect of the assistant should form the basis for a comprehensive concept for “autonomous life at home in old age.” However, this requires the above-mentioned main barriers to be overcome.

Technologies available, lack of acceptance.

It appears that openness to innovative approaches depends less on the current state of the technology, and more on a country's rate of technological, political and social development. Without question, China is currently changing much faster and more profoundly than, for example, Germany. The Chinese are just discovering how new technologies can make everyday life easier. In Germany, by contrast, the majority of older people have long been familiar with the modern technological conveniences relevant for them (e.g., central heating, telephone and television). The Chinese and Korean respondents tend to be significantly more experimental and open overall than, for example, the German respondents (see FIG. 60). Thus the consistently large concerns about technical failure or malfunctioning must be taken seriously (see FIG. 61). This is where the educational work should come in. The messages associated with the healthcare assistant must therefore be that the basic technologies of the healthcare assistant are technically mature, safe and reliable, and that these components are now to be combined safely and reliably in the healthcare assistant, which will then provide valuable support to enable people to have an autonomous life at home for longer.

Fears about social relationships lead to a rejection of supporting technology.

The healthcare assistant helps people to cope with everyday life. This help in itself is certainly desired by respondents – 21 to 30 percent of respondents in Germany like the idea of having meals, drinks and medicines provided and rubbish disposed of. Nevertheless, the healthcare assistant is not popular. On the contrary, a significant proportion of Germans and Swedes (approximately one third), hope it never becomes available. This contradiction can be best explained by fears of a reduction in social contact. It is possible that many respondents think that using the healthcare assistant would give family members, friends and acquaintances who provide care the feeling that the care is no longer required or take it as an opportunity to reduce their own efforts. But it is also conceivable that people fear they will have less social contact if family members, friends and acquaintances are "frightened off" by the healthcare assistant and possible associations with, for example, medical apparatus. Great care must be taken when introducing the healthcare assistant to communicate that it does not replace people – doctors, carers, support staff, but also family and friends – but rather supports them.

The healthcare assistant is a realistic alternative to in-patient facilities.

The following view relates to Germany, but should be transferrable to other countries. The burden on nursing care insurance would be lightened by at least EUR 300 million a year if the good 40,000 outpatients in Care Level I could live at home for a year longer. For Alzheimer's patients, for example, the mild and moderate phases each last about three years. Adapted support from the healthcare assistant can make it entirely possible for such people to remain at home for several years. Thus the healthcare assistant could save billions. The costs are moderate. With the number of units that seems realistic given the market pull in China, a price in the lower four-digits should be possible for a piece of equipment that can easily last for five years. With monthly running costs at around a hundred euros, the net saving would be in the region of hundreds of millions of euros per year. Worldwide, the overall potential of the healthcare assistant is correspondingly higher. In the near future, approximately 0.1 percent of the population in half the world will require this kind of care, i.e., there is demand for several hundred thousand healthcare assistants per year (approximately 1 percent of automotive production). That is a market of several hundred million euros.

Longer at home.

The healthcare assistant delivers wide-ranging benefits. People who require care or have mild cognitive impairment win a few more years of living in familiar surroundings. The lack of nursing staff can be ameliorated; the burden on nursing care insurance is significantly lightened. The industry opens up to a new, significant global market and new economic growth creates jobs. German society cannot manage this change alone, but it can initiate a global trend. The technology can be expertly developed and cost-effectively produced with high quality guaranteed in international cooperation.

Technology as man's friend.

In Germany, it is the responsibility of politics to create the right environment for an innovative, efficient care system that is tailored to people's needs. To this end, outpatient care services and families should be convinced of the benefits of using the healthcare assistant. The care services could reclaim the costs through nursing care insurance, although this form of care would come somewhere between outpatient and inpatient care. Responsible people in the healthcare system – doctors, health insurance companies and carers – must communicate to people and their families that the healthcare assistant is part of the care concept that complements the function of carers and does not somehow replace them.

The scientific and technical requirements for the healthcare assistant are already in place today. Business just needs to build prototypes that can prove that the concept is fit for purpose. This must then be followed by the development of technically mature, safe, reliable and, last but not least, cost-effective series production.

Summary and recommendations.

In light of the fact that the population is shrinking in the medium to long term, while at the same time growing older and increasingly in need of care, it is scarcely possible to provide decent care without technical support. In many countries, there will in the future no longer be enough human carers to routinely give care at home to people who are no longer able to cope with everyday life. The healthcare assistant offers an attractive alternative, helping older people to live an autonomous life at home for much longer, but with comprehensive care.

However, in order to overcome the main barriers related to the healthcare assistant, a comprehensive concept for "autonomous life at home in old age" must be developed, implemented, and communicated with the following three components:

(1) The healthcare assistant supports and protects against social isolation: the care service, medical care and everyday support ("meals on wheels," household help) complement each other and must be closely coordinated. This allows users to see the technical aid as a care add-on. The healthcare assistant even makes it easier to keep up social contact with friends, acquaintances and family. For example, it helps with entertaining guests and takes on physically strenuous tasks in the immediate environment.

(2) The healthcare assistant is safe and reliable: because only tried and tested and already existing components are used, high technical quality, robustness and reliability can be ensured while keeping the price reasonable.

(3) Anyone can afford the healthcare assistant: ultimately, the reimbursement of costs must be coordinated. The use of the healthcare assistant could be financed, for example, within the framework of nursing care insurance as an intermediate stage between traditional care at home and moving to an outpatient facility.

Introduction of the healthcare assistant requires it to be incorporated into a comprehensive healthcare and nursing model for "autonomous life at home in old age," building on the acceptance which certainly exists overall, based on the following points: helping to maintain and increase social contact of those in need of care, creating trust in the technology used, and structuring the reimbursement of costs:

(1) Interaction between the persons involved (doctors, health insurance companies, nursing and support staff): the doctor determines together with the nursing staff whether the healthcare assistant would be expedient in the specific case and makes a recommendation to the health insurer.

(2) Billing and reimbursement model anchored in the social security system: outpatient care with the healthcare assistant is offered as an intermediate solution between outpatient and inpatient care if doing so makes it possible for the user to stay in their own home for longer at a lower cost than would be incurred for an inpatient facility. Even slightly higher costs would be justifiable if it improved the health prognosis and quality of life of older people.

(3) Development of technical solutions: the individual technologies required for the healthcare assistant are already in place today. The next step is to provide mature, safe, reliable, easy to use, and low-cost complete systems. In addition, intensive educational work should be carried out and the right messages associated with the healthcare assistant need to be communicated: the basic technologies of the healthcare assistant are technically mature, safe and reliable. These components are now to be combined securely and reliably in the healthcare assistant, which will then provide valuable support to enable people to have an autonomous life at home for longer.

(4) Worldwide rollout: the healthcare assistant should be designed according to a modular concept, so it can be adapted to different disease patterns as well as cultural aspects. Thus the different situations in the various regions can be accounted for. Acceptance is especially high in China, where the market is very big. Hence China can be addressed directly as a market. Germany could have an impact externally as a source of inspiration and technical innovation, since the terms "made in Germany" and "invented in Germany" are highly persuasive in China. Developed and initially introduced in Germany, then launched in the Chinese media, the healthcare assistant could in the future largely be built in China and also mainly used there. Of course, it will then also be available in other regions of the world, where it can be used to support those in need of care and to lighten the burden on the social security system.

(5) Marketing concept: as the survey shows, marketing of the healthcare assistant must take into account widely different regional sensibilities. It is also necessary to carry out further precise analyses of the regional status quo in the social security systems, the attitudes of those in need of care and their families, doctors, and carers, and the care infrastructures. The healthcare assistant should not be positioned exclusively as a device for disabled people or the elderly. Rather it should be made clear, e. g., by offering a "lifestyle" version in high-end hotels, that it provides "luxury," namely personal service.

"The scientific and technical requirements for the healthcare assistant are already in place today."

Chapter 5
Staying healthy.

Telemonitoring.

The intelligent doctor's report and the electronic prescription.

"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." (World Health Organisation 1946). Based on this generally accepted definition of the term health, there are various possible individual interpretations of a person's needs in terms of their health. They all depend on the sociocultural background. In those regions of the world which represent the largest proportion of the world's population as well as exponential population growth, access to minimal basic medicine will remain one of the most urgent challenges facing the world's population for the foreseeable future.

Due to rising life expectancies and the inversion of the age pyramid, highly developed healthcare systems are encountering new constellations of problems and needs that stand in opposition to general needs and the health needs of the individual. Globally, this is illustrated by a trend that is currently classified by the United Nations as "threatening to the development and implementation of internationally agreed social and economic goals," namely the rapid rise in non-communicable diseases. "Non-communicable diseases" that are particularly threatening in their effects on national economies include cardiovascular diseases, cancer, respiratory diseases, and diabetes (see UN News Centre 2011). These diseases are primarily caused by unhealthy lifestyles, poor nutrition, or alcohol and tobacco consumption and a lack of exercise. A good example of this is the already increasingly common incidence of obesity in children and subsequent development of type 2 diabetes, which pose huge challenges for healthcare systems.

There is an increased need for action on significantly and fundamentally improving the basis for medical interventions, including an increased efficiency in the field of biomedical research, in the development of sustainable healthcare systems, and with regard to satisfying the health needs of the individual. How can ICT innovations contribute to the provision of optimum solutions and at the same time account for the different socio-cultural features found around the world?

Modern communication methods will enable access to information and health advice in all cultural zones, tailored to the relevant environment. This can be, for example, instructions on how to treat a tropical infection, or also help with preventive action to avoid illness as a result of a lack of exercise, poor nutrition or inadequate hygiene. Social networks and non-governmental organizations (NGOs) are starting to support structured and institutional measures to evolve healthcare and at the same time develop efficient measures for raising health awareness. This also includes supporting potential preventive measures and therapies. It will be possible to communicate and interact with all persons involved in the healthcare system more efficiently, faster, and without delays.

Both of the following scenarios show different ICT-based functions related to healthcare services of the future.

The linking up of mobile technologies with ICT technologies on the basis of modern, miniaturized diagnostics procedures (lab-on-a-chip, diagnostic imaging, sensor technology for vital functions, etc.), i. e., the proactive merging of convergent technologies ("technology morphing"), results in simple, customized healthcare solutions available on a mobile basis. The frequency of visits to the doctor is reduced and "remote diagnostics" are facilitated in far-flung regions. This ensures increased qualified care despite a lack of doctors. The following section on **telemonitoring** expressly illustrates such a future vision.

If the provision and management of personal health data is optimized, the information requirement can provide substantial savings potential and at the same time offer the possibility of increased efficiency and improved healthcare services. However, data protection considerations, easy handling of the relevant data sets, intelligent assistance, and emergency data provision are still in the early stages. The discussion about meeting the costs of introducing corresponding systems is a challenge for society. The article on **the intelligent doctor's report and the electronic prescription** discusses this kind of scenario.

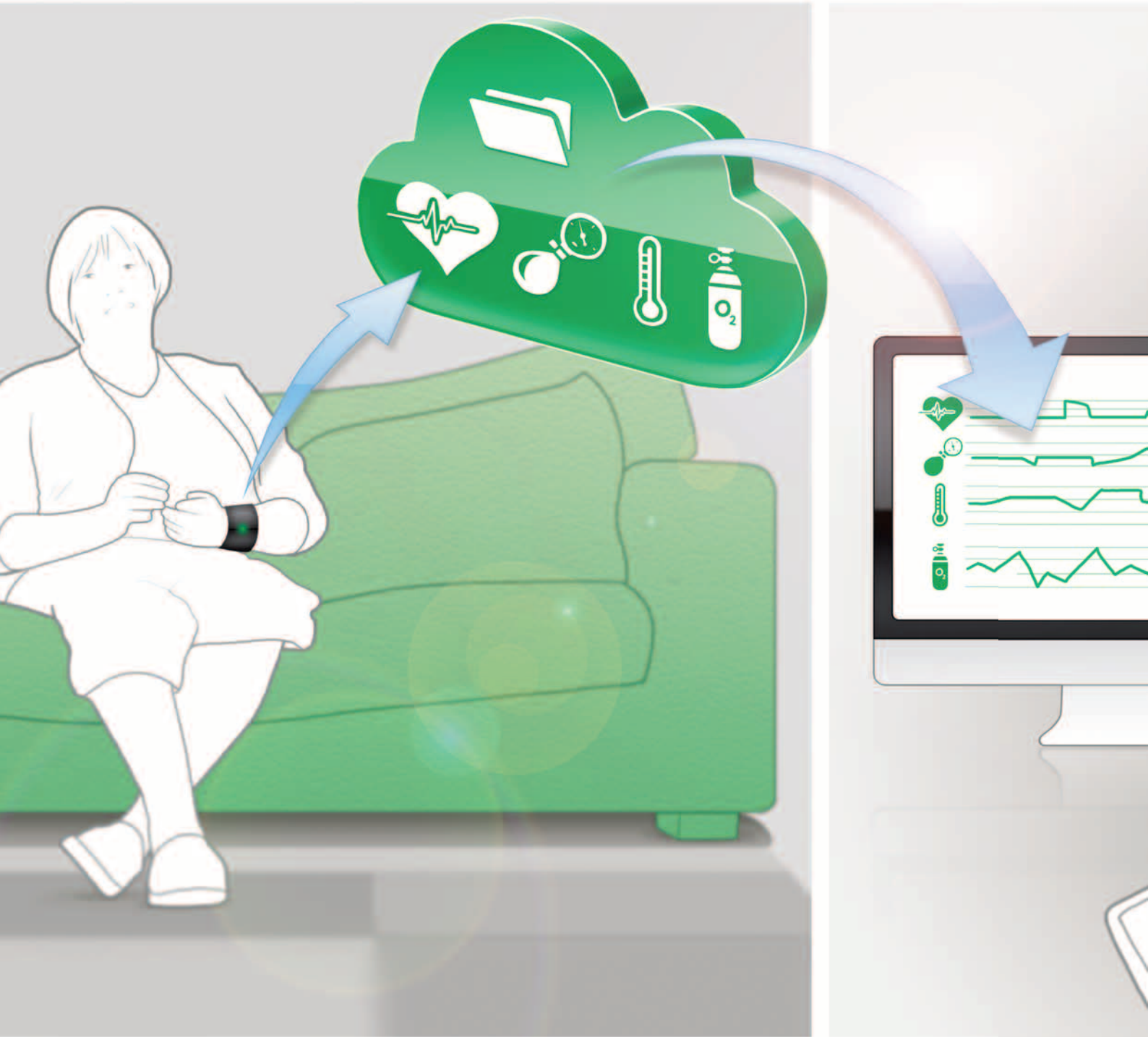


FIG. 65: Visualization of »telemonitoring«

"The recording of vital signs (e. g., pulse, blood pressure or blood sugar) in connection with a mobile device, such as the cell phone will be widespread in the German healthcare system for prevention or medical monitoring (e. g., for chronic illnesses) by 2024 at the latest."

(Result from the second phase of the study, thesis 128)

Telemonitoring.

FIG. 66: Evaluation of individual aspects of »telemonitoring«
"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

If I become chronically ill, I want my doctor to monitor my physical condition regularly, **without having to visit the doctor's office every time.**

21-30%

Telemonitoring lets my doctor monitor my values **remotely, so I don't even have to leave my home.** The system allows me to record my values **regularly, without a great deal of effort, in my familiar surroundings** and **saves me a trip to the doctor.**

31-40%
of people surveyed marked this point.

The necessary medical equipment **was provided to me by my health insurance company.** A healthcare worker showed me how to use it, and it is really quite simple to operate. The device, which is like a smart watch, monitors my vital functions such as pulse, blood pressure, temperature and oxygen content, and records them regularly. This data is then sent **to my doctor automatically.** As a result, my doctor has **access** to my current and past values **at all times** and can monitor them continuously. Should the values worsen, he can detect them and react much sooner. I feel much safer and have better chances of avoiding a relapse.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario; Germany(DE) n=297

“The results clearly show that this topic matters to people and thus they expect telemonitoring to become reality.”

Dimension

Telemonitoring – technology, healthcare system and users are called upon.

Telemonitoring, i. e., the remote recording of health data and the transmission of these data to the doctor, are more or less imminent in the evolution of healthcare systems. The term “systems” here is key, as it relates not just to one technology or device, but to the interaction of people in various roles (e. g., doctor and patient), devices that are in direct contact with a person’s body, and information and communication technologies which are largely beyond the control of the parties involved.

For the user (or patient), telemonitoring primarily manifests itself in the interaction with measurement devices and (tele) communication with the doctor. Indirectly, however, telemonitoring also affects other aspects of one‘s living environment, e. g., financial and time resources, private sphere, and subjective feeling of security with regard to one‘s own health.

In light of this, the question arises of whether it’s worth the effort. Or more precisely, what effort is actually meant? For whom is it worth the effort? And also, how do you measure whether it is worth the effort? This study aimed to answer these questions. The topic of telemonitoring in particular offers excellent opportunities for distinguishing different user groups (regionally and sociologically). The results clearly show that this topic matters to people and thus they expect telemonitoring to become reality. It is interesting how the respondents approach the topic and how they evaluate it, because not all (supposed) technical aids are considered to be life enriching. The highly differentiated picture that emerges from the survey gives the technology providers confidence, while at the same time highlighting for them areas that still require work. These are generally not just technological problems. In particular, the respondents seemed to consider the important (and accepted) components to be not so much the service but instead much more the necessary equipment (sensors and communication equipment).

In terms of technology, underlying the scenario is a system of sensors that communicate with each other and with a monitoring system, and ultimately grant the doctor access to the measurement data. Machine-to-machine (M2M) technologies play a key role here. This current research area offers solutions for many common problems arising in medical technology or the healthcare sector. In particular, standards that develop in that M2M sector are likely to also be suitable for the telemonitoring environment.

Technology alone will not help telemonitoring achieve a breakthrough.

Telemonitoring as a technology is also especially affected by the socio-economic environment and the user’s culture. The legal framework and mentalities play a major role in this regard. For this reason, it is of immense importance, primarily in order to achieve high user acceptance, that the topic is not only investigated in terms of its technological possibilities and effects, but also discussed with the various (potential) target groups.

Description

Almost half the respondents in Brazil (48 percent) say they would definitely like to try telemonitoring once. Thus there is greater acceptance of this scenario in Brazil than in any of the other countries. This can also be seen in a comparison of average values with regard to a trial with telemonitoring (see FIG. 67). The Brazilians are closely followed by the Chinese, where at least 30 percent of respondents say they can imagine personally trying out telemonitoring. Based on an average value of 2.4, third place is shared by Sweden and Korea; Germany and the USA, by contrast, lag behind (average value 2.7). In these two countries, which bring up the rear, "only" 20 and 17 percent respectively of respondents are prepared to try out the telemonitoring scenario. This result is also reflected in the analysis of innovation-minded respondents. Here too, Brazilians and Chinese are most willing to try out telemonitoring.

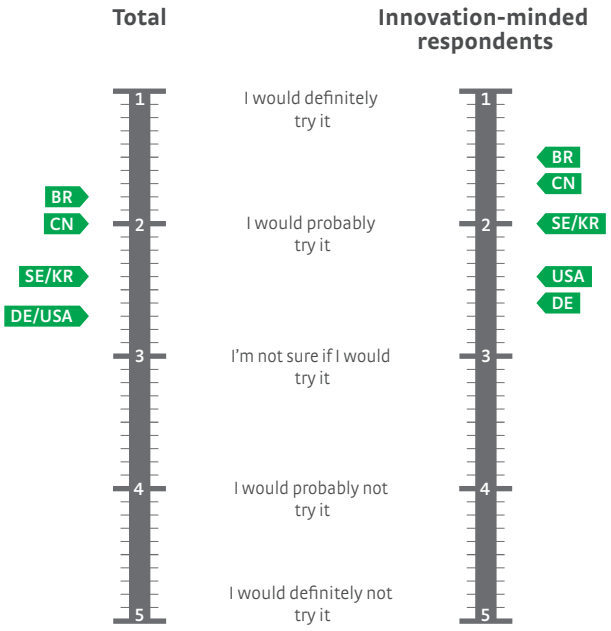
Interestingly, the group of innovation-minded Germans shows itself to be not especially more interested than all German respondents, with an average value of 2.6 only just higher than the average value of all respondents in Germany (2.7; see FIG. 67).

In addition, respondents were asked to mark all the text for the scenario that they particularly liked or view critically. At least 21 to 30 percent of Germans gave positive ratings to the following parts in particular (see FIG. 66): *"without having to visit the doctor's office," "without having to leave my home," – "saves me a trip to the doctor" – the aspect of saving time and effort is thus of special importance to them.* At least a fifth of the German respondents like the aspects of *"regularly"* and *"without a great deal of effort, in my familiar surroundings."* A particularly large proportion of German respondents (31 to 40 percent) marked the words *"was provided to me by my health insurance company."* An important indicator that the Germans would probably make use of this telemonitoring service from the health insurance companies if it were available.

By contrast, the German respondents viewed critically the phrases *"remotely," "access [...] at all times"* and *"to my doctor automatically"* (21 to 30 percent each). This is an indication that the Germans would potentially continue to prefer personal care at the doctor's office or would be skeptical about the remote assessment of their health. It also offers an initial insight that the respondents could potentially have concerns that their data could be accessed illegally.

FIG. 67: What respondents think about a trial with »telemonitoring«

"How likely is it that you would try this future scenario?"



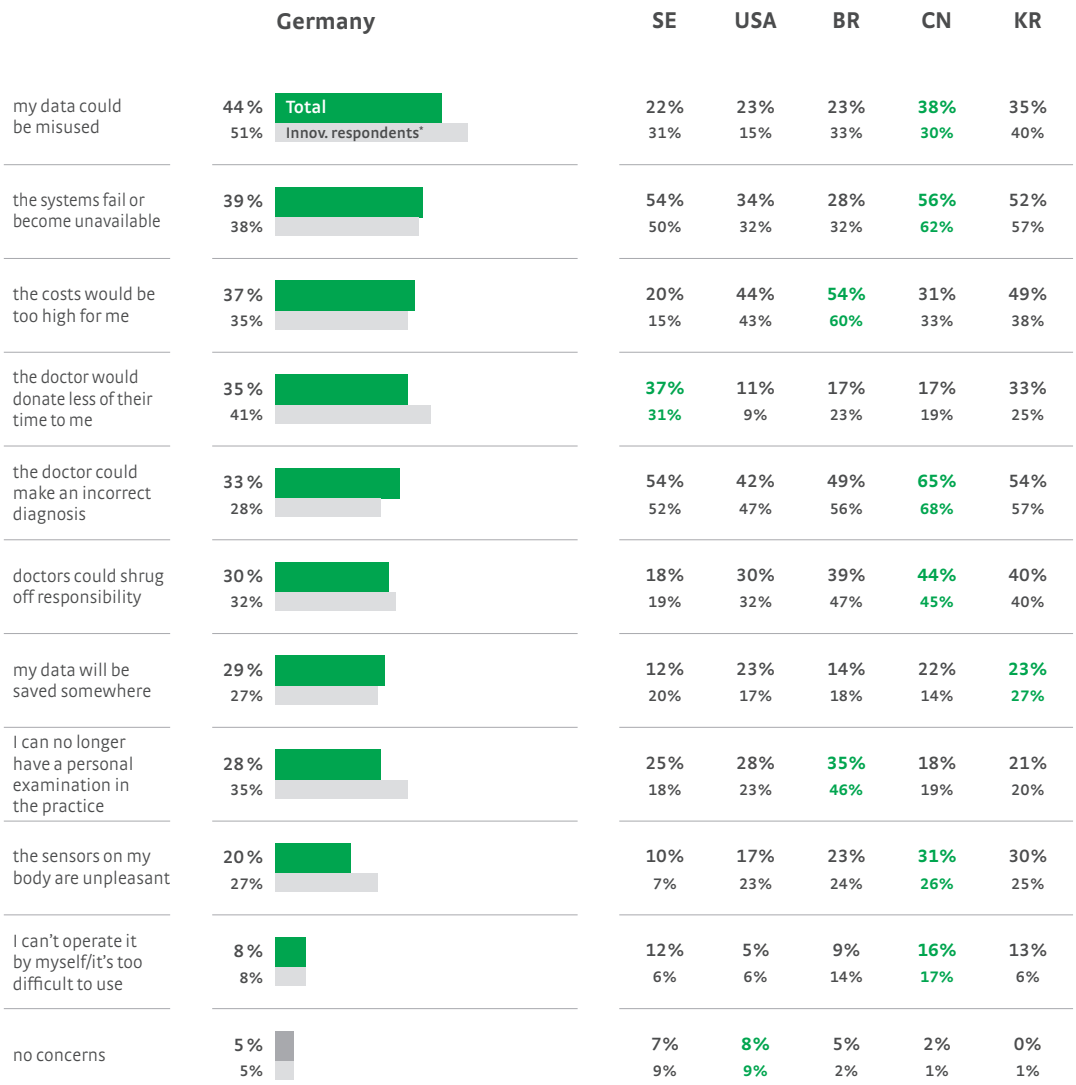
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=297, Sweden (SE) n=304, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=300, Korea (KR) n=301;
Innovation-minded respondents: Germany (DE) n=89, Sweden (SE) n=92, USA (USA) n=92, Brazil (BR) n=103, China (CN) n=82, Korea (KR) n=90

FIG. 68: Respondents' concerns about »telemonitoring«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that …"



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=297, Sweden (SE) n=304, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=300, Korea (KR) n=301;
Innovation-minded respondents: Germany (DE) n=89, Sweden (SE) n=92, USA (USA) n=92, Brazil (BR) n=103, China (CN) n=82, Korea (KR) n=90

This is confirmed by an analysis of the concerns expressed about this picture of the future. The greatest concern the Germans have about telemonitoring relates to misuse of data.
44 percent state this is a concern, whereas in Sweden it is much less common, shared by only 22 percent – an exciting finding (see FIG. 68). Another exciting result can be seen in an analysis of the innovation-minded, where 51 percent of these Germans are concerned that their data could be misused. In Sweden, Brazil and Korea too, this concern is also named more often by the innovation-minded than by the group of all respondents. Despite, or possibly because of, their open attitude to innovations and technology products, they seem to react highly sensitively to the possibility of data misuse. 39 percent of Germans say they are concerned that equipment could break down – a concern shared by only 28 percent of Brazilians. The Brazilians are more concerned that the costs of telemonitoring could be too high: 54 percent of respondents named this concern.

The respondent's answers to the aspect *"concerns that doctors would donate less of their time to me"* are fascinating. While at least a third of respondents in Germany, Sweden and Korea admit to this, the Americans,

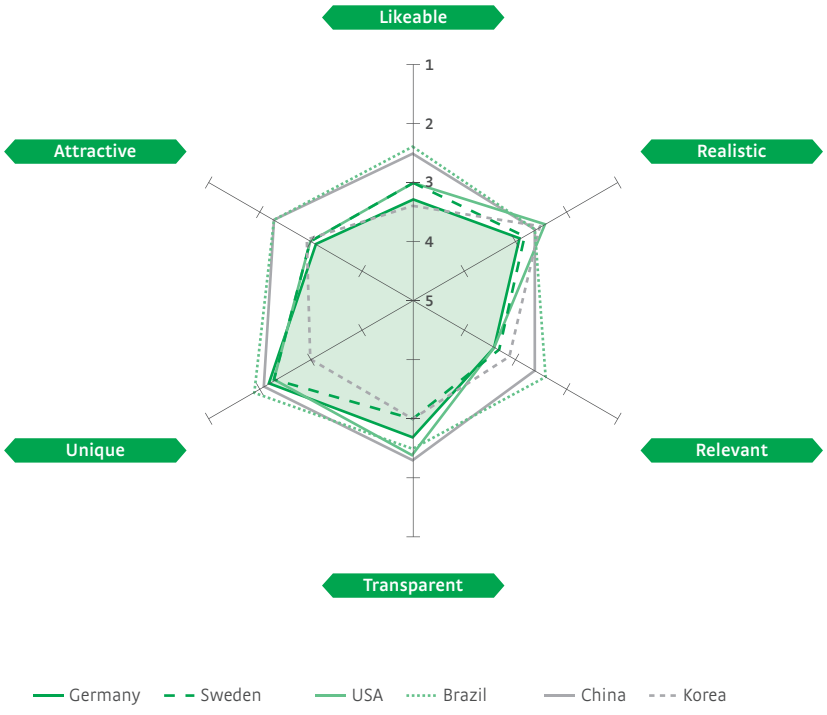
Brazilians and Chinese are less concerned about it (11 and 17 percent). They do not appear to fear a reduction in medical care. In an international comparison, it is surprising that only a third of Germans fear they could get a wrong diagnosis from telemonitoring. The respondents in all other countries show themselves to be substantially more worried about this – in China twice as many respondents hold this fear.

The telemonitoring scenario is most liked in Brazil, with an average value of 2.4 – and thus conforms to the findings of the trial (see FIG. 69)**.**

In Germany and Korea, respondents like the scenario much less, with average values of 3.3 and 3.4 respectively. The respondents assess the scenario as somewhat realistic, with average values of between 2.4 (USA) and 2.9 (Germany). The results as to what respondents think about personal relevance are interesting. Whereas the Brazilians and Chinese see telemonitoring as highly relevant (2.4 and 2.6 respectively), the Germans and Americans give a much more negative assessment of 3.4, seeing the scenario as much less relevant for themselves personally.

FIG. 69: Ratings for individual aspects of »telemonitoring«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



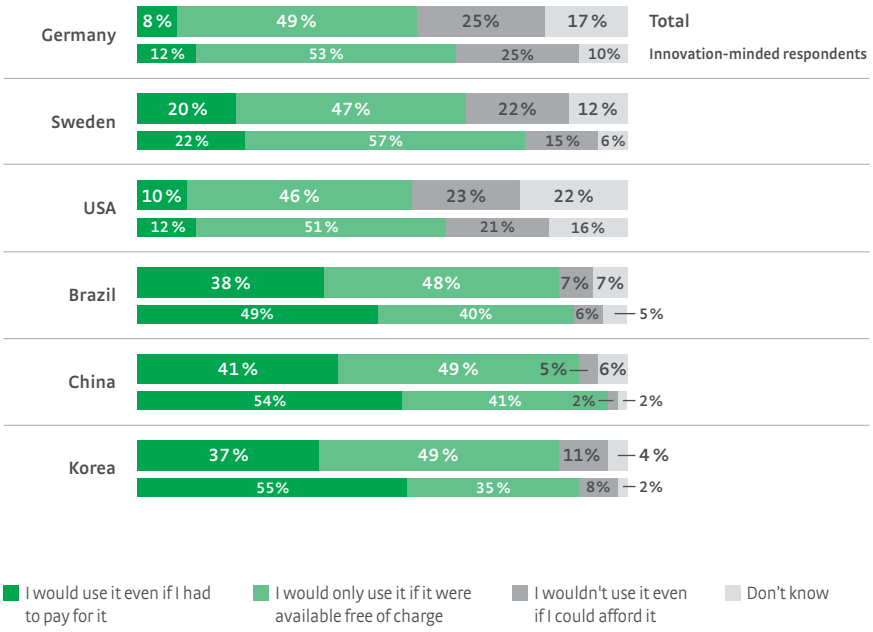
	DE	SE	USA	BR	CN	KR
Likeable	3.3	3.0	3.0	2.4	2.5	3.4
Realistic	2.9	2.8	2.4	2.6	2.6	2.5
Relevant	3.4	3.3	3.4	2.4	2.6	3.1
Transparent	2.7	3.0	2.4	2.5	2.3	3.0
Unique	2.2	2.3	2.3	1.9	2.1	3.0
Attractive	3.1	3.0	3.0	2.3	2.3	2.9

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=297, Sweden (SE) n=304, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=300, Korea (KR) n=301

FIG. 70: Willingness to pay for »telemonitoring«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=297, Sweden (SE) n=304, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=300, Korea (KR) n=301;
Innovation-minded respondents: Germany (DE) n=89, Sweden (SE) n=92, USA (USA) n=92, Brazil (BR) n=103, China (CN) n=82, Korea (KR) n=90

The Chinese in particular feel that they already have a good understanding of the scenario and thus its contents, advantages and disadvantages (average value 2.3). On average, the Brazilian respondents assess telemonitoring as very new and unique (average value 1.9), and it is also seen as similarly new in all other countries. The only exception is Korea, which differs substantially with a value of 3.0 (see FIG. 69).

A consistently highly positive assessment is given in Brazil and China – which is also confirmed in the last point of figure 61, attractiveness. Both countries give an average value of 2.3, the other countries give an assessment of between 2.9 and 3.1.

Even at first glance, respondents in Germany and the USA are much more unwilling to pay for telemonitoring.

Just eight to ten percent of respondents in these countries would be prepared to pay for use (see FIG. 70). In Sweden, it is 20 percent, in other countries as much as 37 (Korea) to 41 percent (China). In Germany, Sweden and the USA, the share of innovation-minded respondents who would be prepared to spend money on telemonitoring is not significantly higher than for the respondents as a whole. In Brazil, China and Korea, by contrast, willingness to pay is noticeably greater: 49 (Brazil), 54 (China) and even 55 percent (Korea) of respondents in this group are prepared to pay something for telemonitoring. The percentage of respondents who would use telemonitoring if it was free is level across all countries: approximately 50 percent would use it under these circumstances.

In Germany, Sweden and the USA a substantial percentage of respondents (25, 22 and 23 percent respectively) would not use telemonitoring even if they have enough money for it. Also, around a quarter of respondents refuse point blank to use it. In other countries, however, the percentage of those who would not use it under any circumstances does not exceed 11 percent (Korea) – an interesting finding. The number of undecided, who answered with *"Don't know,"* is also much lower in other countries.

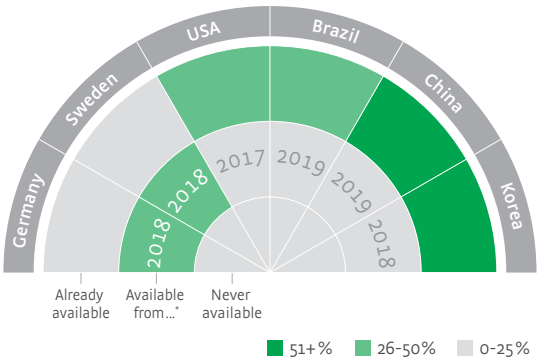
In China and Korea (58 and 53 percent respectively), the majority of respondents believe that telemonitoring is already available for the majority of people in their country or will become available in 2011 (see FIG. 71)**.** In the USA and Brazil, it is 38 and 42 percent respectively who believe this. In Germany and Sweden, however, just one in five is of this opinion (23 and 18 percent respectively) – almost the same number believe it will never be available for the majority of people in their country. A third of respondents in Germany and Sweden expect telemonitoring will become available from approximately 2018.

It is particularly noteworthy that, when asked when they would like the scenario to be available in their country, in almost all countries, the most common answer is *"immediately"* (see FIG. 71). The majority of respondents in all countries would like telemonitoring to be available sooner than they expect it to. In Brazil, the percentage of those who would like it to be available immediately is particularly high. However, one in five Germans and Swedes do not ever want telemonitoring to be available for the majority. In Brazil and China, this view is only shared by a tiny proportion of respondents.

FIG. 71: Expected availability date for »telemonitoring« vs. preferred availability date for »telemonitoring«

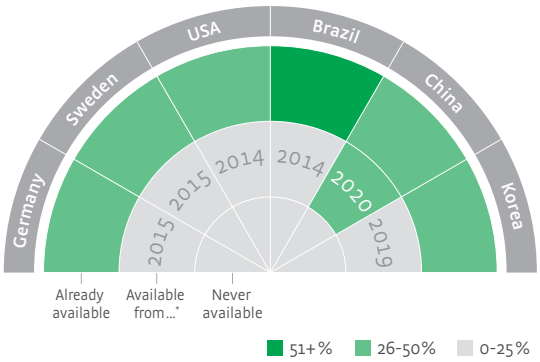
"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"

Expected availability date



	DE		USA	BR	CN	KR
Already available	23%	18%	38%	42%	58%	53%
Available from ...	29%	33%	19%	20%	20%	22%
Never available	18%	20%	8%	7%	5%	7%
Don't know	29%	29%	35%	31%	18%	19%

Preferred availability date



	DE		USA	BR	CN	KR
Immediately	29%	42%	27%	56%	36%	35%
Available from ...	13%	14%	9%	15%	34%	19%
Never available	19%	20%	13%	7%	3%	10%
Don't know	40%	24%	51%	22%	28%	35%

"A third of Swedes expect telemonitoring will become available from approximately 2018. However, many would like it never to become available."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=297, Sweden (SE) n=304, USA (USA) n=301, Brazil (BR) n=300, China (CN) n=300, Korea (KR) n=301;
Preferred availability date: Germany (DE) n=233, Sweden (SE) n=251, USA (USA) n=196, Brazil (BR) n=181, China (CN) n=124, Korea (KR) n=150

“Clearly people fear misuse of their personal health data through telemonitoring more than, e. g., malfunctions or operating problems.”

Interpretation

Telemonitoring – Uncertainty in communication of this topic is creating an ambivalence in the respondents’ ratings.

Telemonitoring is a technology that can, in principle, be used anywhere, in both a geographical and a thematic sense: globally, telemedicine equipment and procedures could dramatically change healthcare systems. Advances in sensor technology allow more and more data readings to be recorded and transmitted. It is therefore hardly surprising that the survey confirmed the expectation that telemonitoring will (soon) become reality. Viewed in detail, however, the various expectations and ratings are surprising. On the one hand, differences between the countries are startlingly high, but on the other, there are also surprisingly similar results between countries with hugely different healthcare systems. For example, willingness to use the scenario is at around the same level in the USA and in Germany – 17 and 20 percent respectively of the respondents would definitely try out the telemonitoring scenario – even though the two countries have hugely different healthcare systems.

Also surprising are the results relating to ease of use for patients. In China, three times more respondents say they are worried they could have problems operating the system than in the USA (16 and 5 percent respectively; see FIG. 68). This may be due to the fact that less value is placed on product design in China than in the West, hence the equipment is generally more difficult to operate. Nevertheless, this observation is somewhat surprising. The observation that, in Asia, direct physical contact with another person is seen significantly more critically than in the West is also relevant in this context. Cultural characteristics and the sense of physical privacy could be much more important here than, e. g., concerns about data protection.

Expected, but no less important, are the German respondents’ concerns arising from the text for the scenario that was marked critically: *“remotely,” “access at all times,” “sent automatically”* (each 21 to 30 percent). Clearly people fear misuse of their personal health data through telemonitoring more than, e. g., malfunctions or operating problems. This prompts requirements for providers of the relevant equipment and services: telemonitoring must leave the initiative to the user. Not the machine, not the remote doctor, but rather the user himself would like to determine when such data readings are to be recorded and sent. The resulting conflicts with medical-technical requirements must be avoided or resolved through suitable measures. For example, the equipment could include an alarm or a means of notification that reminds the user to record and send the data. This would leave the initiative with the user; they would not feel that they were being turned into the subject of all-powerful healthcare monitoring machinery.

Motives and obstacles for telemonitoring.

Because (lack of) user friendliness could not be identified or confirmed as an obstacle or barrier to acceptance of the telemonitoring technology, other factors take greater precedence. The question of drivers or barriers can essentially be dealt with and ultimately answered by reformulating it: what is the cost/benefit ratio of introducing telemonitoring into the healthcare system? In other words, is it worth the effort?

These questions were carefully scrutinized in the study. Three types of "cost" can be identified: money, privacy and quality of doctor's visits. These costs can be weighed up against the benefits, specifically the convenience and time saving. The result varies from country to country, but allows the justified assumption that many of the respondents see the benefits as largely positive, since the majority of respondents from all countries say they would use telemonitoring if it was provided free of charge or subject to a charge (see FIG. 70).

However, the percentage of telemonitoring "objectors," who cannot imagine trying out the technology even if it was free of charge, should not be disregarded (Germany: 25 percent, USA: 23 percent). Interestingly, in Germany it tends to be younger people who are more open to the scenario, while the group of over 50s has the largest percentage of people who would never use it. In all other countries surveyed, however, it is older people who are more open to telemonitoring and say they would like to use it.

There is a wide range of technology behind the telemonitoring scenario, which can be implemented and used in varying degrees of complexity, such that you could already talk about usability today. As with every technology, however, there is a huge gap between proven feasibility and use in the mass market. This gap is bridged by prototypes, pre-series production, small series production, then the first products for early adopters and the subsequent more mature devices, through to the everyday object. Of course, this kind of device development also has a role to play in telemonitoring. However, the device here is only the first small link in a chain or network of system components; it can be part of an entire ecosystem. Furthermore, telemonitoring does not describe a specific scenario that relates to precisely one measurement parameter (and the related device). Rather it can relate to simple values, such as body temperature, more difficult to measure attributes, such as blood sugar level, or even just the visual appearance of the patient. The individual metrics and measuring equipment as well as the following diagnosis processes are at different stages of (product) maturity at present. The results of the survey also show that how this is perceived and rated by respondents varies widely.

Special situation in Germany? Not really.

Unsurprisingly, German respondents showed themselves to be particularly cost-conscious and at the same time afraid of data misuse. Fear of relinquishing privacy is widespread among the Germans, as can be seen, for example, from the huge resistance to Google Street View. Accordingly, a deep fear can be seen among the Germans that once data have been recorded, they may not (just) be used for the original purpose, but also for other purposes. More than half of the innovation-minded Germans expressed concerns in this regard (51 percent; see FIG. 68), more than in any other group of any of the surveyed countries. It is striking that these results are relatively close to those from China, where huge data privacy concerns also prevail overall (all respondents: 38 percent). However, there may be other reasons for this that are more likely to have to do with the interpretation of the open network by the Chinese regime. Overall, the innovation-minded appear to more clearly identify the risks of data misuse (and to give more weighting to them) than the overall population. In the USA in particular, however, there are substantial deviations from this impression. Here, the innovation-minded are much less concerned than the average (15 percent and 23 percent respectively).

In general, it can be seen that the innovation-minded do not always express concerns everywhere. The highly varied picture revealed by the figures relating to concerns hardly allows any clear conclusions to be drawn. On the contrary, sometimes the innovation-minded express their opinions more strongly than "normal citizens," sometimes less strongly. This ambivalent attitude on the issue of telemonitoring gives reason to conclude that there is no need to attempt to initially target a potential market approach at the innovation-minded. Rather, the target group should be those who stand to gain the greatest benefits from telemonitoring. However, this leads directly to the question of willingness to pay for telemonitoring. In this regard there is (unsurprisingly) a correlation with the innovation-minded: those who show themselves to be open to new ideas are also (more) prepared to pay for them.

Overall, three times more of all respondents in China, Brazil and Korea (41, 38 and 37 percent respectively) are prepared to pay for telemonitoring than the innovation-minded Germans (12 percent). This gives rise to the recommendation that the market approach should begin in these countries.

However, Germany would then be one of the latecomers and (not for the first time) would introduce an innovative technology later or reject it altogether. Of all the countries under consideration, however, acceptance in the USA (average value 2.7) Sweden and Korea (average value 2.4 in each) is also no greater, or not much greater than in Germany (average value 2.7; see FIG. 67).

International comparison and cultural differences.

As can be seen from the international comparison of acceptance and individual concerns, the cultural and social environment plays a huge role in the assessment of telemonitoring. The new technologies are much more openly received in Brazil and China than in traditional industrial nations. Of course, positioning as a medical offering and not as an aid to care makes a difference here. If the technology is positioned more in the latter environment, care in the home, this could give rise to a different picture: in Asia, the family traditionally plays a major role here, although this is currently gradually changing.

The role of the doctor and the trust of people in this profession (regardless of telemonitoring) varies widely from country to country. Telemonitoring seems to cement these differences or to amplify them. Fears of wrong diagnosis can scarcely be explained otherwise. However, existing fears could be dispelled precisely here through targeted communication, since telemonitoring could be presented as a kind of "extended stethoscope" of the doctor, and could thereby remove certain fears. In China, the fear of wrong diagnosis through the use of telemonitoring tops the list (Germany: 33 percent, China: 65 percent; see FIG. 68).

Economic and social importance.

In western countries, telemonitoring, as part of the constantly growing health and fitness market, has traditionally great and growing potential. In Germany, countless devices and procedures are being developed and integration into the overall European market is in full swing. Germany is highly interesting, both as a manufacturing country and a country of deployment for telemonitoring. The question of whether the health insurance companies would be prepared to assume the costs of telemonitoring in whole or in part and, if so,

under what conditions, is of central importance for success in the submarket "healthcare systems," at least from the German perspective.

However, the results of this study suggest a new approach to marketing, communication and further development, namely rather than tackling the German market (even though it may seem suitable as a relatively critical test market), looking instead for sales markets on a global scale. Asia and Latin America seem to be much more willing to implement telemonitoring.

Naturally, this gives rise to challenges for the providers: on the one hand, the devices must be adapted to the taste and purchasing power of the users in these regions; on the other, the respective country-specific legal requirements and approval procedures for medical products must be complied with, which makes it expedient to work with local branches or partners.

Summary and recommendations.
The moderate overall acceptance of telemonitoring and in particular the limited willingness to pay, force the players in this area to pause for reflection. This pause should be utilized to revise the positioning of the relevant telemonitoring equipment and services, in two respects:
(1) Local: are the Asian market and South America perhaps more suitable sales regions?
(2) Segment-specific: will telemonitoring be marketed as an interface to the healthcare system or as an "extended stethoscope" or even as a wellness product?

"Germany is highly interesting, both as a manufacturing country and a country of deployment for telemonitoring."

Further thought should be given to financing models, since immediate willingness to pay is not very great. It must be clarified centrally to what extent telemonitoring services can be (part) financed by health insurance companies.

In the end, this study should provide an opportunity to review the acceptance (i. e., the "precondition") for telemonitoring explicitly expressed here: "The device is simple to operate and as unobtrusive as a wristwatch." This fits in with the last recommendation: in many countries, telemonitoring is already believed to be available on the market. Clearly, respondents already count existing devices and services as part of this technology. The trick, therefore, is to keep it simple. Simple devices for well-defined purposes open up the market, which can then be evolved.

As large and diverse as the topic of telemonitoring is, so are the results of the survey ambivalent. Its importance and usefulness is by and large acknowledged worldwide, but only a minority of the respondents would use the technology themselves, many reject it altogether. Positioning in the market is proving to be one of the core challenges: is telemonitoring a "next generation personal coach," a medical instrument of diagnosis that is always available to the user (and thus perhaps also access to a "doctor on demand"), or is it just another means of keeping down costs in the healthcare system?

The results show that telemonitoring has plenty of potential. The topic requires conviction through experience of the practical value of the technology and for financial resources and the user's privacy to be treated carefully and responsibly.

The intelligent doctor's report and the electronic prescription.

FIG. 72: Evaluation of individual aspects of »the intelligent doctor's report and the electronic prescription«

"What do you particularly like about this scenario?"
"And is there anything about it that you view critically?"

After I visit the doctor, I usually want to have more information about my illness. In particular, I want **to be able to understand** my doctor's diagnosis and recommendations better.

21-30%

The intelligent doctor's report helps me better understand my diagnosis and my doctor's recommendations. After the discharge talks, my doctor makes an intelligent report available to me automatically. I can **read** the report **at my leisure on my home computer.**

41+ %

31-40%
of people surveyed marked this point.

The intelligent doctor's report is linked **with medical documents, pictures and additional literature** through a generally available **online database.** It lets me retrieve **additional information** for my data, **anonymously** and with a click of the mouse button, such as localizing the finding in the picture with explanations.

I can also save the prescription and my doctor's instructions electronically and forward them directly to my pharmacy, another doctor, or a medical **service provider** (such as a physical therapist) **in electronic form.** This simplifies archiving and, when necessary, handling with my **health insurance company.** All the information is available whenever I need it and I can never lose a prescription slip again.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=303

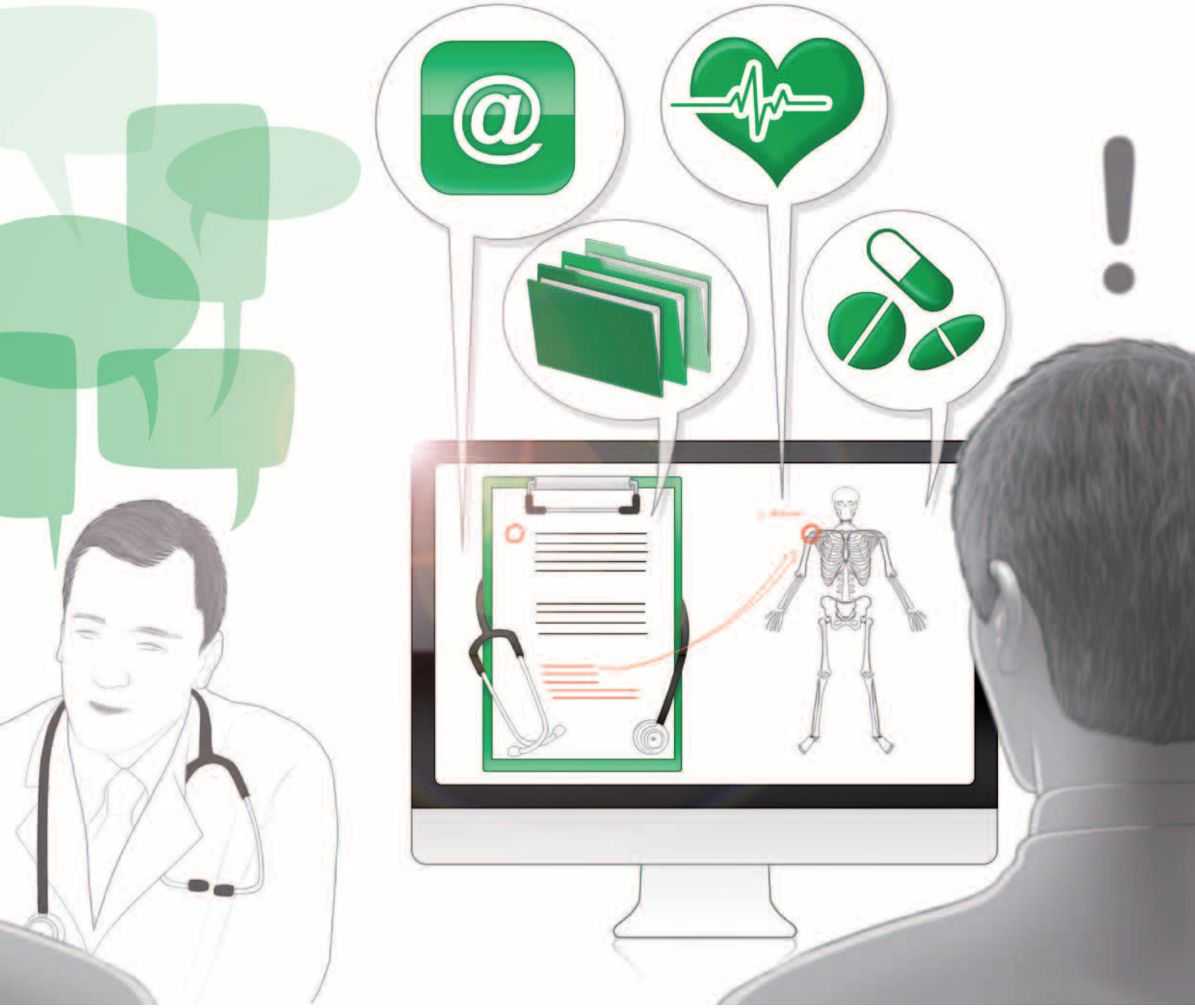


FIG. 73: Visualization of »the intelligent doctor's report and the electronic prescription«

"Entirely new forms of prevention, diagnostics and treatment will be available in Germany by 2019 at the latest, thanks to ICT combined with vital functions monitoring."

(Result from the second phase of the study, thesis 127)

“In the future, the intelligent doctor’s report will be able to provide the patient with prepared information and help the doctor to explain to the patient.”

Dimension

The intelligent doctor’s report helps to explain to the patient.

Diagnostic imaging, such as ultrasound, computer tomography or magnetic resonance imaging, are important bases for medical diagnosis and treatment. They make it possible to identify illnesses at an early stage and to target treatment. These days, in radiology surgeries or hospitals, patients are generally given a DVD to take home with their records. The GP then receives the related report from the radiologist - the doctor’s report - to discuss with the patient.

In the future, the pictures could be attached to the doctor’s report in electronic form. However, the medical language is often difficult for a layperson to understand. But mature patients are increasingly keen on being able to take another look at the points discussed in the confidential consultation with the doctor at their leisure at home.

“In the future, the intelligent doctor’s report will be able to provide the patient with prepared information and help the doctor to explain to the patient.” For this purpose, the electronic doctor’s report includes hyperlinks linking parts of the text, e. g., anatomical structures, with the relevant points in the medical pictures. For example, the word “heart” in the text could be linked with the heart in the picture. In addition, patients will be able to access an online database to view more detailed clarifying information relating directly to the relevant text.

Another facility for the patient is the electronic prescription, which is to replace the paper prescription. In the doctor’s surgery, it is transferred to a mobile device as an electronic document and can be downloaded again by the relevant medical service provider (pharmacist, physiotherapist, etc.).

Semantic technologies are the key.

The intelligent doctor’s report is based on semantic technologies as developed in research projects such as THESEUS – Internet of Services. The anonymized text of the reports is analyzed by software which extracts relevant content and saves it in knowledge databases, or ontologies. The pictures are broken down into their constituent parts, segments, using the latest analytical techniques. Machine learning is used here: the computer learns the anatomy of human beings from examples, and can recognize it in pictures. A segment could be, for example, the outline of the heart. The identified picture segments are then semantically linked with text passages in the report, and the results of the inquiry with online knowledge. I. e., the computer understands the content and can correctly assign it and, unlike normal search engines, can compile relevant information.

The electronic prescription uses a certified application on a mobile device to receive an electronic document e. g., via Bluetooth, and to forward it on to the service provider. The application ensures the data transfer is encrypted and the prescription is saved, as well as correctly deleted, in order to guarantee that at any one time, only one instance of the prescription exists on one device and with one person.

Description

Willingness to try out the intelligent doctor's report and the electronic prescription is similarly high as for telemonitoring.

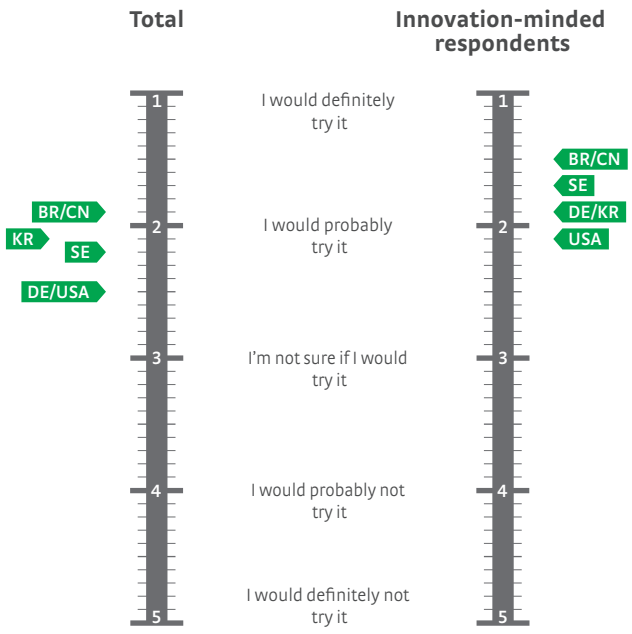
On average, respondents say they would probably try out the scenario. In Brazil and China, the level of willingness, at an average value of 1.9, is somewhat higher than in other countries. Germany and the USA gave the lowest score, with an average value of 2.5 (see FIG. 74). The picture is similar for the innovation-minded. It is notable that the German innovation-minded in particular are very open to this scenario – as their name suggests. The average value of 1.9 for this group shows that many more of these respondents would definitely try out this idea if it was available.

The respondents marked all the text for the scenario that they like or view critically (see FIG. 72). Based on these markings, it can be seen that the aspect of better understanding and being able to understand is very important to the German respondents. When asked what they like about the scenario, they marked the following text: *"able to understand"* (21 to 30 percent), *"better understand my diagnosis and [...] recommendations"* (at least 31 percent), *"read [...] at my leisure on my home computer"* (31 to 40 percent).

Also marked were *"with medical documents, pictures and additional literature," "online database," "anonymously"* and *"additional information"* (each 21 to 30 percent). However, the aspect of the *"online database"* is also viewed critically by 21 to 30 percent of respondents, as are the words *"service provider"* and *"health insurance company"* (each 21 to 30 percent).

FIG. 74: What respondents think about a trial with »the intelligent doctor's report and the electronic prescription«

"How likely is it that you would try out this scenario?"



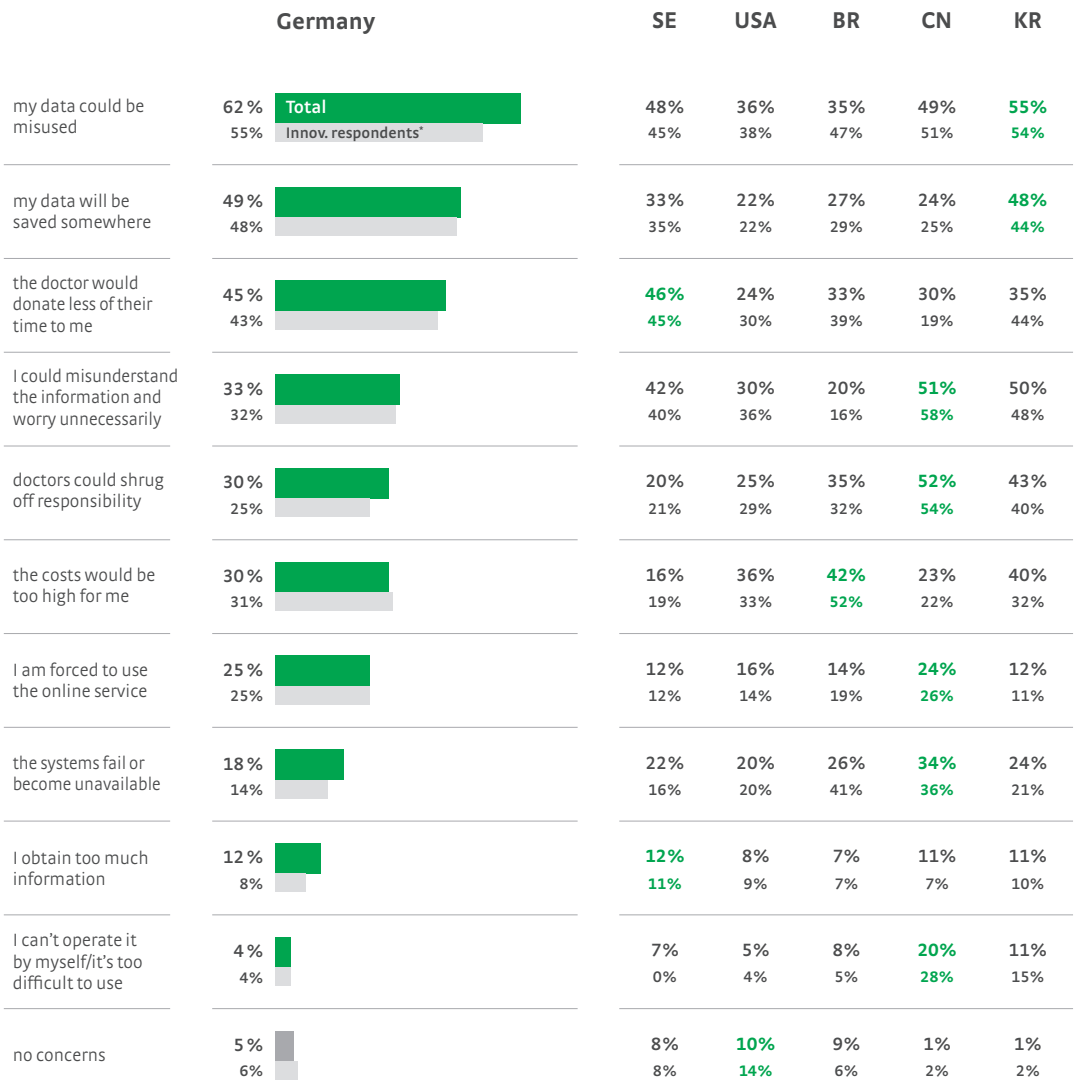
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=297, Brazil (BR) n=301, China (CN) n=299, Korea (KR) n=304;
Innovation-minded respondents: Germany (DE) n=87, Sweden (SE) n=87, USA (USA) n=86, Brazil (BR) n=83, China (CN) n=86, Korea (KR) n=101

FIG. 75: Respondents' concerns about »the intelligent doctor's report and the electronic prescription«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=297, Brazil (BR) n=301, China (CN) n=299, Korea (KR) n=304;
Innovation-minded respondents: Germany (DE) n=87, Sweden (SE) n=87, USA (USA) n=86, Brazil (BR) n=83, China (CN) n=86, Korea (KR) n=101

The critical rating of the words "online database" already shows that for this scenario too, the biggest concern for Germans is data misuse:
62 percent of Germans and 55 percent of the innovation-minded Germans have expressed this concern – hardly surprising on such a sensitive issue as personal health data (see FIG. 75). This concern also comes high up the list in other countries. In Brazil, however, only a third of respondents are concerned that personal data could be misused (35 percent).

Accordingly, the second most important concern among German respondents is data storage. 49 percent of respondents fear their data will be stored. This concern is also widespread in Korea, where it is expressed by 48 percent of the respondents. Whereas in the USA only one in four respondents worry that doctors would donate less of their time to their patients due to the intelligent doctor's report (24 percent), in Germany one in two is concerned about this (45 percent). In Sweden too, 46 percent of respondents expressed this concern. This also applies for the innovation-minded respondents, despite an open attitude to innovation and technology, they also fear that the doctor would donate less of their time to their patients if there

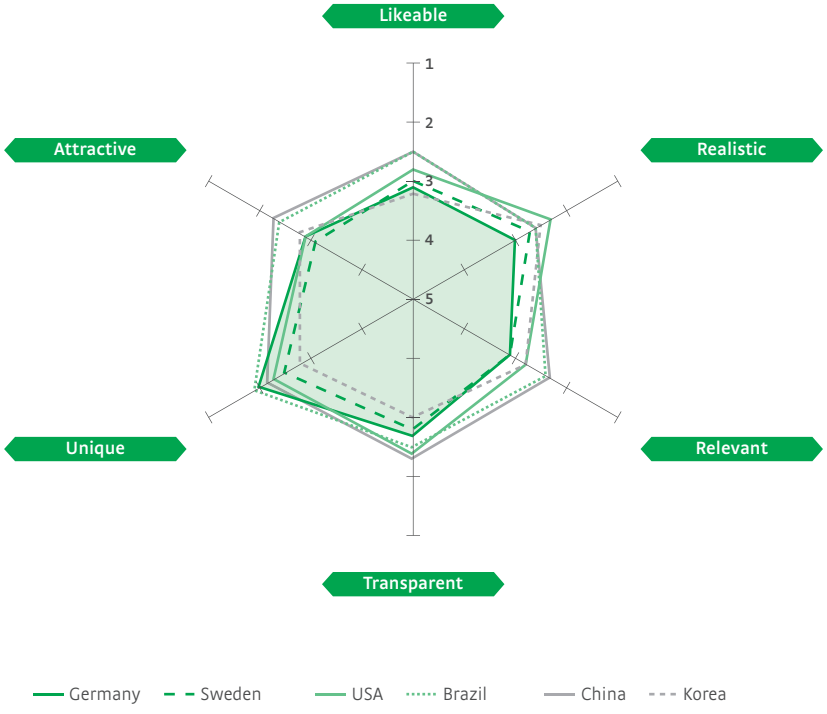
was an intelligent doctor's report. Unlike the Americans, the Germans and Swedes seem to expect the intelligent doctor's report to result in a deterioration in the doctor-patient relationship.

In China and Korea, one in two respondents (51 and 50 percent respectively) is concerned that he could misunderstand the information from the intelligent doctor's report and the linked online databases and consequently worry unnecessarily. But this concern is only shared by a third of the Germans (33 percent). The greatest concern among the Chinese (52 percent named this aspect) is that doctors could shrug off responsibility if they could call on the intelligent doctor's report.

While only 30 percent of Germans named costs as a concern, 42 percent of Brazilians did – making this concern about the scenario the most widespread in Brazil. Interestingly, only 16 percent of Swedes checked this point – fundamental differences in medical care and insurance seem to have an effect here.

FIG. 76: Ratings for individual aspects of »the intelligent doctor's report and the electronic prescription«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



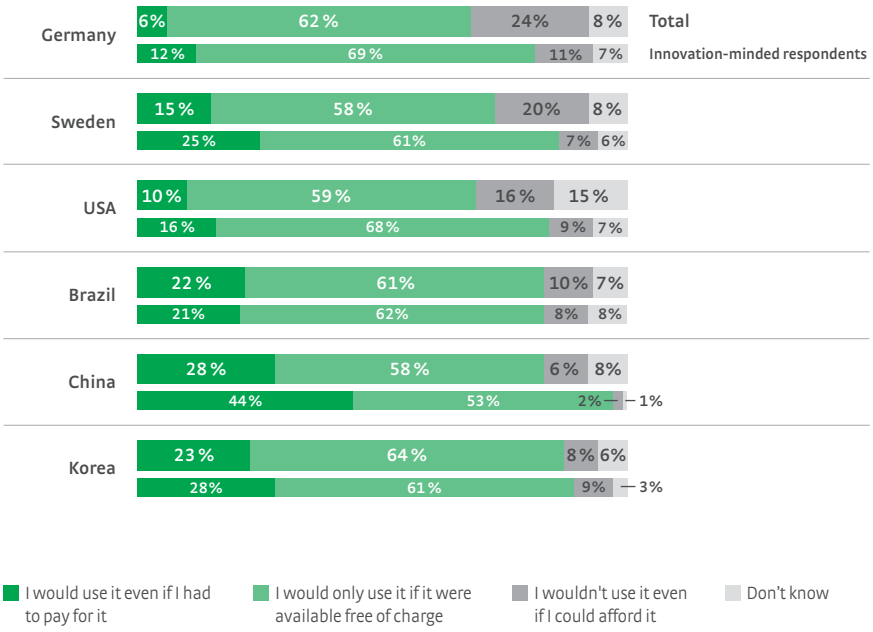
	DE	SE	USA	BR	CN	KR
Likeable	3.1	3.0	2.8	2.5	2.5	3.2
Realistic	3.0	2.7	2.3	2.6	2.6	2.5
Relevant	3.1	3.1	2.8	2.4	2.3	2.8
Transparent	2.7	2.8	2.4	2.5	2.3	3.0
Unique	2.0	2.5	2.3	1.9	2.2	2.8
Attractive	2.9	3.1	2.9	2.4	2.3	2.8

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=297, Brazil (BR) n=301, China (CN) n=299, Korea (KR) n=304

FIG. 77: Willingness to pay for »the intelligent doctor's report and the electronic prescription«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=297, Brazil (BR) n=301, China (CN) n=299, Korea (KR) n=304;
Innovation-minded respondents: Germany (DE) n=87, Sweden (SE) n=87, USA (USA) n=86, Brazil (BR) n=83, China (CN) n=86, Korea (KR) n=101

As has been the case in many other scenarios, the Brazilians and Chinese liked the intelligent doctor's report and the electronic prescription best (average value 2.5). But respondents in other countries also liked the scenario somewhat on average. The average value in Germany is 3.1. Innovation-minded respondents like the intelligent doctor's report better on average. In Germany the average value for the innovation-minded is 2.6.

On average, American respondents assessed the scenario as very realistic, compared internationally, they found the scenario most realistic (2.3; see FIG. 76)**.** The assessment of relevance is similar to that of likeability. In Brazil (2.4) and China (2.3) the scenario is assessed as very relevant on average. In Germany and Sweden, the idea is rated as somewhat relevant (average value 3.1).

In Germany and Brazil, the intelligent doctor's report is assessed as particularly new and unique (average value 2.0 and 1.9 respectively). This does not differ much from the innovation-minded respondents (1.9 and 1.8 respectively). The future scenario is rated as least attractive in Sweden: on average, it is assessed only as "somewhat exciting" (average value 3.1).

Only a small proportion of respondents would be prepared to pay something to use the intelligent doctor's report and the electronic prescription. Willingness is lowest in Germany, with six percent of respondents (see FIG. 77). Even the innovation-minded Germans are least prepared, compared internationally, to pay for this service; only 12 percent would consider this. Willingness to spend money on the intelligent doctor's report is greatest in China; 28 percent of the respondents would use it, even if they had to pay for it; among the innovation-minded it's as many as 44 percent. Approximately three out of five respondents would use this service if it was provided free of charge – this applies for all countries.

In Germany, 62 percent of respondents say this, in Korea 64 percent, and in the USA 59 percent. Germany has the highest number of respondents who would not use the scenario even if they had sufficient financial resources. 24 percent, i. e., one in four Germans say they would not consider using it even in these circumstances. This value is lowest in China at six percent of respondents.

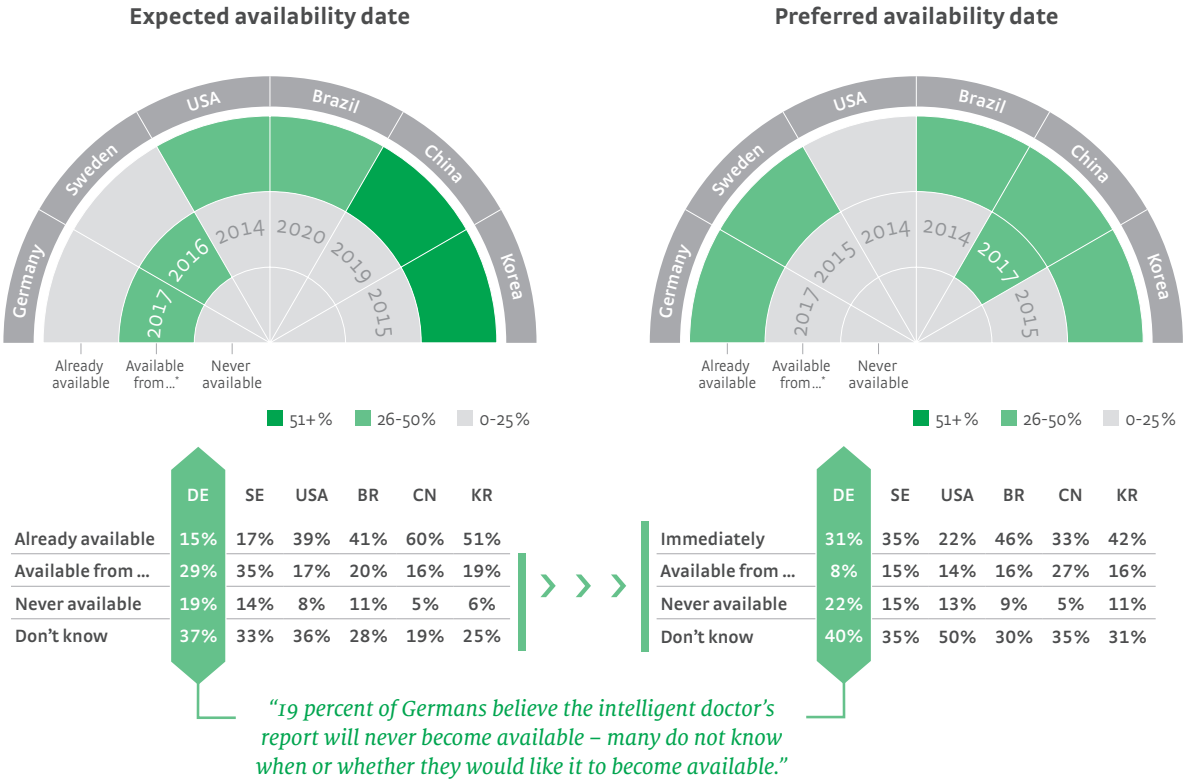
While in China and Korea the majority of respondents say there is already such a thing as the intelligent doctor's report (60 and 51 percent), only 15 percent of Germans and 17 percent of Swedes think this (see FIG. 78)**.**

They think that the scenario will not be available until the coming years, on average 2017 or 2016. However, 19 percent of Germans and 14 percent of Swedes also believe the intelligent doctor's report will never become available.

Following the question of when respondents expect availability, all those who answered that it will not become available until a later data or never, were asked when they would like the intelligent doctor's report to become available. The most common answer in many countries is *"immediately"* (see FIG. 78). Nevertheless, the number of those who hope the scenario will never become reality is very high in Germany: one in five hopes the intelligent doctor's report and the electronic prescription will never become available. Very few respondents in China gave this answer.

FIG. 78: Expected availability date for »the intelligent doctor's report and the electronic prescription« vs. preferred availability date for »the intelligent doctor's report and the electronic prescription«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	15%	17%	39%	41%	60%	51%
Available from ...	29%	35%	17%	20%	16%	19%
Never available	19%	14%	8%	11%	5%	6%
Don't know	37%	33%	36%	28%	19%	25%

	DE	SE	USA	BR	CN	KR
Immediately	31%	35%	22%	46%	33%	42%
Available from ...	8%	15%	14%	16%	27%	16%
Never available	22%	15%	13%	9%	5%	11%
Don't know	40%	35%	50%	30%	35%	31%

"19 percent of Germans believe the intelligent doctor's report will never become available – many do not know when or whether they would like it to become available."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=297, Brazil (BR) n=301, China (CN) n=299, Korea (KR) n=304;
Preferred availability date: Germany (DE) n=258, Sweden (SE) n=250, USA (USA) n=189, Brazil (BR) n=185, China (CN) n=113, Korea (KR) n=150

> **“An intelligent doctor’s report could help many patients to understand their diagnosis.”**

Interpretation

Understanding difficult health information at leisure.
Surely anyone who has been in this situation has wished they had help: after visiting a radiology surgery or a stay in hospital, the patient is handed a DVD with their medical pictures and a printout of the doctor’s report. This puts the patient in a difficult spot: after intensive tests, operations and treatments, he would like to understand his personal situation (which is documented in the pictures and in the doctor’s report), prepare for the meeting with the next doctor, and discuss possible consequences and next steps with his doctor in a confidential meeting.

However, the large volume of medical data, the technical terms and the unfamiliar pictures alienate and overtax most patients. There is no connection between the information (pictures and text) and the easy-to-understand explanations of the medical terms. Another disadvantage is that the information is frequently provided on a range of media (on paper, folder of x-rays, electronically saved pictures, etc.).

As shown in the scenario, an intelligent doctor’s report could help many patients to understand their diagnosis. The electronic prescription can also be very helpful in times of online ordering and the processing of all kinds of transactions and services over the Internet. However, this scenario involves very personal, often highly sensitive medical data, some of which is confidential.

With any simplification and facilitation for the patient, it is crucial that there is proof of discretion or privacy and, above all, that the medical data are secure and protected to ensure they are not disclosed to unauthorized third parties or analyzed without authorization.

Support – yes! Monitoring and uncontrollable disclosure – no!

31 percent of Germans would definitely try the intelligent doctor's report, and another 25 percent would probably try it. As expected, however, the German respondents react very sensitively to critical key words. In the case of the intelligent doctor's report, this means, e. g., the involvement of service providers or health insurance companies. Spurred on by reporting on the misuse of Facebook data or cyber mobbing and the debate about "transparent patients," there is a fear that personal medical data will be disclosed to unauthorized persons. 62 percent of the Germans express concern about data misuse, 49 percent fear that their data could be stored somewhere through the doctor's report. In Korea, these concerns are named with almost the same frequency (see FIG. 75). In its simplest form, the disclosure of personal health data could lead to unwanted advertising, in unfavorable cases to social selection, disadvantages in the workplace, worse terms and conditions when taking out insurance policies, etc.

The advantage of the intelligent doctor's report is that even without an online connection, it gives the user added value, since it combines text and pictures. Additional editorial background information can be downloaded from the online database via a connection to the Internet. No names or other data that could be used to identify the relevant person are transmitted, instead potential questions that could be asked by the patient are derived from the descriptions (meta data) in the doctor's report and corresponding literature is downloaded from the online database and presented to the patient.

The intelligent doctor's report and the electronic prescription aim to provide the patient with fast, simple "customer-oriented" access to information on their "case" and to facilitate communication with doctors, pharmacists, healthcare and rehabilitation centers. At the same time, it must be verifiably ensured that personal data can only be transmitted and analyzed with authorization.

The electronic prescription could conceivably be used in a similar way to cell phone ticketing for Deutsche Bahn or municipal travel operators, through a QR code on a cell phone. The QR code would be issued by the doctor. The service provider (pharmacist, healthcare center, etc.) reads the code and delivers the medicine or prescribed rehabilitation measure, e. g., massage or lymph drainage. Encryption with digital signatures prevents misuse.

The technologies for the intelligent doctor's report and the electronic prescription are largely already available. This is also reflected in the assessment of a large proportion of respondents in the USA, Brazil, China and Korea, who say that concepts such as the intelligent doctor's report have already been implemented. In Sweden and Germany, the technology is not expected to be available until the coming years. An astonishing finding is that, in Germany, the majority of respondents hope the intelligent doctor's report and the electronic prescription never become reality (see FIG. 78). Thus the concepts must be very well explained, especially in Germany, and justified concerns about data protection and security must be permanently eliminated. 30 percent of Germans fear that the doctor's report would be too expensive for them – this means, compared internationally, they are more in the mid-range; the Brazilians and Koreans in particular fear excessively high costs here (see FIG. 75).

Big differences in companies and very different healthcare systems – the Chinese show the greatest interest.

The healthcare system in China is currently being completely restructured. Whereas previously all medical services were provided free of charge by the state or its companies, since the start of the economic reforms, private persons and companies must also bear some of the costs. The government is aiming for a western-style health insurance system. However, many medical services are currently paid for privately. Hence, compared with other regions, China is most prepared to pay for the intelligent doctor's report or the electronic prescription – 28 percent say they would be prepared to pay for it. Among the innovation-minded Chinese, this rises to as many as 44 percent (see FIG. 77). Possibly, there is a certain degree of mistrust of the authorities and the services provided by the healthcare system and hence people particularly appreciate being able to get information independently.

In Korea and Germany, there is a similar sensitivity regarding the storage and unauthorized analysis of data. In August 2011 in Korea, for example, almost 27,000 people brought a group action against the US technology group Apple and its Korean branch due to the storing of location data on the iPhone and iPad. In Germany too, there is strong opposition to the storing of location data by smartphones or mapping by Google Earth, which does not exist or is nowhere near as pronounced in other countries.

Germans and Swedes in particular fear that the doctor could donate less of their time to their patient than before and that explanation will be passed on to the intelligent doctor's report. In addition, the electronic doctor's report is rated as least attractive in Sweden (see FIG. 76). Sweden is one of the countries with complete networking of healthcare facilities. Concepts that aim to improve the availability of information have been used here for years. A survey of the impact of networking in the Swedish healthcare system on concerns and resistance in the population could help to avoid errors in implementation of the intelligent doctor's report and the electronic prescription in other countries. Overall, the intelligent doctor's report is intended as a doctor's aid for the patient and will tend to improve communication between doctor and patient.

Intelligent doctor's report and the electronic prescription as components of integrated networking of patient data.

Previous strategies for ICT in the healthcare system have focused on integrated networking of patient data in order to accelerate processes and cut costs. By intelligently, securely and privately connecting current medical pictures, test results, medicines or diagnoses, the intelligent doctor's report and the electronic prescription can help to improve efficiency in the healthcare system and avoid unnecessary costs. Further economic effects are likely to only be felt indirectly, e. g., through more "healthy" behavior by patients.

Patient at the heart.

The primary focus of this technology is on the patient's wellbeing. A patient is given a better understanding of their own situation and the medical data and pictures. They can behave more "healthily" in the future if they better understands the medical facts. In particular, they can prepare for the meeting with the next doctor. This means that, together, the patient and doctor have a good basis for making a decision on the next steps to take. The time that this frees up is available to the patient for more intensive consultation. With the focus on the patient, future modifications and enhancements of the technologies used are also conceivable, such as customization for educationally disadvantaged patients or the provision of versions for foreign citizens. Special features for other regions like Brazil, India or China, adapted to the social or medical systems found there are also conceivable. The results of the survey show that many Chinese and Koreans fear that the intelligent doctor's report and the electronic prescription could be misunderstood by the patient. As healthcare systems are expanded, therefore, there must also be intensive provision of medical information and education.

What politics, business, science and society can do.

When implementing the intelligent doctor's report and the electronic prescription, data protection and the informational self-determination of the patient must be guaranteed, as for the healthcare card and the electronic patient file. In particular, it must be ensured that data can only be used with the consent of the patient and cannot be disclosed to unauthorized third parties or analyzed without authorization. We also have to clarify when, how, and by whom these (and especially outdated) data can be deleted or how they can be overwritten with current information.

For this purpose, consistent rules and processes must be provided for all parties involved (patients, doctors, medical service providers). It must also be ensured that the patient data are not stored on online databases and access to the databases to look for information is anonymous, such that it is not possible to identify individual patients. The editorial and scientific review of the background information is another important issue.

Summary and recommendations.

The majority of respondents would try out the intelligent doctor's report and the electronic prescription. This willingness can possibly also be extended to other useful additions, such as the connection to the healthcare card, the electronic patient file, or the use of relevant communities (self-help groups) and newsgroups. The technologies required for implementation of this scenario have now reached market maturity. In China, a large proportion of respondents are prepared to pay for this application. The prevailing acceptance worldwide and the statement that users are quite prepared to pay for this technology (28 percent of Chinese respondents), could provide a huge opportunity for the development and enhancement of these technologies in Germany. However, there are also specific concerns: on the one hand, there are fears that personal medical data could be disclosed and misused without authorization, on the other, that the time gained through the technology would be used to increase the "patient throughput" and not to better explain to and reassure the patient. It is therefore key for acceptance that it is ensured that these fears are reliably averted. What is needed are stable decisions at a healthcare policy level and the definition of specific, consistent and comprehensible processes for all parties involved.

"Germans and Swedes in particular fear that the doctor could donate less of their time to their patients than before."

Chapter 6
Maintaining mobility.

The personal mobility assistant.

Ambient communication.

The autonomous car / car on demand.

Without mobility, the cultural, historical achievements of mankind, great discoveries and revolutionary conquests, global trade and scientific advances would never have been possible. Advances in mobility – steam engine, electrification, combustion engine – gave birth to the industrial age. Thanks to air and space travel, we can cross huge distances. The mass-produced car meets the individual needs of its user. However, negative aspects of unrestricted mobility are increasingly coming to the fore: harmful effects on the environment and global climate, economic losses from traffic congestion and accidents, health hazards from pollution and noise, the financial strain from rising operating costs. Hence the more pragmatic approach of "using not owning" is gradually gaining in popularity. Nevertheless, mobility is still a key factor for the competitiveness of countries, regions and cities. Local authorities and the state demand efficient, cost-effective concepts for public and private transport. The current coverage of infrastructure and transportation costs, however, is complex and non-transparent. A cause-based, fair cost distribution would involve every citizen based on the carbon footprint from their mobility. Environmentally-friendly behavior would be rewarded.

The changing mobility needs of the future call for intelligent, integrated, personalized, secure, resource-saving, environmentally-friendly, socially-responsible solutions and concepts. ICT makes crucial contributions in this regard, some of which are briefly outlined here. Through information and entertainment services, mobile applications make time spent on the move productive, relaxed and entertaining, taking into account personal interests. The personal mobile device will meet target group-specific requirements and take on additional functions, e.g., cardless payment. For certain target groups, e.g., older, ill or disabled people, comfortable driving is extremely important. This requires functional user interfaces, ease of getting in and out, and improved night vision. It also includes systems that monitor the driver's physical condition. Modes of transport transmit vehicle data to the workshop or manufacturer for optimized workflows when making diagnoses and when breakdowns occur. Product quality is improved through continuous analysis of driving, which provides impetus for innovations in the automotive industry. New, environmentally-friendly drive concepts (electromobility) will be used to reduce the carbon footprint. Concepts that banish private vehicles with combustion engines from cities will be supported. The electric car is primarily a city vehicle with all the necessary convenience functions and an ICT connection. It is connected to distributed energy networks, which will feed back any unused electricity.

The following three aspects of mobility are presented in detail as scenarios.

The personal mobility assistant enables intermodal travel and door-to-door navigation thanks to an Internet platform for planning and travel across modes of transport, according to the preferences of the user. All necessary reservations are made online in a single transaction. Preferred modes of transport are selected, suitable parking is offered, travel itineraries are spontaneously put together, mobile devices communicate with the travel infrastructure in real time in case of unforeseen events and update the itinerary. The personalized route replaces private transport.

Equipping public spaces with various ICT systems is a prerequisite for efficient and economic transportation. Cars will communicate with each other and with the infrastructure in the vicinity (e.g., traffic lights) in real time through **ambient communication**. This provides direct warnings about the traffic situation and visualized unexpected, undetectable hazards (e.g., icy roads). The accident rate will be substantially reduced and dangerous situations will be avoided without any stress.

The increase in active and passive security has especially reduced the accident rate in private transport. Connected and autonomous modes of transport go a step further. **The autonomous car / car on demand** takes over the driving and navigation to the destination and enables driving without a license or allows the traveler to rest during the journey. The autonomous vehicle can be leased via an Internet portal and comes to the desired starting point at the agreed time.

The personal mobility assistant.

FIG. 79: Evaluation of individual aspects of »the personal mobility assistant«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

I want to handle my business trips and personal travel in accordance with my personal preferences, conveniently in a single portal. I want to use different modes of transport – such as a bike, my private car, trains and planes – seamlessly and be **informed immediately** of any changes over the course of my trip. This is not currently possible, because the wide variety of transport providers and information providers do not allow end-to-end planning.

21-30%

There is now a personal mobility assistant. The mobility assistant is a platform on the Internet that lets me plan each of my trips **optimally in accordance with my desires, from the starting point to my destination, and including all necessary reservations such as parking spaces and seat reservations, in a single transaction.** The integrated planning across all transport operators takes a lot of stress out of travel and can frequently reduce transfer times as well.

The mobility assistant builds on a networked system into which all public and private transport operators feed all the necessary information for a journey and update it automatically (for example, platform information, delays, traffic reports). The mobility assistant **knows my preferences** among the modes of transport and makes suggestions for planning my trip accordingly. Once I choose one of the suggestions, **it books** all the necessary tickets for me **automatically.** If there are any changes or delays during my journey, I am notified immediately – on my smartphone, for example – and can modify my subsequent itinerary.

31-40%
of respondents marked this.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=301

FIG. 80: Visualization of »the personal mobility assistant«

"By 2024 at the latest, digital assistants will detect the needs of their users automatically and on a self-taught basis, and complete routine tasks independently (e. g., during Internet use and to control end devices, software and services of all kinds)." (Estimation by Germany experts)

(Result from the second phase of the study, thesis 14)

“The described fully-integrated, personal mobility assistant is still a long way off.”

Dimension

There are many mobility services and online route planners. The timetables of practically all modes of public transport are now available on the Internet, as well as flight plans and current traffic information. Some private transport operators can also be booked online. But what is missing is the possibility of Internet-based, integrated trip planning, which takes into account all available transport operators to allow optimum planning of the trip tailored to the user’s needs, makes the reservations, and books all the tickets automatically. In addition, an ideal travel planning system would offer users the option of saving their personal preferences and support them in the specific course of their journey. For example, the system should navigate users through unfamiliar surroundings, inform them of delays or other obstructions and, where appropriate, suggest plan changes and rebookings and then automatically make them.

The personal mobility assistant carries out the tasks described above. Essentially, it is a combination of an Internet search engine that specializes in mobility information, an online booking portal, and a mobile navigation system. It is normally accessed via a suitable mobile device, e. g., a smartphone, but can also be used via a PC. The user interface of the mobile device is designed in such a way that it provides the traveler with the right information at any point in the journey in a format that is easy to read, and thus helps him to find the right platform or the right car rental station. All the tickets and booking confirmations needed for the trip are also stored electronically on the mobile device.

The prerequisite for the described personal mobility assistant is that all the information required to plan a trip is available on the Internet in the required quality. As far as public transport and rental cars are concerned, this can be deemed to be largely the case. The same applies for navigation data and, with certain exceptions, traffic information. It is even increasingly possible to reserve parking spaces over the Internet, just as modern smartphones supply the positioning information required to provide users of the personal mobility assistant with all information according to their position and situation.

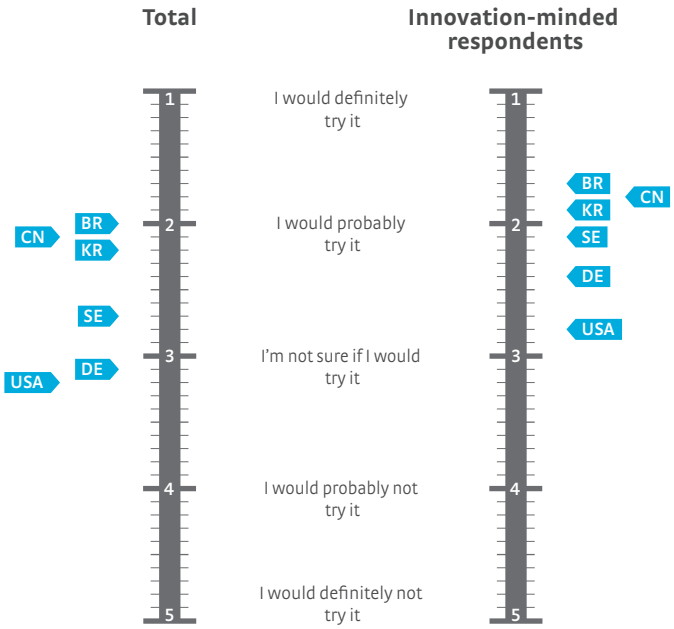
What is missing is the above-described search engine that specializes in mobility information, which is powerful enough to identify the best solution for the relevant user’s travel request from the mass of all the available data. Existing booking portals are also not yet capable of serving the requirements of the personal mobility assistant, since they are mainly restricted to the booking of air and rail tickets, rental cars and hotels. This requires considerable development to incorporate the necessary additional providers; a suitable billing system must also be developed. Furthermore, a number of legal issues need to be clarified in relation to data protection, copyright and personal rights. It must also be clarified who is responsible for the accuracy of the information. Last but not least, a sustainable operator model must be developed to ensure economical operation in the long term. The described fully-integrated, personal mobility assistant is still a long way off. But interim solutions with reduced ranges of functions are surely also interesting.

Description

How likely people are to consider a trial of the personal mobility assistant varies widely between countries.
On average, the Brazilians say they would probably like to try the scenario (average value 2.0; see FIG. 81). 35 percent even say they would definitely like to try the scenario – thus willingness is greater in Brazil than in any other country. The Germans and the Americans, however, are not sure, on average, whether they would like to try the personal mobility assistant, with average values of 3.1 and 3.2 respectively; just 11 and 13 percent respectively would definitely try the personal mobility assistant. As expected, innovation-minded respondents in all countries are more willing to try the personal mobility assistant. Every other Brazilian in this group says they would definitely like to try the scenario; in the USA, however, it is only one in four (51 and 23 percent respectively). These figures already suggest that the Brazilians lead the field in this regard as well, with an average value of 1.7; the Americans bring up the rear with 2.8. The respondents were asked to mark all the text for the scenario that they particularly liked, as well as all that they would view critically.

The core idea of the future scenario, of planning a trip "optimally in accordance with my desires, from the starting point to my destination" was marked by 21 to 30 percent of the German respondents (see FIG. 79)**.**
The same number of Germans also said they would like to be, *"informed immediately"* – i. e., be told in real time about any potential changes in the planned journey. But the possibility of making *"all necessary reservations such as parking spaces and seat reservations online, in a single transaction"* was marked as positive by 21 to 30 percent of the Germans. However, a number of aspects of the personal mobility assistant were also viewed critically. For example, 31 to 40 percent of the German respondents did not like the phrase *"it books [...] automatically."* The aspect of *"knows my preferences"* was also marked critically by 21 to 30 percent – there appears to be strong reservations here. This is also confirmed by the concerns expressed by respondents.

FIG. 81: What respondents think about a trial with »the personal mobility assistant«
"How likely is it that you would try out this scenario?"



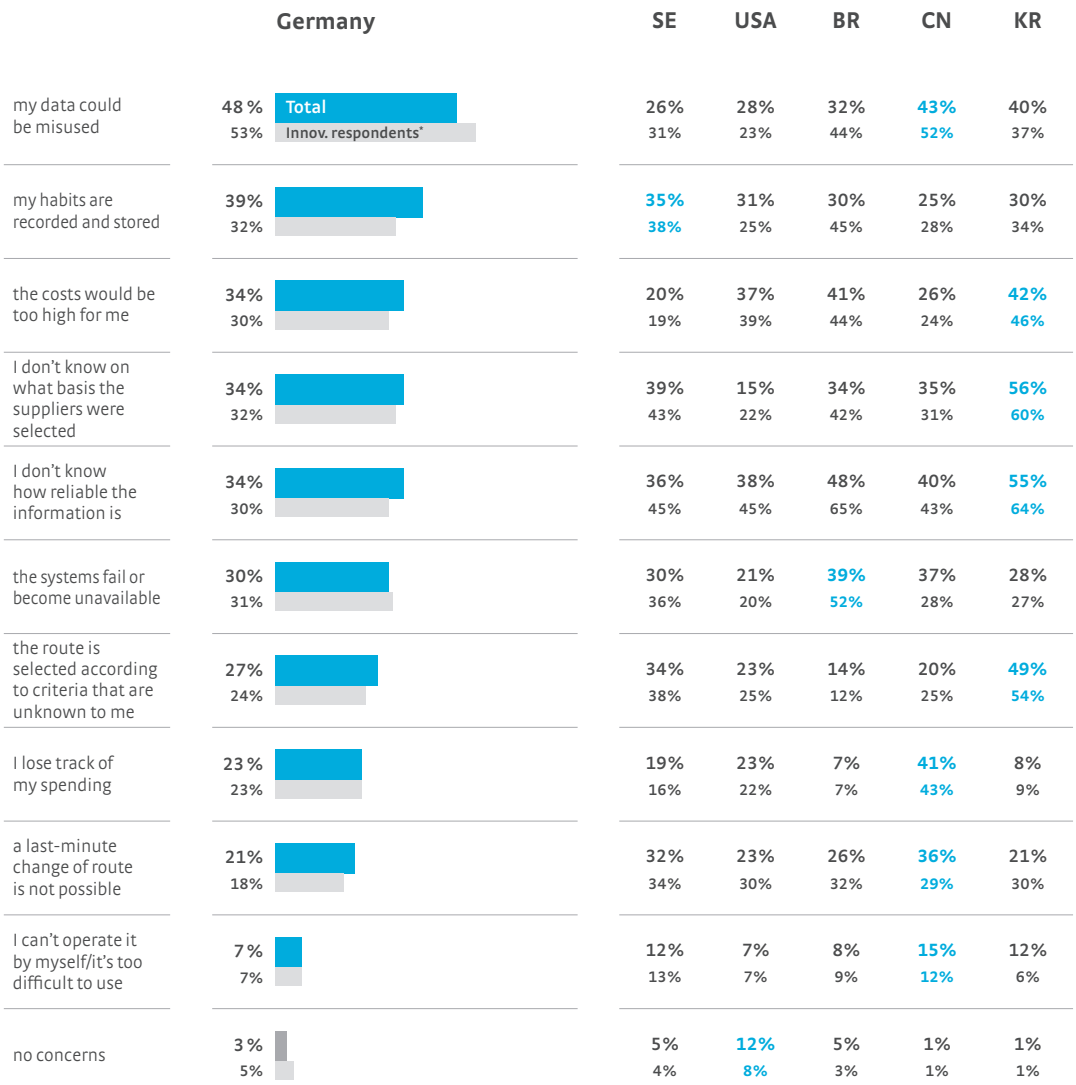
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=299, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=303, Korea (KR) n=300;
Innovation-minded respondents: Germany (DE) n=85, Sweden (SE) n=76, USA (USA) n=91, Brazil (BR) n=86, China (CN) n=85, Korea (KR) n=90

FIG. 82: Respondents' concerns about »the personal mobility assistant«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that …"



	Germany	SE	USA	BR	CN	KR
my data could be misused	48 % Total 53 % Innov. respondents*	26% 31%	28% 23%	32% 44%	43% 52%	40% 37%
my habits are recorded and stored	39% 32%	35% 38%	31% 25%	30% 45%	25% 28%	30% 34%
the costs would be too high for me	34% 30%	20% 19%	37% 39%	41% 44%	26% 24%	42% 46%
I don't know on what basis the suppliers were selected	34% 32%	39% 43%	15% 22%	34% 42%	35% 31%	56% 60%
I don't know how reliable the information is	34% 30%	36% 45%	38% 45%	48% 65%	40% 43%	55% 64%
the systems fail or become unavailable	30% 31%	30% 36%	21% 20%	39% 52%	37% 28%	28% 27%
the route is selected according to criteria that are unknown to me	27% 24%	34% 38%	23% 25%	14% 12%	20% 25%	49% 54%
I lose track of my spending	23 % 23%	19% 16%	23% 22%	7% 7%	41% 43%	8% 9%
a last-minute change of route is not possible	21% 18%	32% 34%	23% 30%	26% 32%	36% 29%	21% 30%
I can't operate it by myself/it's too difficult to use	7 % 7%	12% 13%	7% 7%	8% 9%	15% 12%	12% 6%
no concerns	3 % 5%	5% 4%	12% 8%	5% 3%	1% 1%	1% 1%

* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=299, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=303, Korea (KR) n=300;
Innovation-minded respondents: Germany (DE) n=85, Sweden (SE) n=76, USA (USA) n=91, Brazil (BR) n=86, China (CN) n=85, Korea (KR) n=90

48 percent of Germans say they have reservations about possible misuse of data.

This concern is also shared by the innovation-minded Germans – as many as 53 percent of them fear data misuse if the personal mobility assistant were used (see FIG. 82). Skepticism about data storage and misuse also manifests itself in the second greatest concern among the Germans: 39 percent of respondents in Germany are concerned that the personal mobility assistant could record and store their habits. However, this concern is also shared by 35 percent of respondents in Sweden. In China, by contrast, it is expressed by "only" 25 percent of respondents. Third on the list of the Germans' concerns is the cost. A third of respondents say this is one of their greatest concerns in relation to the use of the personal mobility assistant (34 percent). In Korea and Brazil, this fear is even more widespread – here

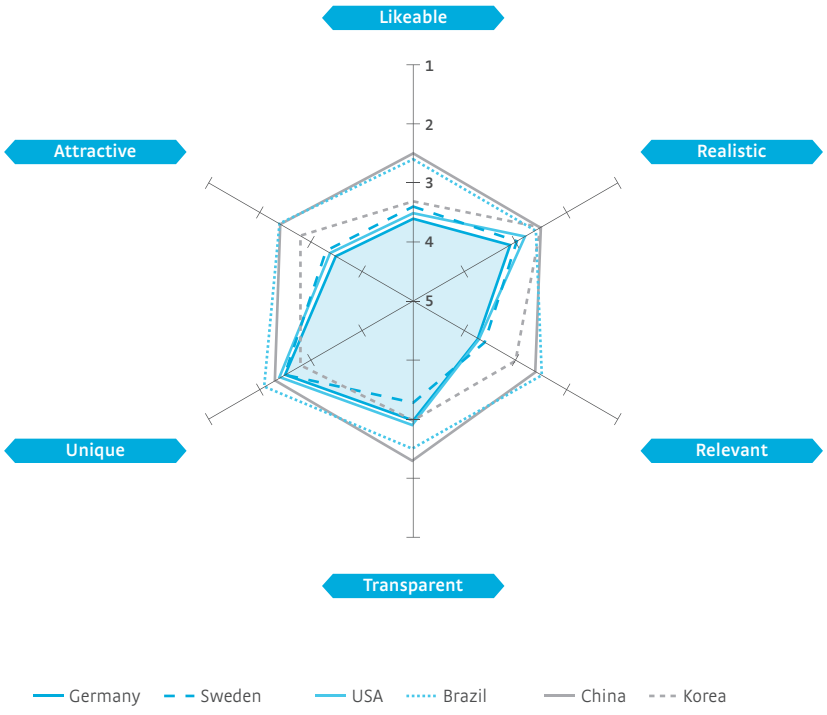
42 and 41 percent respectively of all respondents checked the cost aspect. It is worth noting that, in Sweden, only 20 percent of respondents said they are concerned about the cost.

The most widespread reservation in Korea relates to the reliability of the information. 55 percent of all respondents say they would not know if they could rely on the information from the personal mobility assistant. Among the group of innovation-minded Koreans, this concern is even more prevalent. Interestingly, this concern is least pronounced in Germany – this aspect was expressed by just 34 percent of respondents.

The selection of route based on criteria unknown to the user is given very varied assessments. Whereas in Korea, 49 percent of all respondents checked this as a concern, in Germany it was just 27 percent, in Brazil as few as 14 percent. The assessment of the concern *"I could lose track of my spending"* also fluctuated to a similar degree. 41 percent of the Chinese raised this fear, compared with just seven percent of the Brazilians. The personal mobility assistant is trusted by the majority of respondents to be able to change route even at short notice – in Germany, this is only stated as a concern by one in five (21 percent), in China by one in three (36 percent).

FIG. 83: Ratings for individual aspects of »the personal mobility assistant«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



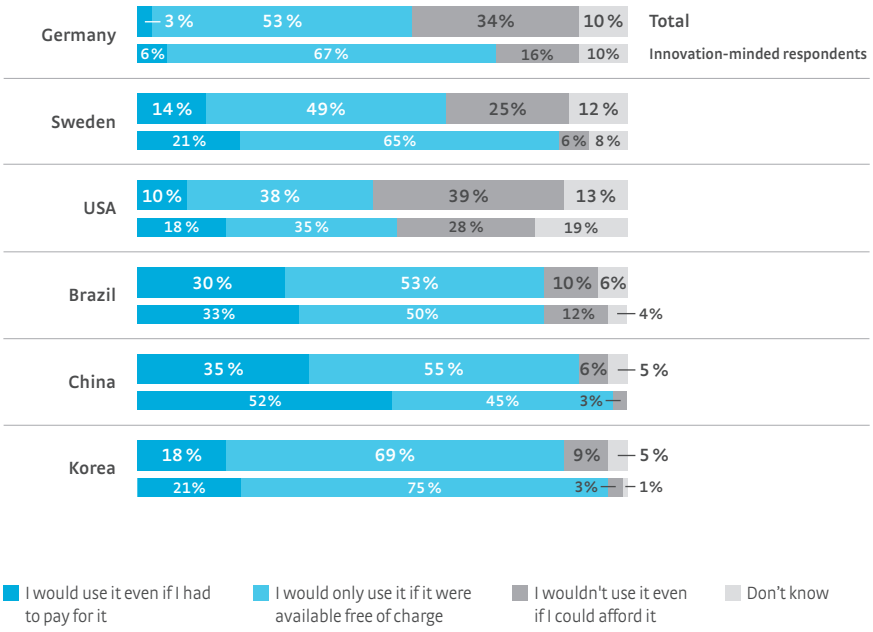
	DE	SE	USA	BR	CN	KR
Likeable	3.6	3.4	3.5	2.6	2.5	3.3
Realistic	3.1	3.0	2.8	2.6	2.5	2.5
Relevant	3.7	3.6	3.7	2.5	2.6	3.0
Transparent	3.0	3.3	2.9	2.5	2.3	3.0
Unique	2.5	2.5	2.4	2.1	2.3	2.8
Attractive	3.5	3.3	3.4	2.4	2.4	2.8

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=301, Sweden (SE) n=299, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=303, Korea (KR) n=300

FIG. 84: Willingness to pay for »the personal mobility assistant«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=301, Sweden (SE) n=299, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=303, Korea (KR) n=300;
Innovation-minded respondents: Germany (DE) n=85, Sweden (SE) n=76, USA (USA) n=91, Brazil (BR) n=86, China (CN) n=85, Korea (KR) n=90

The Germans like the personal mobility assistant least.

With an average value of 3.6, average personal likeability in Germany is much lower than in China or Brazil (average value 2.5 or 2.6; see FIG. 83). As with many other scenarios, it can be seen that personal likeability is strongly correlated with the assessment of relevance and attractiveness. In countries in which a scenario is well liked, the relevance and attractiveness are also rated highly. Accordingly the Germans assess the mobility assistant itself as less relevant, with an average value of 3.7, whereas in Brazil and China, it is assessed as more relevant (average value 2.5 or 2.6 respectively). The values for perceived attractiveness also range from 2.4 (Brazil, China) to 3.5 (Germany). In Korea, the personal mobility assistant is classified as least new and unique (average value 2.8). The best values in this regard are given by Brazil and China (average value 2.1 and 2.3 respectively).

Willingness to pay for use of the personal mobility assistant varies substantially from country to country and is lowest in Germany.

Just three percent of the Germans can imagine paying something to use the personal mobility assistant (see FIG. 84). The number is not much higher among the innovation-minded Germans, at six percent. Fascinating by comparison, in China, 35 percent of all respondents would be prepared to pay to use the scenario; among the innovation-minded it is as many as 52 percent, i. e., one in two. While willingness to pay for the personal mobility assistant is also not very great in the USA (ten percent of respondents), it is notable, compared to Germany, that here even the percentage of those who would use the scenario if it was provided free of charge is not very high (38 percent). In Germany, one in two (53 percent) say this; among the innovation-minded, two out of three respondents give this answer (67 percent). However, in both countries, the number of those who wouldn't use the assistant even if they could afford it is surprisingly high compared with the other countries. In Germany, 34 percent say this, in the USA, 39 percent. By contrast, this group is extremely small in Korea (nine percent) and China (six percent). The clearest difference between all respondents and the innovation-minded can be seen in Sweden. While there is just

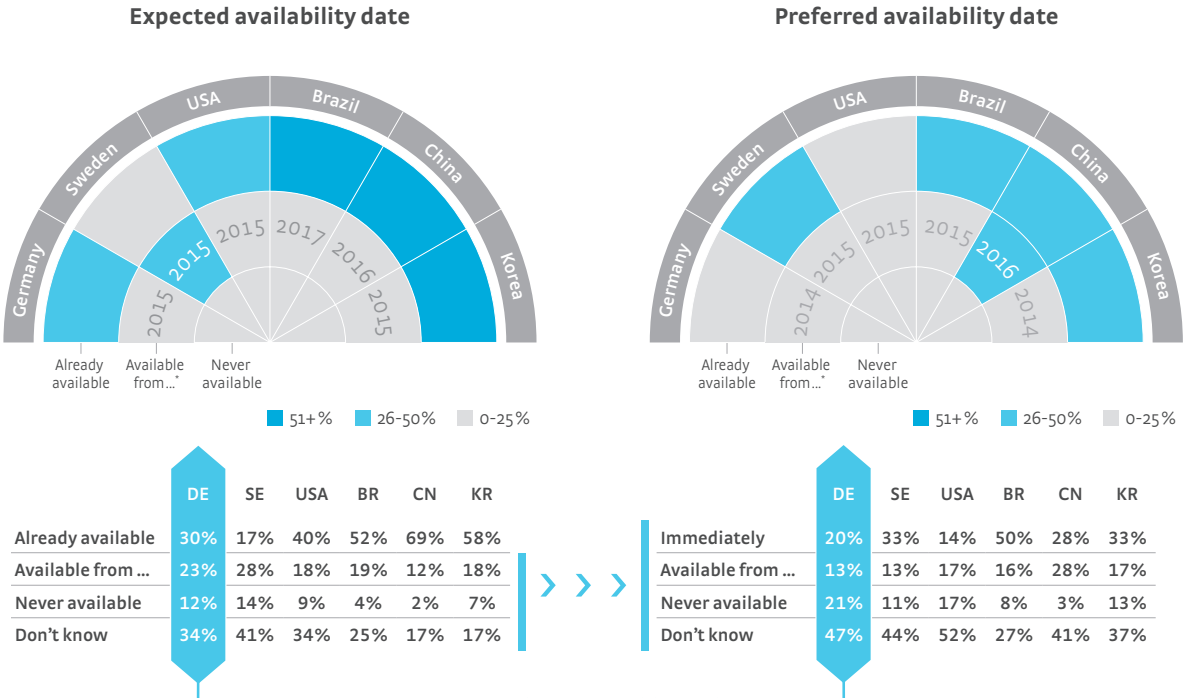
seven percent difference in those willing to pay between the two groups, the difference in "free of charge" users is twice as big: 49 percent of Swedes would use the mobility assistant if it was provided free of charge, compared with 65 percent of innovation-minded Swedes. The biggest difference is between those who would not use the assistant even if they could afford it. While 25 percent of the "normal population" fall into this category, just six percent of the innovation-minded do.

The majority of respondents believe that the personal mobility assistant is already available or will become available in 2011.

The majority of Chinese, Koreans and Brazilians believe this, in Germany it is 30 percent (see FIG. 85). In Sweden, however, 28 percent of respondents believe the scenario will not be available for the majority of people in their country until 2015 on average. A whole 12 percent of Germans think that the personal mobility assistant will never be available to the majority of people in Germany. While in Sweden, Brazil, China and Korea, the majority of those who expect the scenario to be available from 2012 and later or never would like the assistant to be available *"immediately,"* in Germany, a large percentage of respondents would like it never to become available. 21 percent of the Germans surveyed here and 17 percent of Americans do not want the mobility assistant to ever be available for the majority of people in their country.

FIG. 85: Expected availability date for »the personal mobility assistant« vs. preferred availability date for »the personal mobility assistant«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	30%	17%	40%	52%	69%	58%
Available from ...	23%	28%	18%	19%	12%	18%
Never available	12%	14%	9%	4%	2%	7%
Don't know	34%	41%	34%	25%	17%	17%

	DE	SE	USA	BR	CN	KR
Immediately	20%	33%	14%	50%	28%	33%
Available from ...	13%	13%	17%	16%	28%	17%
Never available	21%	11%	17%	8%	3%	13%
Don't know	47%	44%	52%	27%	41%	37%

"12 percent of Germans think the mobility assistant will never become a reality for the majority – rather more hope this."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=301, Sweden (SE) n=299, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=303, Korea (KR) n=300;
Preferred availability date: Germany (DE) n=211, Sweden (SE) n=248, USA (USA) n=194, Brazil (BR) n=154, China (CN) n=96, Korea (KR) n=131

“Information services related to mobility are essential in a globalized world.”

Interpretation

The personal mobility assistant, which supports users in planning and taking trips seamlessly and based on the individual user’s data, as well as automatically booking all necessary tickets and making reservations, is no great innovation from the user’s perspective and generates only moderate interest. Although around a quarter of German respondents believe they always have the latest information during a trip and can plan a trip online optimally from the starting point to the destination, up to 39 percent of respondents are concerned because the personal mobility assistant knows the personal preferences of its users and makes and bills all necessary bookings automatically. Thus a crucial aspect of the personal mobility assistant is met with rejection and calls into question the entire concept.

Only very limited willingness to pay for the service.
Respondents rate relevance, likeability and attractiveness in the middle to lower range (average values of between 2.4 and 3.7; see FIG. 83) and the values for realism, transparency and uniqueness are only marginally better. This means that the presented system is not really seen as useful or does not meet a need. It is notable that China, Brazil and to some extent Korea too, rate the personal mobility assistant much more positively than the other countries surveyed.

Another central result is that there is only minimal willingness to pay for use of the personal mobility assistant. Only in Brazil and China can a third of the population imagine using the personal mobility assistant if they had to pay for it. The situation is different if use of the assistant is free of charge. In this case, at least half of the respondents would use the scenario, except in the USA, where interest in using it is relatively low even then. The reason for this is clear: existing Internet booking portals for trips, hotels, tickets and rental cars are generally free of charge for users and it can be assumed that they also expect this from the personal mobility assistant presented for discussion.

A lot has also changed in relation to route planning and travel information over the last few years. All kinds of attractive offers can be used conveniently over the Internet. They are also increasingly available on mobile devices. But what is missing is integration across different transport operators and the linking up of separate information platforms. Thus the integration of planning and booking systems offered by the personal mobility assistant and the actuality of information is seen positively by respondents. However the fully automatic booking of selected mobility options and – to a lesser extent – also the proposed tailoring of information based on user preferences are viewed critically. In all countries, at least a quarter of respondents rated the recording and storing of habits as concerning (see FIG. 82). This is surprising insofar as the personalization of offers based on user preferences on Internet sales portals like Amazon or eBay is already generally accepted today, which also goes for making payments over the Internet. One reason for this could be that, with the personal mobility assistant, users feel they no longer have control over which providers are actually included in the travel planning for booking trips and getting information. With individual providers such as eBay or Amazon, by contrast, there is much more control in this regard.

The results of the survey suggest that the main potential of the personal mobility assistant lies in the constant updating and rapid provision of local route information. Respondents still have considerable reservations about the processing, especially with regard to automatic payment and plan change functions.

In Korea, concerns over transparency still come above security.
The assessment of concerns discussed in the Delphi Study shows interesting results in a comparison of Germany and Korea. Although Koreans give much more positive ratings than Germans on a number of aspects, such as attractiveness, realism and relevance, their assessments of some concerns are much higher up the scale than those of the German respondents. While the topic of data security appears to be the most problematic in Germany, in Korea, reservations about the transparency of route selection and the reliability of information are greater. Both categories were seen as concerning by at least 55 percent of Korean respondents. It is notable that the group of innovation-minded respondents viewed these aspects even more critically (60 percent and 64 percent; see FIG. 82). However, there are concerns about the transparency and reliability of information in all countries surveyed, even if the percentage of respondents expressing these concerns is not quite as high as in Korea. This could be due to the fact that free of charge price comparison platforms on the Internet have increasingly come under criticism recently because it is not always clear to what extent independence and neutrality are ensured.

By contrast, usability is not an issue in an international comparison. Values across all countries and groups range from 6 to 15 percent, which implies a minimal barrier and possibly also previous good experience of using mobility portals. This assumption is supported by answers to the question of expected and desired availability. Except for Sweden, where a majority of respondents are not sure when the personal mobility assistant could become available, in Brazil, China and Korea, more than half of respondents, and in Germany and the USA, at least 30 percent of respondents believe that this is already reality (see FIG. 85).

No market potential at present for continuous process chains with payment functions.

The scenario of the personal mobility assistant is based on the existing acceptance of Internet-based information services and route planning and attempts to establish integration between the services relevant for planning a trip efficiently. The results of the survey suggest that respondents view online travel planning and travel information positively and that a combination of both services would be used. Less promising, however, are the reactions to the anticipated transition to integrated handling of a trip, including bookings and payment via a portal. The fear of uncontrollable costs as well as unreliable data play a major role here. Whether trust can be established through greater transparency on the part of providers and proven reliability of the services, e. g., via a rating system, remains to be seen. However, the results of the survey show that these are basic requirements for delegating booking and payment transactions to the system. The convenience function is widely accepted and promises that the system will also pay off accordingly for providers. However, if concerns remain considerable and the continuous process chain for planning and booking described in the scenario fails due to the reservations or, to put it another way, the caution of users, the potential of the personal mobility assistant is very limited.

Opportunities for mobility assistants with reduced functions.

Information services related to mobility are essential in a globalized world. At present, three areas of application for these kinds of services can be identified:

- Traffic safety: this area is addressed by the scenario of ambient communication, which is also discussed in this Delphi Study.
- Efficiency: this area covers transport information services and dynamic route guidance systems, which in the future will also include the abovementioned ambient communication.
- Convenience: this relates to mobility management systems that provide up-to-date and better customized information and new offers for business and personal mobility needs and wishes.

The personal mobility assistant is a service that satisfies aspects of efficiency as well as convenience. In addition to seamless travel planning tailored to the user, another central starting point for the personal mobility assistant is the support of intermodality when selecting transport operators, an aspect that no mobility system currently adequately satisfies.

Currently it seems that system errors and additional costs in planning and taking a trip are accepted if additional convenience requires the provision of sensitive personal data. Security concerns, especially in Germany, have already carried weight in the past as barriers to acceptance for a range of applications, such as the new electronic ID card with its additional functions, and have prevented the anticipated success. As such, personalized mobility services with integrated payment functions, such as the personal mobility assistant under discussion, do not seem very promising at present, at least not in Germany.

However, it should be considered to what extent a mobility assistant that is not personalized and has no payment function could be effectively and economically implemented. In light of the limited willingness to pay for use of the personal mobility assistant, such a portal would have to be financed largely through advertising and agency fees. However, under such circumstances, it is questionable to what extent the necessary neutrality of the portal could be ensured. It is also questionable whether revenues from advertising and agency fees would be enough to finance the development costs for the required search engine software and the costs of operating the platform.

Summary.

It can be seen that investments in the personal mobility assistant in its described form would not pay off at present due to serious problems of acceptance. Improving current information functions and developing seamless intermodal travel planning tools seem to be more promising approaches. How cost-effective this would be remains to be clarified. At any rate, according to the results of the survey, payment and personalization functions in conjunction with mobility services that can also be used via mobile devices will have a hard time on the market.

Ambient communication.

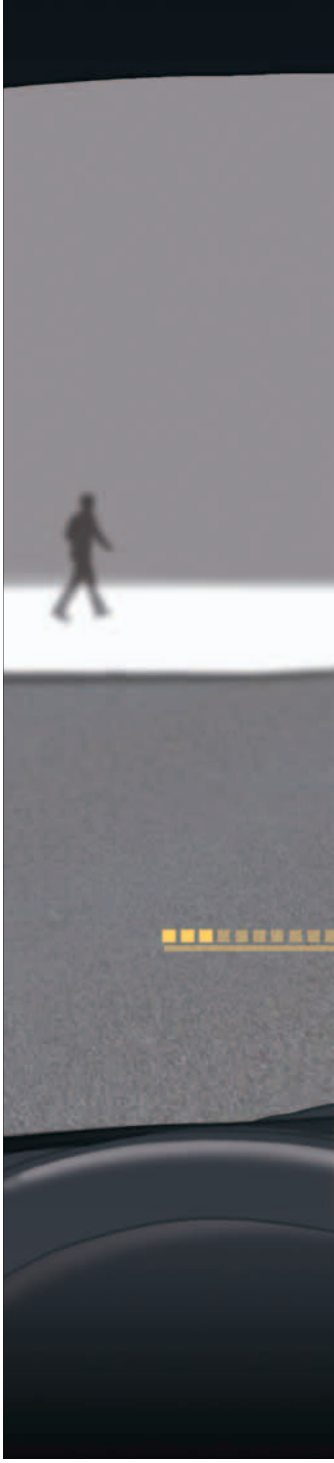


FIG. 86: Evaluation of individual aspects of »ambient communication«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

When I am driving my car, I want to know everything I can about **potential hazards** in my vicinity, in addition to local traffic reports. The traffic information provided by radio and GPS navigation devices is insufficient.

21-30%

My car is now integrated with both other cars and with the **road infrastructure** through ambient communication. As a result, I have direct access to all information about relevant traffic situations in my immediate vicinity in **real time.**

Within this system, **cars and other vehicles communicate directly with one another** and receive messages from traffic control centers and the local infrastructure, such as traffic lights and signs. This **anonymous integration** between my vehicle and its surroundings gives me the **latest traffic information,** as well as **warnings about unexpected maneuvers** by other **drivers and undetectable hazards such as icy roads.** Hazards are shown to me via a simple **visual display,** e.g., on the inside of the windscreen. This can help prevent rear-end collisions, for example, as well as **avoid** many other **potential hazards,** and I feel safer on the road. There will be fewer traffic jams and accidents, and I will reach my destination more quickly and more relaxed.

31-40%
of respondents marked this.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=294

FIG. 87: Visualization of »ambient communication«

"In Germany, the Internet will become the means of central communications access in the vehicle regarding journey-related information (e. g., route planning, traffic information, danger warnings) by 2019 at the latest."

(Result from the second phase of the study, thesis 134)

“The aim is to connect vehicles and the road infrastructure through cooperative communication systems in the future, in such a way that the traffic situation can be determined in real time.”

Dimension

Secure and reliable mobility in the future.

Researchers and entrepreneurs around the world are working on solutions that will closely interlink different modes of transport in cities and make it possible to control them intelligently. Future mobility on the roads of Europe will be characterized by the fact that destinations will be reached without accidents and it will be possible to make rapid progress without getting stuck in traffic jams, while impact on the environment remains low. In the future, one must be able to rely on the ability to get from A to B in one piece and within a defined time. Today, anyone going to an important meeting must plan in buffer time because it is not possible to determine how the traffic situation will develop on the way. In the future, however, it will be possible to plan mobility and the majority of accidents caused by careless driving will be avoided as far as possible. Ambient communication and networking though ICT are core technologies for future transportation systems.

Accident-free mobility through cooperative vehicles.

The scenario of accident-free and therefore much more efficient mobility can be facilitated by using cooperative systems. Gradually, all vehicles will be fitted with appropriate communication systems for exchanging warnings about risk situations (e. g., icy roads) with each other (cooperatively) in real time and displaying them directly in the vehicle. In order to enable this, the EU commission has provided its own radio channels in the 5.9 GHz frequency band, which is to be used exclusively for cooperative systems (see Heise 2008).

The use of cooperative systems will facilitate the extension of visibility across other vehicles through communication. This foresighted approach to driving will make the activity easier to assess and less stressful, with the result that fewer accidents will be caused, thus helping to increase the efficiency of mobility.

Congestion free mobility through cooperative infrastructure.

Today, traffic guidance systems work without interacting with drivers. The interfaces are mostly visual (traffic lights, flashing blue lights) or acoustic (sirens). The aim is to connect vehicles and the road infrastructure through cooperative communication systems (car-to-X) in the future in such a way that the traffic situation can be determined in real time and drivers can be optimally informed appropriately and guided away from traffic jams. The local information prepared by traffic control centers are transmitted locally via cooperatively communicating road infrastructure (traffic lights, signs) and displayed on vehicle devices (navigation system, etc.) in a way that is generally intelligible. This makes it easier to interpret the increasing volume of signs, which is especially important in foreign countries with an unknown language.

Thus, in the future, drivers will be completely connected to their driving environment through cooperative systems, thanks to the constant exchange of data with other vehicles and with the infrastructure. They will be instantly informed of hazards and problems en route and can get a precise picture of their mobility in real time and, if available (e. g., in urban areas), change to alternative modes of transport (park-and-ride system, public transport, etc.).

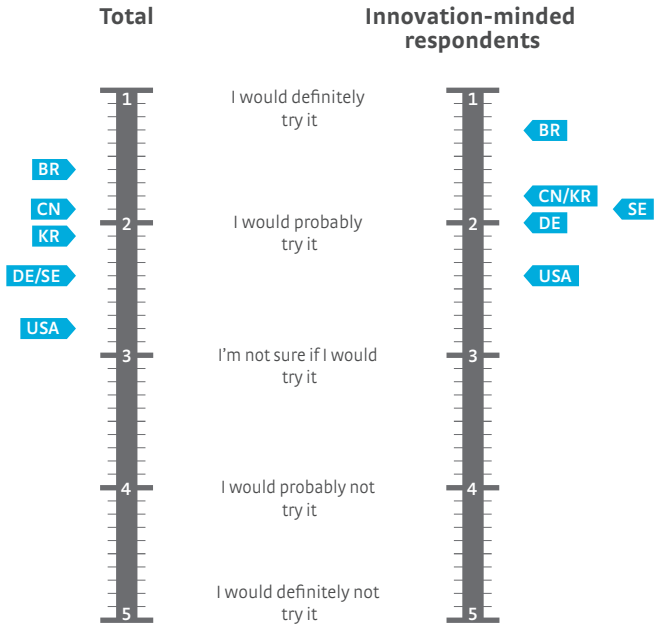
Description

The respondents from the different countries give very different assessments of the probability for a trial with ambient communication.

Above all, respondents in Brazil and China would be the most likely to try ambient communication (average values 1.6 and 1.9 respectively; see FIG. 88). The Koreans also tend to be more positive about the scenario, with an average value of 2.1. Just like the Germans and Swedes (each with an average value of 2.4) they say on average that they would probably try ambient communication. By contrast, respondents in the USA are not sure on average whether they would undertake a trial (average value 2.8). In the USA, just 13 percent of respondents would definitely try the scenario, compared with 56 percent in Brazil. In a comparison with innovation-minded respondents, it can be seen that in all countries, this group is generally more prepared to try ambient communication. However, innovation-minded Americans also score lowest here, with an average value of 2.4. Brazil also leads the innovation-minded, with an average value of 1.3, followed by China and Korea (both with an average value of 1.8). All respondents were asked to mark text in the description of the scenario that they liked or view critically.

FIG. 88: What respondents think about a trial with »ambient communication«

"How likely is it that you would try out this scenario?"



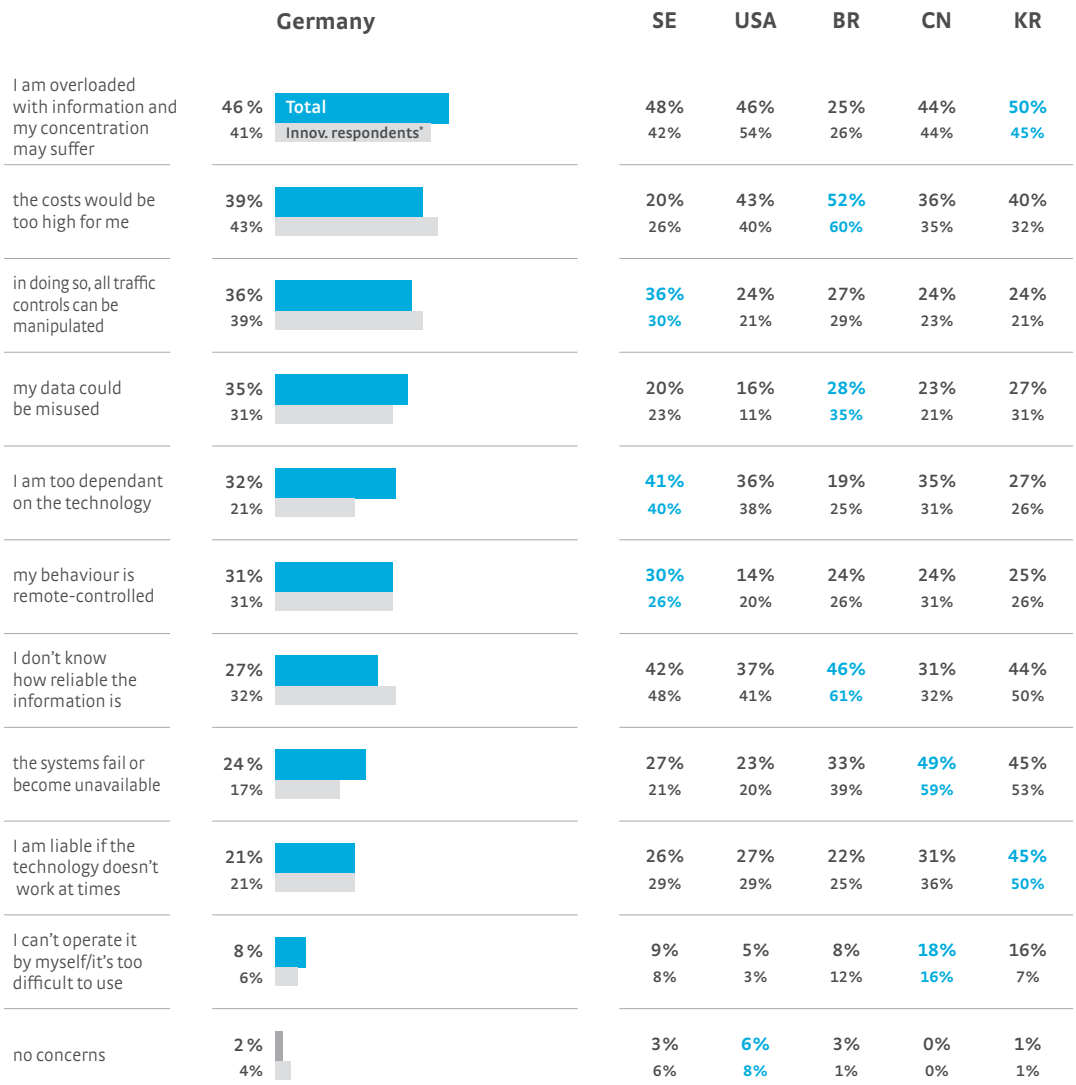
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=294, Sweden (SE) n=301, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=94, Sweden (SE) n=90, USA (USA) n=95, Brazil (BR) n=91, China (CN) n=87, Korea (KR) n=104

FIG. 89: Respondents' concerns about »ambient communication«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that …"



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=294, Sweden (SE) n=301, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=94, Sweden (SE) n=90, USA (USA) n=95, Brazil (BR) n=91, China (CN) n=87, Korea (KR) n=104

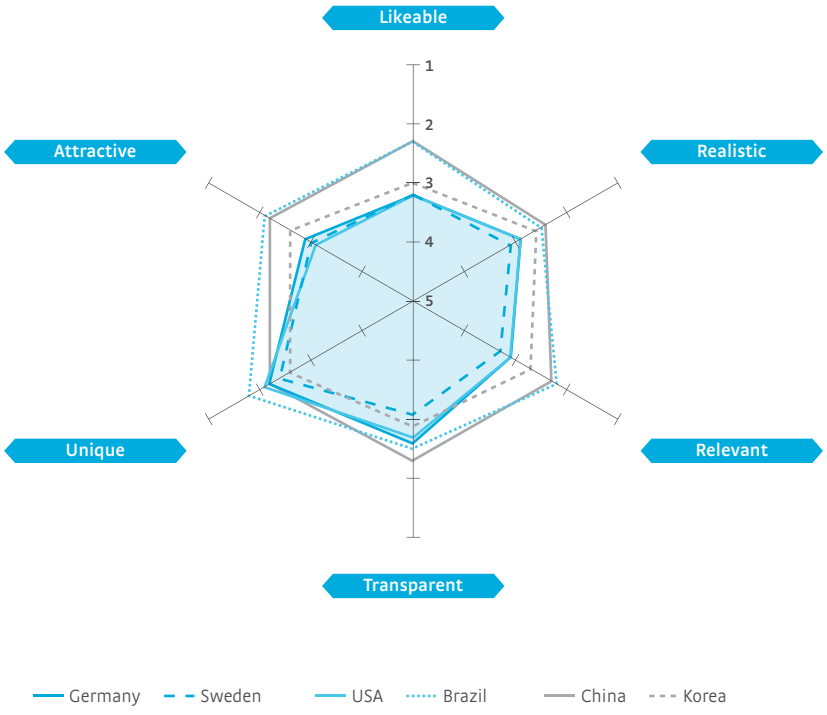
The Germans particularly like the possibility of detecting hazards at an early stage.

31 to 40 percent of respondents marked that they like to be informed about *"hazards"* (see FIG. 86). Overall, 21 to 30 percent of respondents view positively the fact that they receive *"the latest traffic information [and] warnings about unexpected maneuvers"* as well as that *"warnings about unexpected maneuvers"* or *"undetectable hazards such as icy roads"* are shown to them visually. They also marked *"real time"* and *"anonymous integration"* (each 21 to 30 percent). Notable text that was viewed critically was both *"road infrastructure,"* and *"cars and other vehicles communicate directly with one another"* (each 21 to 30 percent).

Most Germans are concerned that ambient communication would overload them with information while they were driving and that their concentration could suffer as a result (46 percent; see FIG. 89)**.** Around half of respondents in Korea, Sweden, China and the USA also share this concern (50, 48 and 44 percent respectively). It is notable that just a quarter of Brazilian respondents expressed this concern, whereas in most countries it was the most frequently expressed concern. The most widespread concern in Brazil, however, is that the costs could potentially be too high (52 percent). Among innovation-minded Brazilians, this concern is even more prevalent, at 60 percent. In the USA this concern is shared by 43 percent and in Korea by 40 percent. Sweden scores lowest here, with just 20 percent. 36 percent of Germans fear that all traffic controls could be manipulated by ambient communication. One in three respondents in Sweden and Brazil also expressed this concern (36 and 27 percent respectively). A fear frequently expressed by the Germans is that their data could be misused – 35 percent also raised this concern in connection with this scenario. Respondents in both Brazil and Korea share this concern, with 28 and 27 percent respectively naming it. The USA clearly stands apart here, with just 16 percent of all respondents and one in ten of the innovation-minded respondents.

FIG. 90: Ratings for individual aspects of »ambient communication«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



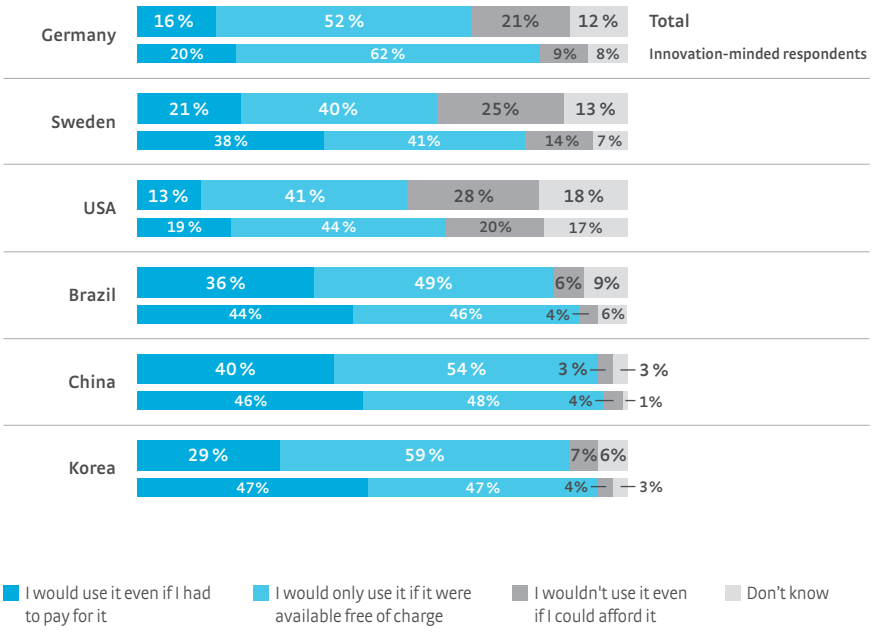
	DE	SE	USA	BR	CN	KR
Likeable	3.2	3.2	3.2	2.3	2.3	3.0
Realistic	2.9	3.1	2.9	2.5	2.4	2.6
Relevant	3.1	3.3	3.1	2.2	2.3	2.7
Transparent	2.6	3.1	2.7	2.5	2.3	2.9
Unique	2.2	2.4	2.1	1.8	2.2	2.6
Attractive	2.9	3.0	3.1	2.1	2.2	2.6

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=294, Sweden (SE) n=301, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302

FIG. 91: Willingness to pay for »ambient communication«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=294, Sweden (SE) n=301, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=94, Sweden (SE) n=90, USA (USA) n=95, Brazil (BR) n=91, China (CN) n=87, Korea (KR) n=104

In Sweden, the USA and China the results from the scenario shows that more than a third of all respondents fear becoming too dependent on the technology (41, 36 and 35 percent respectively). The Brazilians take a more relaxed view: just 19 percent expressed this concern.

One in three Germans and one in three Swedes suspect that ambient communication could control their conduct remotely (31 and 30 percent respectively). In the USA, this concern was named by just 14 percent. Brazilian and Korean respondents are concerned that they will not know how reliable the information is if they use ambient communication (46 and 44 percent). Sweden comes next with 42 percent. Overall, this is in fact the second greatest concern among Swedish and Brazilian respondents.

In a comparison of countries, ambient communication scores best for likeability in China and Brazil.

While the scenario is not so well liked in Germany, Sweden and the USA (average value of 3.2 in all three; see FIG. 90), the Chinese and Brazilians find it much more likeable, with an average value of 2.3. Ambient communication is assessed to be least realistic in Sweden (average value 3.1), whereas the Chinese respondents on average find the scenario to be very realistic, with an average value of 2.4. The relevance of the scenario scored best in China and Brazil, with average values of 2.3 and 2.2. By comparison, the Swedes assess the scenario as only somewhat relevant (average value 3.3). However, Germany and the USA do not perceive ambient communication as being much more relevant (average value of 3.1 in both countries).

Whereas the Brazilians view the scenario as very new and unique (average value 1.8), the Swedes and Koreans give this aspect a worse assessment (average value 2.4 and 2.6 respectively). The group of all respondents in both Brazil and China rate the scenario as very attractive (average value 2.1 and 2.2 respectively). Innovation-minded respondents in both countries find the scenario on average to be even more attractive (average value 1.7 and 1.9 respectively). In the USA, Sweden and Germany, it is only rated as somewhat exciting (average value 3.1, 3.0 and 2.9 respectively).

Willingness to pay for ambient communication is relatively low, especially in Germany.

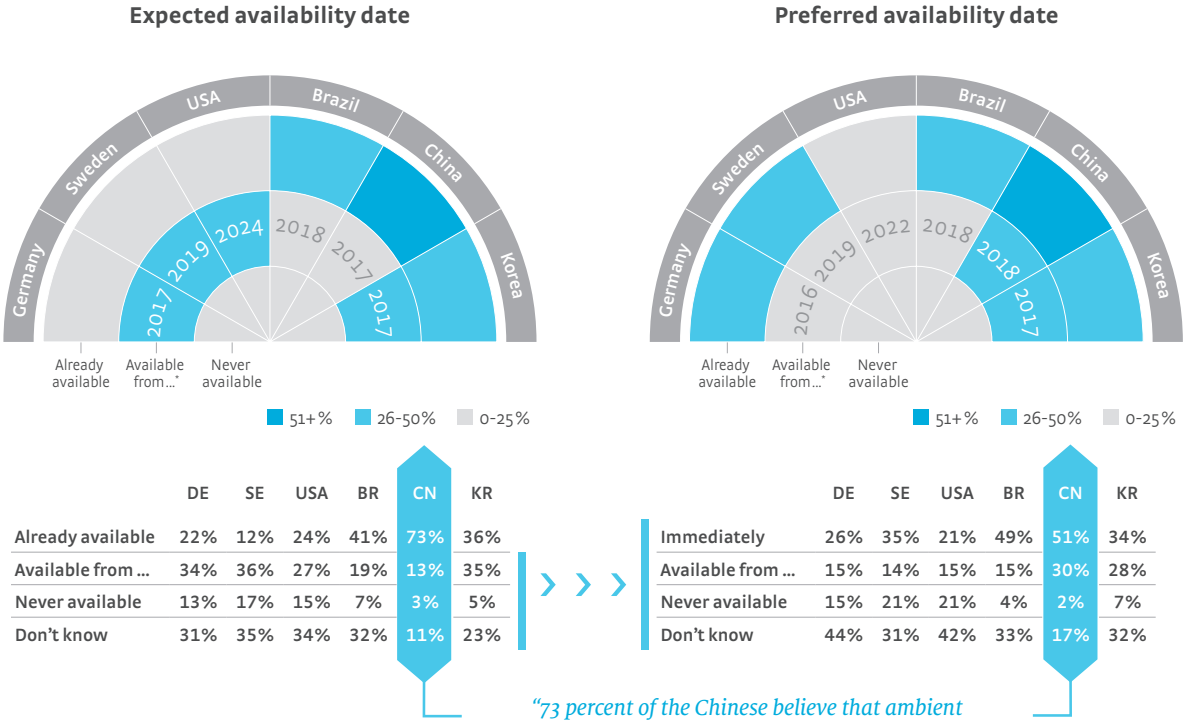
More than half of the Korean and Chinese respondents say they would only use the scenario if it was provided free of charge (59 and 54 percent respectively; see FIG. 91). In Germany and Brazil too, one in two respondents share this opinion (52 and 49 percent respectively). Among the innovation-minded Germans, as many as 62 percent would use it, if it was provided free of charge. While a large proportion of respondents in China and Brazil would pay to use ambient communication (40 and 36 percent), in Germany and the USA, comparatively very few respondents would do so (16 and 13 percent). The stark differences between all respondents and the innovation-minded in Korea and Sweden are notable. In Korea, one in two of the innovation-minded would pay for the scenario (47 percent) and in Sweden almost twice as many (38 percent) as among all respondents. Also for the aspect of willingness to pay, it can be seen that the Americans, Swedes and Germans view the scenario very critically, since a large percentage would not use ambient communication even if they could afford it (28, 25 and 21 percent). In China, Brazil and Korea, it is not even ten percent.

Expectations about the availability of ambient communication are divided.

While the Chinese, Brazilians and Koreans think ambient communication is already available (73, 41 and 36 percent), the Swedes, Germans and Americans believe it will not become available to the majority of people for several years (36, 34 and 27 percent; see FIG. 92). 17 percent of Swedes even think that the scenario will never become available. When asked when they would like the scenario to be available, the most given answer in all countries is *"immediately."* However, a large proportion of Swedes and Americans also say they would like it never to become available.

FIG. 92: Expected availability date for »ambient communication« vs. preferred availability date for »ambient communication«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	22%	12%	24%	41%	73%	36%
Available from ...	34%	36%	27%	19%	13%	35%
Never available	13%	17%	15%	7%	3%	5%
Don't know	31%	35%	34%	32%	11%	23%

	DE	SE	USA	BR	CN	KR
Immediately	26%	35%	21%	49%	51%	34%
Available from ...	15%	14%	15%	15%	30%	28%
Never available	15%	21%	21%	4%	2%	7%
Don't know	44%	31%	42%	33%	17%	32%

"73 percent of the Chinese believe that ambient communication is already available to the majority of people in their country – only a few would like it to never become available for the majority."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=294, Sweden (SE) n=301, USA (USA) n=303, Brazil (BR) n=301, China (CN) n=300, Korea (KR) n=302;
Preferred availability date: Germany (DE) n=232, Sweden (SE) n=267, USA (USA) n=228, Brazil (BR) n=188, China (CN) n=85, Korea (KR) n=201

“The need for intelligent transportation systems is growing rapidly.”

Interpretation

In the future, connected transportation systems and up-to-date information about the fastest connections are to ensure that drivers reach their destination safely, in comfort, and always on time, despite rising congestion. Many megacities and metropolitan regions already have to endure interminable traffic jams, a dire lack of parking and muggy air, and problem spots in the traffic often can’t be detected quickly enough due to a lack of networking of drivers and infrastructure. This can be remedied by an intelligent infrastructure with ambient communication. Respondents currently still view the ambient communication scenario critically in parts. Positive aspects of this scenario are *“the latest traffic information”* (21 to 30 percent) and information about *“undetectable hazards”* (21 to 40 percent; see FIG. 86).

In today’s cars, users can already find out traffic information from the radio and navigation devices, although generally with a delay and not in real time. 21 to 30 percent of the German respondents find the possibility of receiving information in *“real time”* exciting (see FIG. 86). This is enabled through the ambient communication and the connecting of cars with each other in cooperative transportation systems. This makes a huge amount of data and traffic information available that can be used by drivers as well as by control centers. There are already many additional traffic services on the market, but they are not yet accepted if they incur additional costs. This behavior by potential users is also confirmed by the results of the study. In most countries, the expected availability date coincides with the preferred availability date. The barriers are to be overcome through the use of innovative technologies in conjunction with suitable business models that enable refinancing through new services and IT services. The ambient communication scenario shows that respondents are not worried about not being able to learn how to use the technology, thus the future level of use depends rather on a no-cost service for the end user with tamper-proof technology.

Acceptance and use of traffic information via ambient communication.

46 percent of the German respondents are concerned that they would be overloaded with information while they were driving and that their concentration could suffer as a result. There are similar concerns in Korea, China, Sweden and the USA. In addition, the respondents think dependence on the technology will be too great and many respondents also question the reliability of the information (see FIG. 89). This is surprising inasmuch as there are already a range of driver assistance systems in today’s cars, some of which are already based on communication of vehicles with their surroundings and traffic services. Car manufacturers are working hard on suitable man-machine interfaces that will prevent information overload and enable easy usability and readability. The communication is largely anonymous and takes place in the background where the driver cannot detect it. But there are also functions that allow the driver and his passengers to use IT services at any time during the journey. More than half of the respondents in Korea and China would use these technologies if such services were provided free of charge, among the innovation-minded Germans it is as many as 62 percent (see FIG. 91). In the USA just 13 percent and in Germany just 16 percent would pay and the majority of respondents in these countries do not expect truly functional ambient communication to be available for several years yet (see FIG. 92). In the USA and Germany, the aspects of likeability, attractiveness and relevance are rated with average values between 2.9 and 3.3 (see FIG. 90). The results of the study are in keeping with the observations of many researchers and entrepreneurs around the world, who are working on new transportation solutions with ambient communication and networking of modes of transport. The product innovation must therefore go hand in hand with the development of suitable business models and a range of commercial ideas.

Traffic problems and security requirements are resolved by cooperative transportation systems.

The need for intelligent transportation systems is growing rapidly. The global urbanization cannot be halted. According to a recent study, by 2025, some 4.5 billion people will live in cities – that is a good 60 percent of the world’s population (see Frost & Sullivan 2011). To make sure that life in cities remains attractive, municipal decision-makers and mobility providers are looking for new solutions. The idea is that, in order to enable people to get quickly and effectively from A to B in major cities, people are guided through the urban jungle by intelligent systems. These cooperative transportation systems communicate with all players and the infrastructure.

The ambient communication scenario is also shaped by two basic transportation requirements: first, the reaching of a destination without accident, and second rapid progress without congestion or other unforeseen traffic situations. In the future, people will want to get around in one piece and within a defined time. Today, when going to important meetings, buffer time must be planned in because a non-deterministic mobility situation still has to be assumed. The aim must therefore be to make mobility plannable through the linking-up of cars with each other and with the intelligent infrastructure and at the same time constantly improving security within the transportation systems.

This already works today in rudimentary form. The global expansion of ICT and the mobile Internet offer enormous potential for networking inner-city traffic even more efficiently. Mobile communications technology can be used for car-to-infrastructure communication, with which traffic controls can react even faster. The individual components are getting increasingly intelligent, but it is not enough. In order to be able to master the challenges of growing congestion in cities, information from the individual transportation systems needs to be pooled and used to control and optimize traffic flows. But it must also be ensured that additional services remain affordable and are supported by new business models. Only then will acceptance of these services also increase in western countries.

Restraint from Germany in an international comparison.

More than half of the respondents in Germany, China and Korea would use this technology if the service was provided free of charge. As in the USA, only a little over a tenth of users in these countries would be willing to pay. As such, it is not surprising that the costs are seen as a typical concern. Also notable are the concerns of the Germans with regard to the misuse of data and potential manipulation of traffic routing, which were both named by around a third of respondents. 46 percent also fear that their concentration could be affected by being overloaded with information while driving (see FIG. 89).

In an international comparison, these evaluations of the scenario are to some extent unexpected and also serious. The results, as well as initial pilot trials in other countries, provide a learning effect. Megacities in the Middle East have recognized that the networking of all road users, including public transport, will play a crucial role here. For example, the integration of transportation systems has highest priority for planners in Dubai, enabled by means of communication and intelligent infrastructure. Drivers communicate purposely and anonymously with control centers and service providers and in this way are informed about the current traffic situation or costs.

The needs of future generations must also be taken into account. Young people in major cities in particular are increasingly doing without their own car (see Bratzel 2010 among others). More and more, this object of desire and symbol of personal independence has become a plain and simple tool of mobile functionality (see Kruse 2010). The car is now just one of many forms of modern transportation. At the same time, constant access to IT services and the ability to communicate at all times are increasingly turning into basic needs for the Internet generation.

Networking cars through ambient communication is a necessary requirement for intermodal solutions in conjunction with forms of public transport. Car manufacturers have also long since been adapting to the changed mobility needs of their customers. They want to sell not only cars, but also mobility. Drivers today already draw on a range of information from the radio and navigation systems, and other driver information systems are finding their way into the car. In the future, in addition to car sharing offers for electric cars in the city, companies will also place more emphasis on connecting with local public transport (see “The personal mobility assistant” scenario).

Improved mobility as a basic need of society.

Mobility is a basic need of society and, in addition to improving the flow of traffic, local authorities must also optimize public transport. In order to make their offer as attractive as possible, all offers must interconnect with each other as efficiently as possible. Ambient communication, intelligent road infrastructure and traffic management systems are already used now in conjunction with IT solutions to compile and make available the relevant data. This means that the growing volume of information from intermodal processes can be used effectively in the traffic control centers of cities. This brings economical and ecological benefits for all road users, transport operators, local authorities and ultimately society as a whole. The road infrastructure of major European cities will also be optimized in the near future, in order to constantly improve mobility and logistics. In London, for instance, up to 70 percent of the city’s budget will be spent on connected transportation and logistics solutions over the next few years.

The scenario also places emphasis on the trend toward greater traffic safety. The linking up of cars with each other and with the intelligent road infrastructure is a means of providing information about hazards, avoiding them, and accordingly also reducing the number of accidents on the road – after all, at present there are still too many accidents on the roads of Europe. Despite improvements in automotive construction and intelligent vehicle sensors, it has not yet been possible to prevent all accident risks. The aim is to connect all vehicles with each other in the future, so that they can share information with each other using real-time radio communication (between vehicles and with the infrastructure), even at high speeds. They will exchange warnings about abrupt or unforeseen maneuvers by drivers and risk situations on the road (e. g., icy roads). The large number of accidents on the road gives rise to abnormal situations during journeys, which result in obstructions, roadblocks, traffic jams and often also injuries, which suddenly and unexpectedly restrict mobility.

The use of communicative and cooperative systems facilitates the extension of visibility across other vehicles. This "foresighted" approach to driving enables users to better assess the traffic, make driving stress-free, and thus help to increase the efficiency of mobility. Overall, despite a high degree of openness to innovation in western countries, acceptance needs to be improved for all users and providers through suitable solutions and business models.

An intelligent road infrastructure requires investment.
The vision of accident-free mobility using cooperative ambient systems will become technically feasible from 2015. Astonishingly, the majority of car drivers in China already believe ambient communication to be available, whereas in Germany, Sweden and the USA, most respondents believe realization is still a few or many years off (see FIG. 92). In order to realize the scenario of accident-free and thus substantially more efficient mobility, all vehicles must gradually be fitted with appropriate communication systems for exchanging warnings about risk situations with each other and displaying them directly in the vehicle. In later versions, intervention from within the vehicle would even be practical.

Today, traffic guidance systems work without interacting with drivers. The aim is to connect vehicles and the road infrastructure through communication with cooperative systems (car-to-X) in the future in such a way, and to determine the traffic situation in real time, such that drivers can be optimally guided and informed. Currently, due to a lack of communication and the passive infrastructure, no suitable measures can be taken to break down the traffic load or counteract it. This gives rise to huge economical and ecological burdens and losses for society, which can be reduced by the use of ambient communication and new cooperative transportation systems.

Of course, the use of new technologies requires infrastructure in western countries to be optimized and even greater investments to be made in transportation networks in Asian or BRIC countries. But these costs can be redeemed over the long term through anticipated savings as well as new sources of income from the provision of traffic services with corresponding business models. In addition, new business models will evolve from the use of the available data, while the use of new IT solutions will open up potential for providers of additional traffic services. This gives rise to great business potential worldwide for large providers, but also for small and medium-sized businesses or start-ups with intelligent solutions and innovative ideas. Thus the ambient communication scenario offers huge economic potential.

Increased mobility through multimodal transportation systems.
By continuously transmitting vehicle data (position, speed) to the traffic control center through communication and cooperative systems (car-to-X communication), the control center receives a detailed picture of the traffic situation and, in return, can provide realistic forecasts about traffic jams in real time and send them to car drivers in good time. Thus, in the future, drivers will be completely connected to their driving environment through cooperative systems, thanks to the constant exchange of data with other vehicles and with the infrastructure. They have a full picture of the traffic flow throughout the entire journey, are informed instantly of hazards and problems, and can get an accurate overview in real time. They receive information about the optimum route to take and, if necessary, can switch to alternative modes of transport, especially in urban areas (park-and-ride, public transport, etc.; see also "The personal mobility assistant" scenario). By networking all modes of transport, it is possible to increase mobility not just in urban areas or regionally, but also at a global level. For society, this optimizes traffic, transport and logistics at a global level by using cooperative mobility systems.

In the past few years, providers and local authorities have endeavored to optimize the effectiveness and capacity of individual modes of transport. Traffic guidance systems now direct the flow of traffic in many cities and cars process information through traffic lights or signs. Drivers communicate with each other and there are already occasional intermodal offers by rail operators and airports. There's also already a large number of telematic services available to car drivers, but these generally find little acceptance due to the unwillingness of users to pay for them.

Multimodality through cooperation.

Cooperation between different operators is also made difficult by the lack of communication, compatibility of the technical systems, and a lack of overall openness toward collaboration. All providers and local authorities are called upon to facilitate the networking of modes of transport in the future by using new technologies as well as new shared operator and business models. The findings of a series of pilot projects and initiatives are to be used to optimize transportation solutions at a global level. The need for standardization and regulation by countries and local authorities must be met through the cooperation of countries, local authorities and industry. In order to enable this, the EU commission has provided its own radio channels in the 5.9 GHz frequency band, which can only be used for ambient communication and cooperative systems. Research and development for future ambient communication and intelligent transportation solutions requires politics and business to work closely together to develop suitable financing and operator models. Industry and research must also further development sensitive systems, IT solutions, and use historical and empirical traffic data in order to ensure improved mobility in the future. Ambient communication is a first step and also in the future a necessary requirement of networking drivers.

Summary and recommendations.

The ambient communication scenario and thus the networking of all drivers is seen very positively overall, but certainly does not yet meet the expectations of researchers and entrepreneurs all over the world who are working on solutions for improving the traffic situation. More than half of the respondents would use ambient communication if it was offered free of charge.

Costs are second on the German respondents' list of concerns. Interestingly, other concerns, apart from the fear of data misuse, are the risk of information overload during the journey and a resulting lack of concentration, as well as the risk of manipulation of the traffic situation. Such fears and concerns must be taken into account when further developing these forward-looking mobility concepts and dealt with through appropriate measures, especially political ones. Business, especially the automotive industry, must agree as a whole to introduce ambient communication. Through the Car-2-Car Communication Consortium, initiatives are currently underway at European level to gain a commitment from both the automotive industry and the umbrella associations of road operators to introduce this technology from 2015. Politics should also give a clear commitment to introducing ambient communication and provide the relevant funds for putting the infrastructure in place. The standardization of ambient communication at European level must be agreed as quickly as possible, so that the rollout of this technology can start in 2015.

Future transportation solutions with cooperative systems not only compile data from the different transportation and information systems and visualize them for the traffic control centers of urban areas, but also simplify the communication and interaction between drivers. Every action is mapped and transparent for all. No one knows what will be possible in the future through the use of new technologies. By transmitting information to mobile devices, drivers on the move can also be involved in the decision-making. This not only makes reaction times faster, it also makes the coordination process more accurate and safe. Traffic flows, buses and trains are more punctual, the environmental impact is reduced. The traffic information is also available to people in the city. They can check the current traffic situation at any time via their smartphones or from display boards and decide spontaneously which mode of transport to take. Ambient communication and connected transportation systems are the prerequisite for future mobility and the acceptance of such systems will also increase thanks to optimized route planning and travel costs.

The autonomous car/car on demand.

FIG. 93: Evaluation of individual aspects of »the autonomous car/car on demand«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

21-30%
of respondents marked this.

Independent mobility is important to me. But sometimes I wish I didn't have to drive myself, so I could use my time spent on the road for other things.

There is now the autonomous car. I can **decide whether I** want to drive **myself or let the car** drive for me. If I want, it will take me and my family to our desired destination completely autonomously, without a human driver. I still maintain my personal mobility and independence, but can use my time for other things, like work or a quick nap.

When I enter my destination, my autonomous car can take me from one place to another without a driver. It can also take my family members to their desired destinations, whether they are able to drive or not, without me having to drive them there. I simply set the car to "autonomous mode" and enter the destination.

An autonomous car can also be **rented** simply **over the Internet** and drives itself to the agreed place at the defined time. This means I can have unlimited personal mobility even **without** a car or **a driver's license.**

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=303

FIG. 94: Visualization of »the autonomous car / car on demand«

"In Germany, autonomous driving, i. e., without the "driver" actively controlling the vehicle, will be permitted in some subsections of the traffic system by 2030 at the latest."

(Result from the second phase of the study, thesis 138)

“The car on demand is no longer a utopian concept. The necessary technologies are essentially out there.”

Dimension

Autonomous vehicles are already reality today. In factories, automated forklifts ensure that goods and parts arrive in the right place at the right time; at large ports, autonomous container transporters are an indispensable component of logistics. These days, trucks at large mines or closed plants also find their way automatically; and at the Expo 2005 world exposition in Nagoya, largely automated buses ferried visitors around the site.

Nevertheless, for many people, the thought of getting into a car and being automatically transported to their destination without doing anything themselves is still a “thing of the future,” even though the idea has gripped researchers on all continents for the last five decades.

A year ago, Google thrust autonomous driving into the limelight in spectacular fashion. A fleet of Toyota Prius cars, with “safety drivers” behind the wheel has now driven autonomously across large parts of the USA without intervention by the safety drivers, and the licensing of autonomous driving is now within reach, at least in Nevada.

The Google vehicles are still research vehicles and their sensor systems are so expensive they would never be found in production models. But so much progress has been made in technical developments in the last few years that even today’s cars can already automatically maintain the correct distance from the car in front using radar measurement, and brake automatically in an emergency or, with the assistance of cameras, put the driver gently back on course if he strays from his lane. If modern cars can already support their drivers to this extent today, why shouldn’t future cars be able to take over a greater part of the task of driving, or even take over driving entirely from the driver?

However, the chosen scenario goes yet another step further. The car on demand presents a new mobility concept in which the autonomous car is just one, albeit a major, component. The car on demand arrives driverless at the desired location at the requested time and picks up its passengers. Those who wish to do so can drive the car on demand themselves, but it is also possible to be automatically driven by the car on demand and to use the journey time for other things. It is also possible to electronically link together several cars on demand into larger units, for example, if one car is not enough for a family outing.

The vision of car on demand is still a long way off. The technology needs to be much more advanced before it can become reality. High-definition and long-range sensor systems for recording the vehicle’s environment must be available at low cost, as well as high-performance control units that are capable of drawing the same conclusions from the sensor data as an experienced driver and then giving the right instructions to the different actuators in the vehicle. Furthermore, the car on demand must be capable of communicating with its environment. The relevant communication technologies for this, such as LTE or Car-2-X communication, already exist today, but would have to be augmented for use in autonomous vehicles.

Thus the car on demand is no longer a utopian concept. The necessary technologies are essentially out there. They just need to be developed further and brought together. When this happens, and this is to be expected, the car on demand will cease to be a vision.

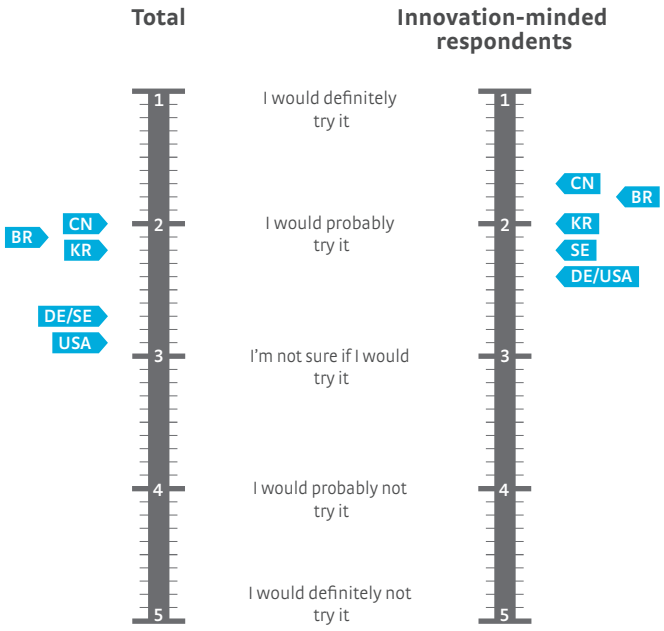
Description

Chinese respondents are mostly willing to try out the autonomous car/car on demand.
With an average value of 2.0, the Chinese score higher than the Brazilians and the Koreans (2.1 and 2.2 respectively; see FIG. 95). In these three countries, the respondents say on average that they would probably be willing to try the autonomous car/car on demand. The Germans and Swedes (average value 2.7) and the Americans (average value 2.9), by contrast, are not sure on average whether they would try it. Among the innovation-minded, the average values of the different countries are more or less similar. Here too, the Chinese lead the field with a value of 1.7, but the Germans and Americans, who score lowest here, are not so far behind, with an average value of 2.4. The largest percentage of respondents who say they would definitely like to try the scenario is the Brazilians (45 percent) – among the innovation-minded Brazilians it is as many as 60 percent.

The respondents marked all the text for the scenario that they like, as well as the text they view critically.

The German respondents marked a number of aspects as positive, e.g., 21 to 30 percent underlined the aspect of "independent" – not being dependent on defined timetables seems to be important to these respondents (see FIG. 93).
Also, 21 to 30 percent of respondents marked the fact that the autonomous car/car on demand gives them the option to *"decide whether I want to drive myself or let the car drive for me"* as particularly positive. Thus having the option is an important aspect for the use of an autonomous car/car on demand. The fact that the car can also be *"rented [...] over the Internet"* also seems to be a plus point for 21 to 30 percent of the Germans. By contrast, *"without [...] a driver's license"* was viewed critically by 21 to 30 percent of the German respondents. The fact that people without a driver's license could also use the autonomous car/car on demand seems to have negative connotations for many respondents. Possibly they want users of these special vehicles to have training behind the wheel to fall back on in case of an emergency.

FIG. 95: What respondents think about a trial with »the autonomous car/car on demand«
"How likely is it that you would try out this scenario?"



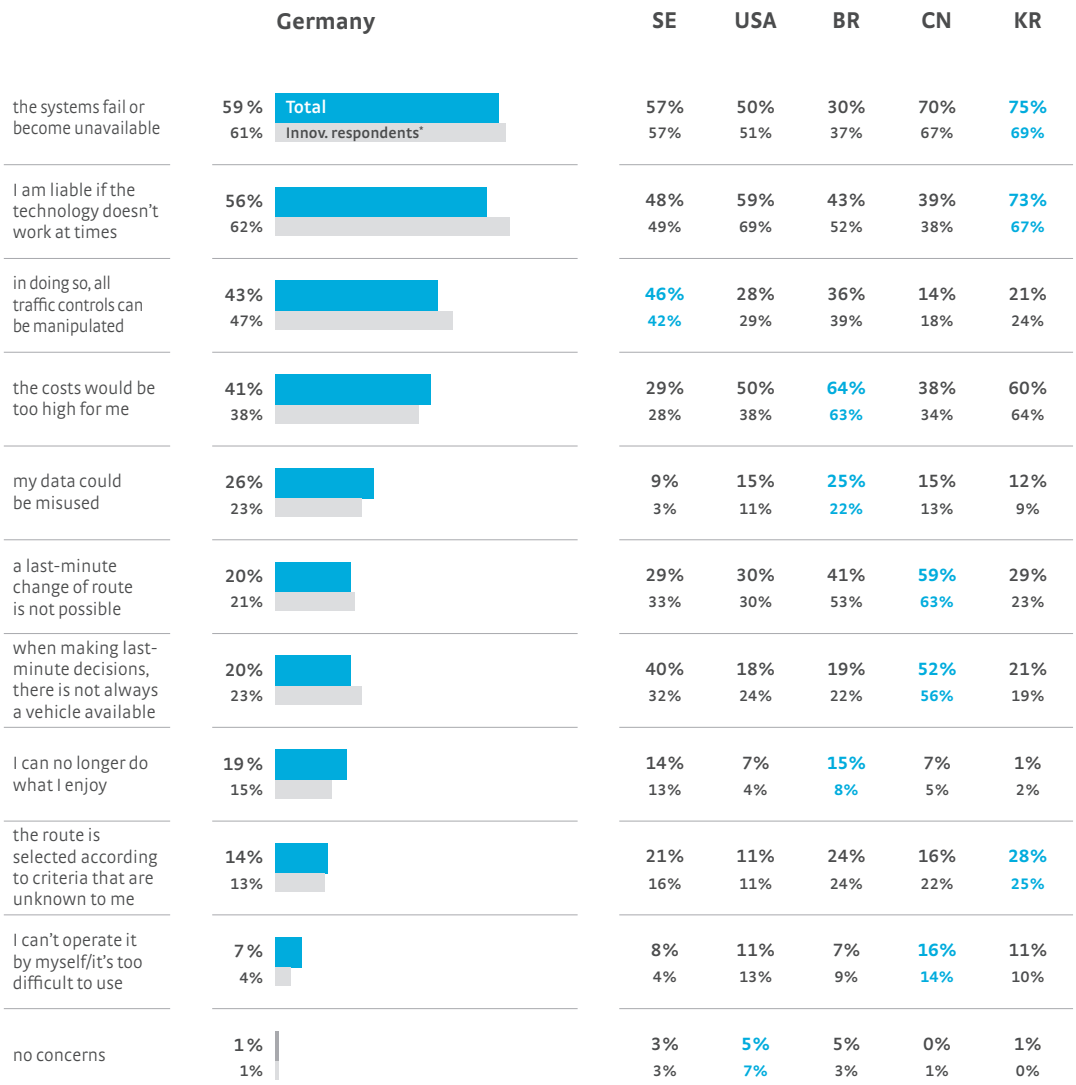
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=303, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=299;
Innovation-minded respondents: Germany (DE) n=95, Sweden (SE) n=105, USA (USA) n=83, Brazil (BR) n=101, China (CN) n=90, Korea (KR) n=87

FIG. 96: Respondents' concerns about »the autonomous car / car on demand«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that …"



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=303, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=299;
Innovation-minded respondents: Germany (DE) n=95, Sweden (SE) n=105, USA (USA) n=83, Brazil (BR) n=101, China (CN) n=90, Korea (KR) n=87

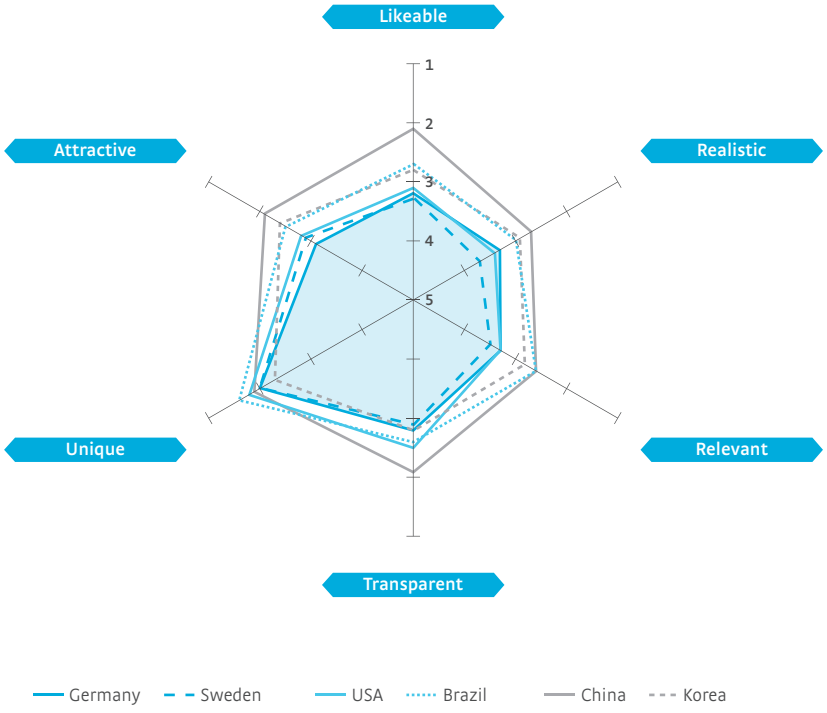
The greatest concern of respondents with regard to the autonomous car / car on demand is the reliability of the technology.

Understandably, many respondents are concerned about what would happen if the technology of the autonomous car / car on demand were to fail. 59 percent of Germans name this concern in connection with the scenario; in Korea it is as many as 75 percent of all respondents (see FIG. 96). In Brazil, just 30 percent of respondents specify this concern. The Brazilians appear to have more confidence that the technology would only be rolled out on the market once it was mature. Another important concern named by 56 percent of all respondents in Germany and 62 percent of the innovation-minded Germans, is of personal liability if the technology were to fail. The Koreans are especially concerned about this aspect (73 percent). In China and Brazil, by contrast, just 39 and 43 percent of all respondents respectively share this fear.

43 percent of Germans and 46 percent of Swedes believe that all traffic controls can be manipulated in this manner – in China, just 14 percent of respondents express this as a possible concern. The cost aspect is named above all by the Brazilians (64 percent); however, 41 percent of German respondents also fear that the costs of the autonomous car/car on demand could be too high for them. In Sweden, only one in three shares this concern (29 percent). The concern that otherwise comes up so often in Germany – misuse of data – only takes fifth place in this scenario. "Only" 26 percent of Germans checked this concern. Nevertheless, in an international comparison, German respondents are still most concerned about this. In Sweden only nine percent expressed this concern. While just 20 percent of Germans believe it would not be possible to suddenly change the route after starting the autonomous car/car on demand, 59 percent of the Chinese are concerned about this. Another concern relates to the possibility of ordering an autonomous car/car on demand over the Internet as a rental car. One in two Chinese fear that no autonomous car/car on demand would be available if decided on spontaneously or required at short notice. In the USA, by contrast, only 18 percent of respondents named this concern, in Germany just 20 percent.

FIG. 97: Ratings for individual aspects of »the autonomous car/car on demand«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



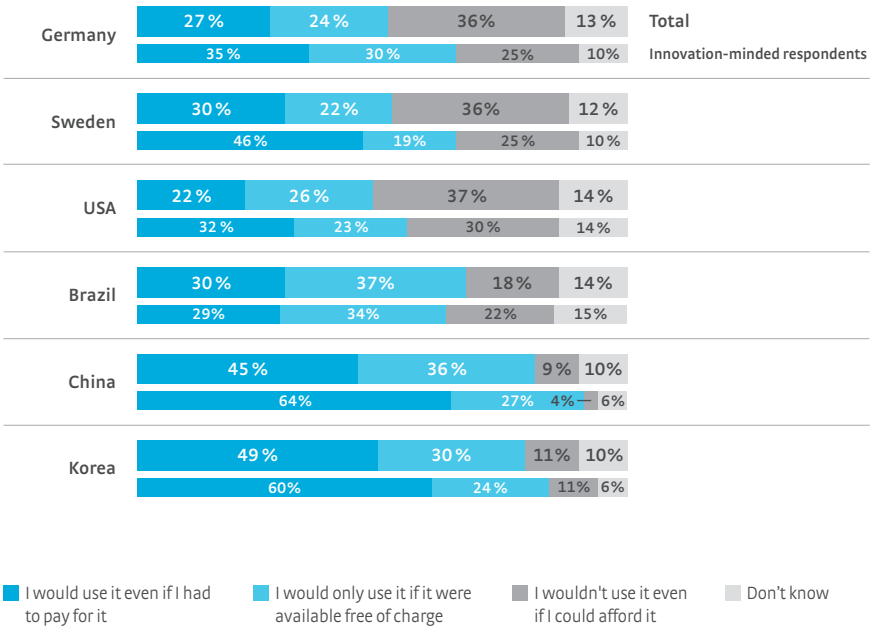
	DE	SE	USA	BR	CN	KR
Likeable	3.2	3.3	3.1	2.7	2.1	2.8
Realistic	3.3	3.7	3.4	3.0	2.7	2.9
Relevant	3.3	3.5	3.3	2.6	2.6	2.8
Transparent	2.8	2.9	2.5	2.6	2.1	2.8
Unique	2.0	2.0	1.8	1.6	1.9	2.3
Attractive	3.1	2.9	2.8	2.5	2.1	2.4

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=303, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=299

FIG. 98: Willingness to pay for »the autonomous car/car on demand«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=303, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=299;
Innovation-minded respondents: Germany (DE) n=95, Sweden (SE) n=105, USA (USA) n=83, Brazil (BR) n=101, China (CN) n=90, Korea (KR) n=87

The autonomous car/car on demand is liked to varying degrees in the different countries surveyed.

While the Chinese generally like the scenario very much, with an average value of 2.1, respondents in Germany and Sweden "only" liked it somewhat (average value 3.2 and 3.3 respectively; see FIG. 97). This corresponds to the assessments of relevance and attractiveness. The Swedes rate the autonomous car/car on demand as less relevant on average (average value 3.5), whereas the Chinese and Brazilians assessed it as much more relevant (average value for both 2.6). As such, it is unsurprising that the scenario is assessed as very attractive on average in China (average value 2.1), but only as somewhat attractive in Germany (average value 3.1); the Brazilians fall between the two with an average value of 2.5.

The autonomous car/car on demand is seen as very new and unique in all countries; opinions on this matter do not differ much: in Brazil, the scenario is assessed as entirely new and unique by 55 percent of respondents (average value 1.6), in Germany by 41 percent (average value 2.0). Very few respondents assess the scenario as extremely realistic: in Sweden it is just three percent, in Brazil 14 percent. Accordingly, the scenario is seen as somewhat realistic on average across all countries, with average values ranging from 2.7 (China) to 3.7 (Sweden).

Willingness to pay for the autonomous car/car on demand is surprisingly high (see FIG. 98)**.**

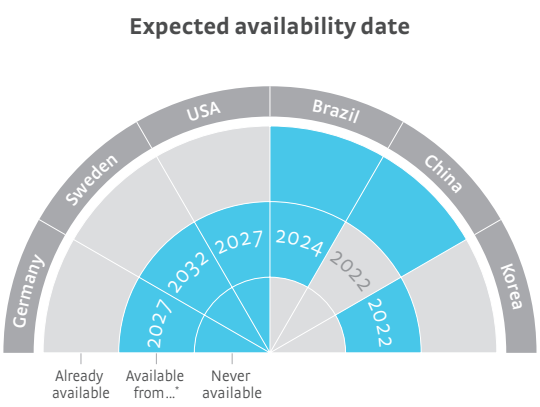
The percentage of those who indicated they would also pay to use the scenario is highest in Korea (49 percent), and lowest in the USA (22 percent). Germany comes at the lower end of this scale, with 27 percent of Germans being willing to pay for the autonomous car/car on demand. Unsurprisingly, willingness to pay to use this car is higher among the innovation-minded in almost all countries. In China, two out of three innovation-minded respondents say they would pay (64 percent). A large proportion of respondents would also be prepared to use the scenario if it was provided free of charge. In Sweden, 22 percent of respondents say this, in Brazil, 37 percent. Germany lies between the two with 24 percent. It should be noted, however, that the largest proportion of respondents giving the answer *"I wouldn't use it even if I could afford it"* are found in Germany, Sweden and the USA. 36 percent of the Germans and Swedes, and 37 percent of the Americans give this answer. Compared with China and Korea (nine and 11 percent respectively), the percentage of this group is very high.

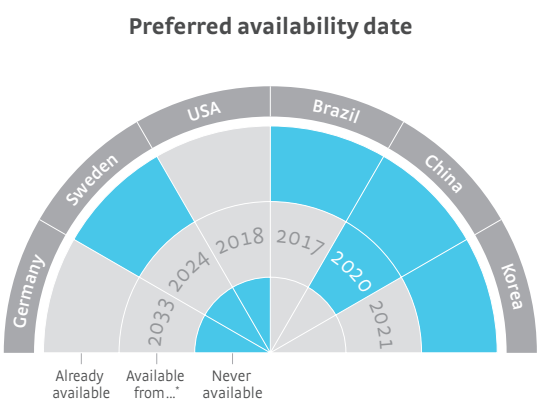
In almost all countries surveyed, availability of the autonomous car / car on demand is believed to be a long way off.

37 percent of Koreans say they believe the scenario will not be available for the majority of people in their country until 2022 on average. The 33 percent of Germans who believe the autonomous car / car on demand will become available in the future give 2027 as an estimated forecast. In Sweden 46 percent of respondents believe the car will never become available, whereas 45 percent of the Chinese say they believe it will still become available in 2011. A high percentage of Germans, Swedes and Americans hope that the autonomous car / car on demand will never become available. For the Brazilians and Koreans, by contrast, it can't arrive fast enough: many respondents in these countries would like this car to become available immediately (see FIG. 99).

FIG. 99: Expected availability date for »the autonomous car / car on demand« vs. preferred availability date for »the autonomous car / car on demand«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"





	DE	SE	USA	BR	CN	KR
Already available	9%	5%	12%	26%	45%	17%
Available from ...	33%	30%	34%	30%	22%	37%
Never available	28%	46%	29%	11%	11%	22%
Don't know	30%	19%	25%	34%	22%	24%

	DE	SE	USA	BR	CN	KR
Immediately	25%	26%	25%	33%	27%	32%
Available from ...	13%	16%	15%	20%	35%	24%
Never available	29%	33%	36%	12%	10%	14%
Don't know	33%	25%	24%	35%	27%	30%

"37 percent of Koreans think on average the autonomous car / car on demand will be available from 2022. A large proportion would like it to be available immediately."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=303, Sweden (SE) n=304, USA (USA) n=303, Brazil (BR) n=302, China (CN) n=302, Korea (KR) n=299;
Preferred availability date: Germany (DE) n=276, Sweden (SE) n=288, USA (USA) n=266, Brazil (BR) n=230, China (CN) n=171, Korea (KR) n=253

“More and more young people in urban areas are making a conscious decision not to get a driver’s license.”

Interpretation

Autonomous cars are still a long way off being a marketable product, but the fact that more and more vehicles have driver assistance systems, such as distance control or lane keeping support, which assist drivers in the task of driving or even take over parts of the task of driving, suggest that the vision of an autonomous car could actually become reality.

However, the scenario selected for this study goes yet another step further. It considers not only the autonomous car in itself, but also a new mobility concept, which uses the possibilities offered by the autonomous car to create maximum flexibility in carrying out transportation tasks, doing away with the idea of car ownership.

Some of the results of the study are very surprising. For example, the chosen scenario would receive relatively great acceptance in Brazil, China and Korea, whereas respondents in Germany, Sweden and the USA are somewhat more reserved to the idea of an autonomous car / car on demand (see FIG. 95).

The autonomous car / car on demand – especially sought after in Brazil, China and Korea.
Approximately a quarter of respondents in Germany appreciate the independence that a car offers its user (see FIG. 93). It can be assumed that these people see driving not merely as a means of getting about, but also enjoy the flexibility and individuality that set the car so far apart from other modes of transport. Nevertheless, this group of people can also imagine not driving the car themselves, but rather being driven by the car, as long as they have the choice. This is not entirely unexpected, when you consider how popular the driving assistance systems have become.

It is surprising, however, that the idea of the autonomous car meets with particularly high acceptance in Brazil, China and Korea – countries which were decided latecomers to mass motorization – compared with the traditional automotive countries Germany, Sweden and the USA, and where driver assistance systems are currently little in use, since the majority of the population, if they can afford a car at all, can only afford one with basic features. This is also surprising because the idea of the autonomous car was seriously pursued for the first time at the start of the 1990s as part of the PROMETHEUS research program in Germany, and is only just now experiencing a renaissance in the USA thanks to the activities of a non-automotive manufacturer – Google.

No clear reasons, e.g., differences in openness to new technology, can be identified for this surprising result. However, if you take into account the fact that a larger number of the Chinese and Brazilian respondents do not have a driver’s license and are therefore largely excluded from personal motoring, an autonomous vehicle could be the key to personal mobility for this group of people, especially when the vehicle discussed in the scenario can be individually requested and does not have to be owned. In Germany, Sweden and the USA, car ownership is still seen as a matter of course for large swathes of the population and is correspondingly common. This could be one of the reasons why there is much less acceptance of the autonomous car / car on demand in these countries.

Reliability of the technology is a critical factor for introduction.
The majority of respondents in all countries expressed concerns in relation to the reliability of the technology, and fear that they would be liable in the event of the technology failing. This is a key issue which still needs to be worked on intensively until the product has been widely launched. Apart from Brazil, where the number of those who are concerned about this is relatively low at 30 percent, in all other countries of the study, 50 percent or significantly more of the respondents have doubts about the reliability of the system (see FIG. 96). This shows that there is still a lot of work to be done to convince people and also that publicity campaigns, such as the automatic driving of Google’s vehicles in the USA, are not doing enough to dispel these concerns.

The potential costs of an autonomous car are also viewed critically, especially in Brazil. This must be taken into account when designing such vehicles. The additional components required for the automatic operation of a vehicle must not make it excessively more expensive than a conventional car. In addition to the concerns mentioned, which not only relate to the described scenario, but also to autonomous driving in general, respondents were also asked about concerns relating specifically to the concept of the autonomous car on demand. It is striking that there are substantially fewer reservations about this concept than about the reliability of the technology. However, the surprising result that in both European countries in the study, more than 40 percent of respondents believe the autonomous car on demand could be misused to manipulate traffic controls (see

FIG. 96), should be taken seriously. The flexibility of the autonomous car on demand concept is also doubted, especially in China, where some 60 percent of respondents fear that once a route has been chosen, it would not be possible to suddenly change it, and 52 percent doubt whether a car on demand would be available at short notice if required. This could be due to everyday experience in the major cities of this country regarding the great difficulty of reliably planning arrival times, especially when people are using taxis or their own cars.

However, willingness to pay for use of an autonomous car/car on demand is surprisingly high. This and the fact that many Koreans and Brazilians would generally like the car on demand and thus also the autonomous car to be available immediately, and the majority of Chinese would also like them to be available on the market by 2020 on average (see FIG. 99), suggests that there will be strong buying interest for autonomous cars – the car market in these countries is growing fast.

Germans would like to continue driving themselves.

German respondents view the idea of the autonomous car relatively critically. Only the group of innovation-minded Germans would on average probably try the autonomous car, whereas German respondents overall are not sure if they would try it (see FIG. 95). The main reason for this restraint is likely to be the already mentioned technical concerns, which is surprising inasmuch as assistance systems are especially widespread in cars made by German manufacturers.

The willingness to pay for use of an autonomous car/car on demand is also much less in Germany than in most other countries surveyed for this study (see FIG. 98). One reason is surely that in Germany, as in the USA where there is even less willingness to pay, the level of motorization of the population is very high and the majority of Germans would rather use their own car than a third-party car. Thus in Germany, there are around 500 cars per 1,000 inhabitants; in China it's just 21 (see VDA 2010). In addition, in Germany in particular, the car is associated with individuality and the pleasure of driving and it can be assumed that the majority of the German respondents fear that the autonomous car/car on demand scenario could substantially cut into this. In light of this, it is also not surprising that almost a third of the German respondents hope the concept of the autonomous car never becomes reality and an equally large proportion of Germans also believe that the scenario will never become reality (see FIG. 99).

New mobility concepts will change the industry.

Around the world, the trend can be seen that the number of private persons in conurbations who own a car is falling. More and more young people are also making a conscious decision not to get a driver's license, since the lack of parking makes it impossible to own a car and public transport largely satisfies the need for mobility. Nevertheless, the increasing acceptance of car sharing scenarios and the success of new kinds of vehicle lease models, like Flinkster or Car-2-Go, show that there is also a desire for personal mobility in major cities, although many people do not necessarily want to possess a car of their own (see Honsel 2011). Vehicles that meet this need for mobility do not necessarily have to be the same as those a private car owner would choose. It can be expected that special vehicle designs will evolve, tailored for use in car-sharing concepts and short-term lease models or as autonomous cars on demand. As a result, new vehicle providers will come into competition with the traditional automotive industry. This development is furthered by the increased emergence of alternative drive technologies, which brings new players onto the stage, just as much as by the fact that a car on demand is, by definition, no longer a status symbol. Thus ultimately, it is relatively unimportant whether the relevant vehicle was made by a traditional automotive manufacturer or by a newcomer, as long as the car can carry out the task for which it is intended.

Despite this, traditional car manufacturers are in a good position, especially those which invested in the development of driver assistance systems at an early stage. They have the necessary experience, especially in the field of complex, electronic systems in vehicles, to be able to create autonomous cars, which competitors coming from other areas will first have to develop.

But the electronics and supplier industry will also benefit from the automation of driving, again, with those firms that have already been active in this area in the past having the edge. Demand for electrical and electronic vehicle components will increase sharply. Although the resultant economies of scale will push down prices to some extent, this is likely to be more than offset by the expected increase in volumes. However, the traditional supplier industry will also increasingly come up against new competitors from other areas.

Due to the globalization of the automotive industry, it is difficult to work out the economic significance of the autonomous car for individual countries or continents. It can be expected, however, that countries in which the automotive industry has thus far played a subordinate role will catch up all the quicker to traditional automotive countries the more the autonomous vehicle moves away from the conventional vehicle concept. More expertise will be required, which will first need to be developed by the traditional automotive and supplier industries, too. This may gain particular momentum if these new mobility concepts entail new drive technologies.

It is also difficult to estimate to what extent time spent travelling in an autonomous vehicle can be used by the passenger for other activities, and what economic significance this would have. An increase in productivity is conceivable, since activities that are not tied to a fixed workplace, such as dealing with e-mails, could also be done in the vehicle. But it is also possible that the user of an autonomous vehicle would have more leisure time, because he can take care of work he would otherwise do at a fixed workplace during the car journey.

Conservation of resources despite individual mobility.
Autonomous driving makes even those who have no driver's license individually mobile. This is viewed critically by around a quarter of German respondents, however, precisely this aspect is a major advantage of this technology, which is particularly relevant in those countries in which the number of people holding driver's licenses is not as high as in western Europe or the USA. This is also confirmed by the results of the survey, which show that the autonomous car meets with particularly high acceptance in Brazil, China and Korea (see FIG. 95). But this aspect is also relevant for Europe and the USA, especially in light of the increasing average age of the population in these parts of the world, which calls for new mobility solutions that meet the specific needs of older people.

Autonomous cars are expected to have fewer accidents and also use fewer resources than those driven conventionally. Fewer accidents mean less human suffering. Lower energy consumption means fewer emissions, even if the described cars on demand were to be electric. Consequently, quality of life will increase when vehicles drive autonomously.

This increase in quality of life goes hand in hand with a decrease in the costs of road traffic to be borne by society, which is of particular importance for countries with a high level of motorization. But countries like China will also benefit more than average, since autonomous cars could make an important contribution to resolving traffic problems in urban areas.

The future of mobility lies in the new growth markets.
Even if there are still certain reservations in Western Europe and the USA about autonomous cars, it makes sense to invest in this technology since there is widespread approval of autonomous driving in the growth markets of Brazil, China and Korea. This means, however, that technical developments in this area need to be aligned with the needs of these markets if they are to succeed. Furthermore, the concerns existing in all countries surveyed about the reliability of the systems must be taken seriously. Approval guidelines and product liability laws will mean that autonomous cars work reliably when they come to market, but future buyers also need to be convinced of this. If they are not, the technology is bound to fail, even if everything possible was done to make it safe.

With regard to the car on demand scenario, concerns about the logistics particularly need to be addressed. A car on demand system must ensure that there are always enough vehicles in the right places and that the system is flexible enough to react to sudden changes in the desired route.

Substantial work still needs to be done before autonomous cars can actually hit the roads. The technology is not yet ready to go into production and the legal basis required for market launch is not yet in place (see Volume II of the 2009 study: International Delphi Study 2030). Business, science and politics must work closely together here. Industry and science can develop the technologies for autonomous cars and outline new mobility concepts based on these technologies. But their implementation depends on the support of politics, as global approval requirements do not permit the certification of autonomous cars. New mobility concepts that entail such far-reaching changes as the autonomous car on demand can also only be implemented in cooperation with the state, as their realization has a direct impact on existing transportation systems, such as buses or trains, and also requires certain infrastructure measures, e. g., special parking spaces or parking garages for cars on demand, or even separate lanes.

Summary.
Autonomous cars and new kinds of mobility concepts like the car on demand are desired. But it is surprising that they find greatest approval in those countries that are not traditional automotive countries, like China, Brazil and Korea. The results also clearly show that even in countries where respondents take a positive view of the autonomous car concept, there are still great concerns about the reliability of this technology. These concerns must be taken seriously. Only then can autonomous cars be a success.

“Substantial work needs to be done before autonomous cars can actually hit the roads.”

Chapter 7
Consumption and payment.

Mobile shopping on my cell phone.

The smartphone wallet.

Opening bank accounts on the Internet and electronic bill management.

Consumption is one of the basic processes of our daily lives: choosing and buying groceries and everyday consumer products is a routine task that some find tedious. In contrast, the purchase of upscale consumer products and capital goods – and even luxury articles – is an entirely different process, which is normally carefully planned, prepared and carried out with emotional involvement. Payment, along with the associated financial and banking transactions, concludes the consumption process.

Every day needs did not change fundamentally for many years. Convenience of buying, comparison options and alternatives in product selection, quality control of goods and services, security of the means of payment and control over one's own budgetary possibilities have always been important aspects of the shopping process. In contrast, structural changes are subject to political, economic and technological influences and can lead to new forms of presentation, buying processes, means of payment and kinds of competition.

Our habits for personal consumption and financial transactions are predominantly determined by conventional methods and processes, although full digitization has already taken place worldwide. E-commerce has long made its way to consumers, not only online, but also – and in particular – on mobile devices. The most recent changes, resulting from information and communication technologies, have great disruptive potential. Shopping processes will be much more convenient in the future, as new forms of presenting goods and services arise, along with selection assistants, recommendations and matching advertisements.

The following three pictures of the future illustrate future aspects of mobile consumption and payment.

The Internet is already used intensively to find, rate, choose, order and pay for products and services in nearly all consumer areas. Presentations in shop windows, on posters and information boards, and even restaurant menus will become interactive with mobile devices. The future scenario **"mobile shopping on my cell phone"** illustrates this. Goods distribution and logistics systems ensure that daily shopping can be delivered quickly to households or any other agreed location.

People who travel on business have to carry payment instruments, identification, and different kinds of documents. Repeated efforts have been made to meet these requirements with an end-to-end mobile solution, but without any major success. Meanwhile, a completely electronic form of **the smartphone wallet** has been implemented and has the potential to become established as a basic tool of everyday life. From a technical perspective, the major obstables have been overcome: mobile e-payment systems in Africa and India have proven that parking meter payment can work reliably in practical use. Field trials of e-ticketing via smartphone are making inroads in Germany, as well. The new European electronic ID card will be used for mobile identification and authorization and can be used online. Electronic membership cards, customer loyalty cards and coupon/discount card systems can be retrieved with a convenient GUI and utilized at the point of sale with near field communication.

The need for consumption in our personal lives will also be aided by an end-to-end e-commerce process, which is shaping increasingly virtualized purchase transactions to be transparent, controllable and secure. This is combined with personal financial management features that integrate the subprocesses of opening a bank account, account management, payment transactions, invoice storage, automatic account assignment and alert functions – enhancements to regular e-banking. Such services supplement personal bank support and help improve the transparency of personal finances. In addition to the collection of electronic documents, ongoing personal account assignment and automatic cost assignment, automatic tax allocation and target/actual comparisons with one's personal financial planning will be components of the personal assistant in the bank account of the future. This is explained in more detail in the future scenario involving **opening bank accounts on the Internet and electronic bill management**.

What all these functions have in common is that they must satisfy the strictest requirements for security, identity protection and protection against the marketing and misuse of personal data.

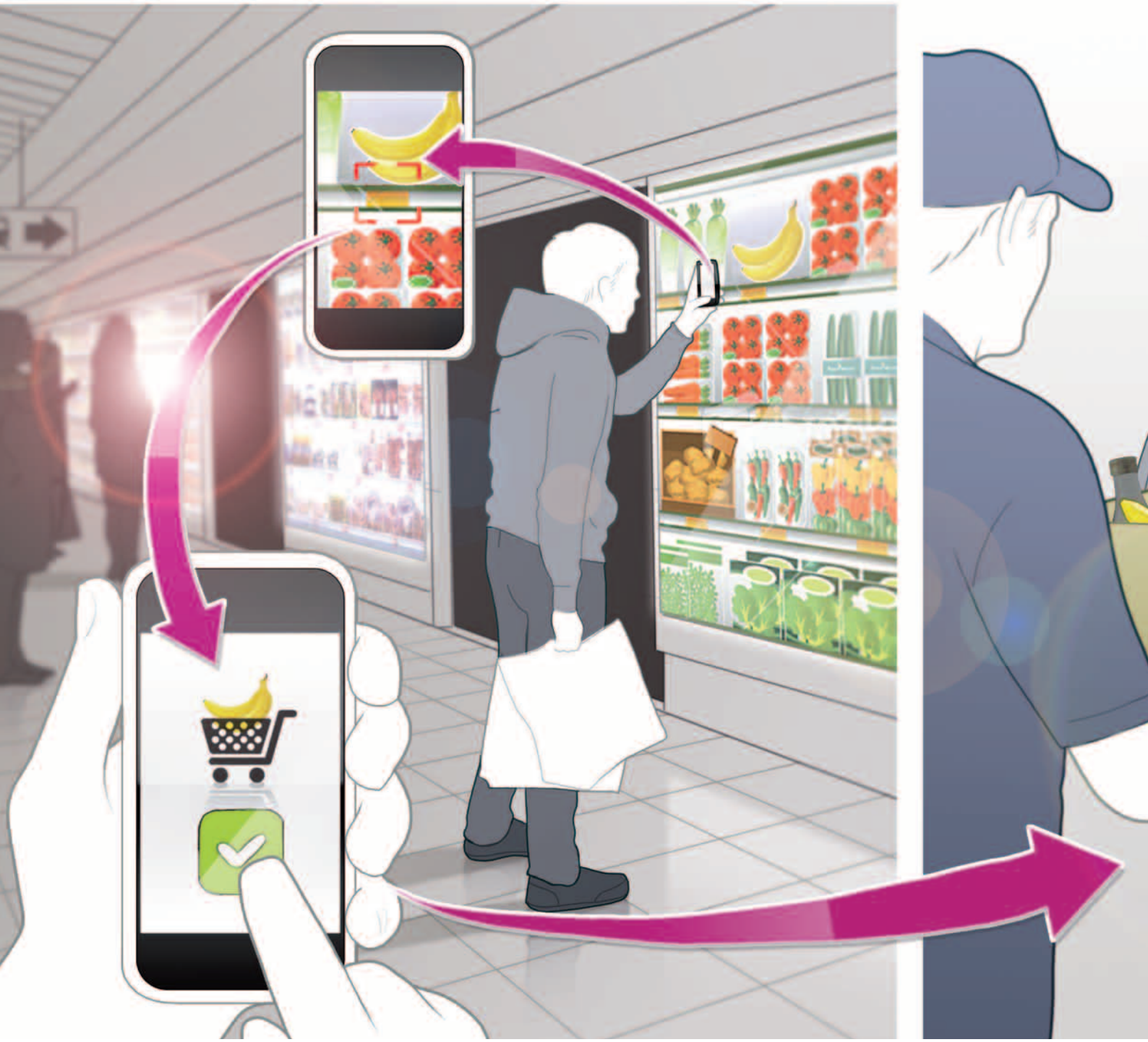


FIG. 100: Visualization of »mobile shopping on my cell phone«

“By 2019 at the latest, 75 percent of cell phone users in Germany will be using the Internet daily on their mobile devices.”

(Result from the second phase of the study, thesis 5)

Mobile shopping on my cell phone.

FIG. 101: Evaluation of individual aspects of »mobile shopping on my cell phone«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

I like to have a relaxed grocery shopping experience, but the stores are usually full when I want to go shopping, and sometimes I wish I didn't have to drive all the way there.

Now I can use mobile shopping on my cell phone, **without having to go to the supermarket – around the clock.** I simply skim through the current catalog from my favorite supermarket and use my cell phone to scan each product I want to buy. The system identifies the product automatically and places it in my virtual shopping cart.

I can also go shopping with my cell phone at bus stops and subway stations: large areas have stickers with life-sized images of supermarket shelves, and I can simply walk past and scan the products that I want to buy. This lets me make use of the time I would otherwise spend waiting idly.

My order is then processed directly in a warehouse and dispatched. Shortly thereafter, or at a **time of my choice,** my purchases **are delivered by courier.** The **food is always fresh** and I can **choose how I want to pay** direct and cash-free with my cell phone or in cash upon delivery.

21-30%

31-40%
of respondents marked this.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=300

“The ‘HERE and NOW’ factor of mobile devices will become a decisive driver of development.”

Dimension

The Pictures of the Future. Chapter 7
Consumption and payment.

Mobile shopping on my cell phone.

Mobile and smart – an outstanding development?

The mobile use of the Internet and its services will have a lasting impact on the information society and create independent new areas of application. This trend toward the regular use of the Internet via mobile devices was confirmed by a majority of the experts surveyed for the International Delphi Study 2030, along with the thesis that by 2015, more people in Germany will be using the Internet through mobile devices than on stationary computers. Use of the Internet will be primarily mobile by the year 2019 at the latest (see Volume II of the 2009 study: International Delphi Study 2030).

One primary application area that is driving this rapid diffusion, opening new perspectives for both users and companies/providers, is Mobile Commerce (M-Commerce).

M-Commerce – the new freedom?

Mobile devices have been enjoying increasing popularity in broad sections of the population for many years now. In particular, mobile devices that combine these two trends – Internet and wireless technology – such as smartphones and tablet computers, enjoy overwhelming prevalence among users, as confirmed by the current Mobile Life 2011 study. Nonetheless, many users who already possess a mobile device say they would like to have a new, better, “smarter” one (see Mobile Life 2011). Overall, mobile Internet offers much more and much greater benefit to individuals than the stationary Internet can provide. Intuitively usable devices are a major driver of the mobile Internet and thus the development of M-Commerce.

The rapid developments in end user devices are being matched by expansion of broadband wireless infrastructure, which forms the foundation for fast, mobile Internet that is available everywhere. Current examples from around the world are already demonstrating what the comprehensive expansion of network infrastructure can mean for business and society: broadband mobile networks represent the nucleus and foundation for developing new services in nearly all industry sectors, including automotive, healthcare, energy supply, media and retail – with M-Commerce, for example.

In this area, the “here and now” factor of the mobile device is a decisive driver of developments: from a technical perspective, mobile, broadband communication networks make the Internet available everywhere; GPS (and Galileo in the future) greatly simplifies geolocation and near field communication (NFC) is revolutionizing payment transactions, together with the camera-based analysis of 2-D bar codes and QR codes. In particular, techniques such as QR codes are helping bridge media discontinuities between the physical world and the digital world in a new, unprecedented way, creating a combination that reflects the best of both worlds.

Mobile shopping on my cell phone.

This is where the future scenario of “mobile shopping on my cell phone” begins: the visual factor, the unknown, spontaneity and emotion continue to play an important role in the purchase of everyday goods and products. In the future, it will be possible to go shopping independently of time and – to an extent – place, placing the desired products in your shopping cart simply by photographing them when flipping through a catalog or standing in front of a poster. This “smart” method of dealing with the perceived media discontinuity between analogous purchase transactions and digital shopping is expanding to many areas and harbors major development potential for the future. The basic prerequisites for this scenario are ownership of the appropriate ICT product by the customer, intelligent, highly functional logistics, modern systems for the purchasing process and customer relationship management systems that support buyer and seller.

Description

Willingness to try mobile shopping on cell phones varies significantly between countries.
While the survey subjects in Brazil, China and Korea would likely try out the future scenario (average values 1.0 and 2.0, respectively, see FIG. 102), the average Swede, German or American is not sure whether they would try it out (average values 2.9, 3.0 and 3.1, respectively). Willingness is higher among the innovation-minded survey subjects (2.5 in Germany, for example), but is still far behind Brazil, China and Korea.

Only in China did the innovation-minded participants indicate that they would definitely try out mobile shopping on their cell phones (average value 1.4; see FIG. 102). One noteworthy result is that the German and American innovation-minded participants, in particular, were not significantly more open to this future scenario compared to all persons surveyed (average values of 2.5 and 2.7, compared to 3.0 and 3.1, respectively).

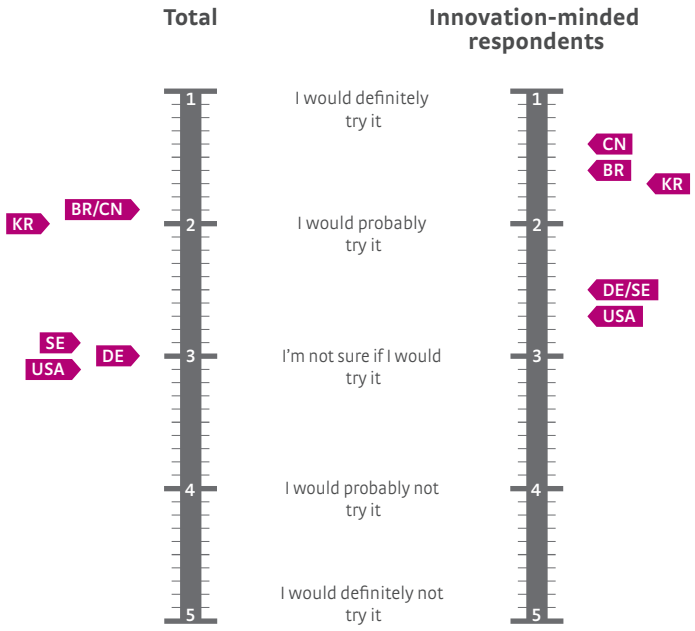
The respondents highlighted all text passages that they liked or that they view critically with regard to mobile shopping on cell phones (see FIG. 101).

As these highlighted passages show, German participants feel that the aspect of independence from store closing times is very important.
When asked what they liked about the future scenario, they highlighted *"without having to go to the supermarket"* (21 to 30 percent), *"around the clock"* (31 to 40 percent) and *"the food is always fresh"* (at least 21 to 40 percent). They also highlighted *"time of my choice", "delivered by courier"* and *"choose my payment method"* as positive (between 21 and 30 percent).

The text passages that the German respondents judged negatively from the future scenario did not exceed 20 percent for any issue – which essentially means no noteworthy negative criticism is discernable.

Germans' greatest worry with regard to mobile shopping on cell phones is misuse of their personal data.
46 percent of all those surveyed and 44 percent of innovation-minded participants in Germany expressed this fear (see FIG. 103). The Chinese and Korean participants also named this aspect as one of their main concerns (47 and 46 percent, respectively). In contrast, less than a quarter of Swedish respondents fear that their data could be misused (23 percent). A bigger worry is that the goods might not be completely

FIG. 102: What respondents think about a trial with »mobile shopping on my cell phone«
"How likely is it that you would try out this scenario?"



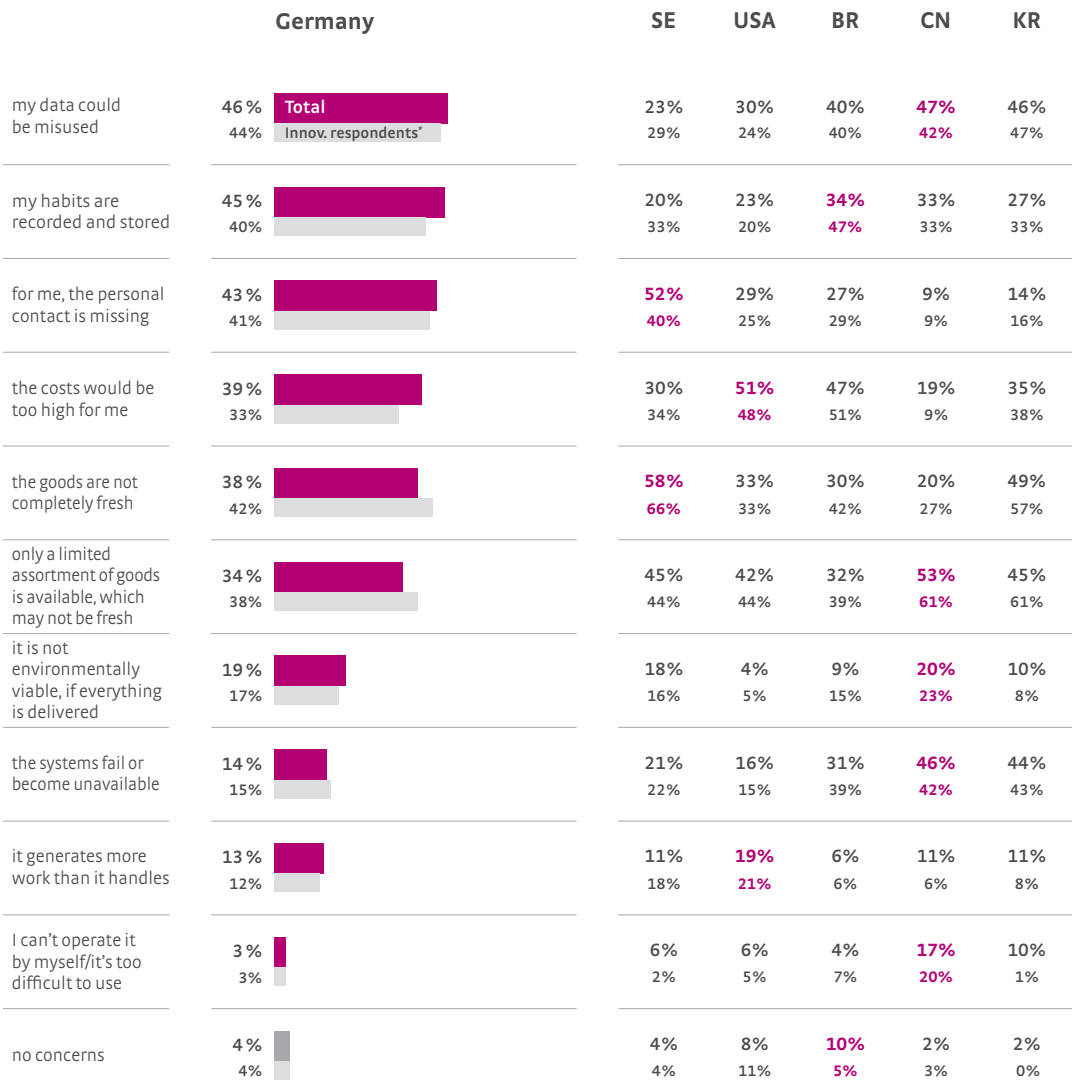
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=300, Sweden (SE) n=305, USA (USA) n=307, Brazil (BR) n=305, China (CN) n=301, Korea (KR) n=303;
Innovation-minded respondents: Germany (DE) n=93, Sweden (SE) n=106, USA (USA) n=83, Brazil (BR) n=92, China (CN) n=78, Korea (KR) n=88

FIG. 103: Respondents' concerns about »mobile shopping on my cell phone«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=300, Sweden (SE) n=305, USA (USA) n=307, Brazil (BR) n=305, China (CN) n=301, Korea (KR) n=303;
Innovation-minded respondents: Germany (DE) n=93, Sweden (SE) n=106, USA (USA) n=83, Brazil (BR) n=92, China (CN) n=78, Korea (KR) n=88

fresh, which was also the main concern voiced in Korea (58 percent and 49 percent, respectively). In comparison, just over a third of Germans share this worry (38 percent).

The second-greatest concern among German participants, named by 45 percent of those surveyed, is the recording and storage of personal habits. 43 percent also fear that they would miss personal contact, a fear shared by 52 percent of the Swedish respondents as well. Remarkably, only one in ten Koreans have this concern. While around one in two participants in the USA and Brazil expressed the fear that the costs would be too high (51 and 47 percent, respectively), it is only the fourth-place concern of German participants, at 39 percent.

A critical point noted by nearly half of the surveyed Swedes and more than half of Chinese participants is that only a limited assortment of goods is available and that they might not always be fresh. In comparison, this concern is shared by only one in three Brazilians and Germans (32 and 34 percent, respectively). Americans and Brazilians believe it is ecologically justifiable for everything to be delivered – as such, only four and nine percent of respondents, respectively, are concerned about this; in contrast,

around 20 percent of Germans, Swedes and even Chinese are worried about the negative impact.

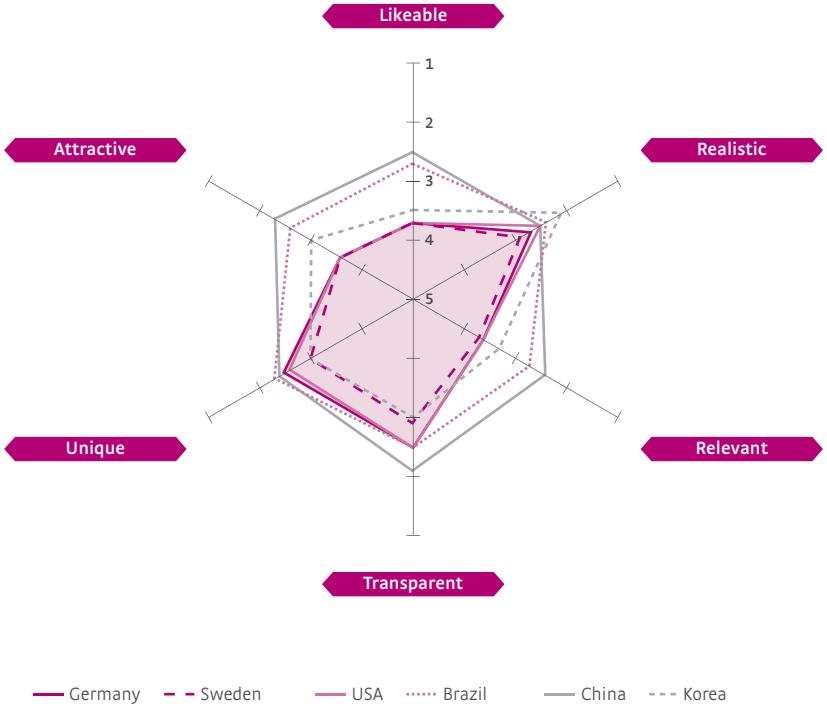
While 39 percent of innovation-minded Brazilians are concerned that the equipment could break down or become unavailable, just 31 percent of the total persons surveyed in Brazil feel the same way. Many Chinese (46 percent) and Koreans (44 percent) share this reservation. In Germany, in comparison, just 14 percent have this concern.

It is also striking that 17 percent of Chinese participants expressed their concern that they wouldn't be able to operate mobile shopping on a cell phone by themselves or it would be too difficult to use, while only three percent of German participants said the same.

As with other pictures of the future, it is noteworthy that mobile shopping on cell phones appeals to Chinese and Brazilians the most (average value 2.5 and 2.7 respectively; see. FIG. 104)**.**
Koreans believe this future scenario is entirely realistic, on average (average value 2.1), while Germans and Swedes give it the poorest marks for believability (2.7 and 2.9, respectively) in international comparison. In a comparable figure, the respondents also assess the

FIG. 104: Ratings for individual aspects of »mobile shopping on my cell phone«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



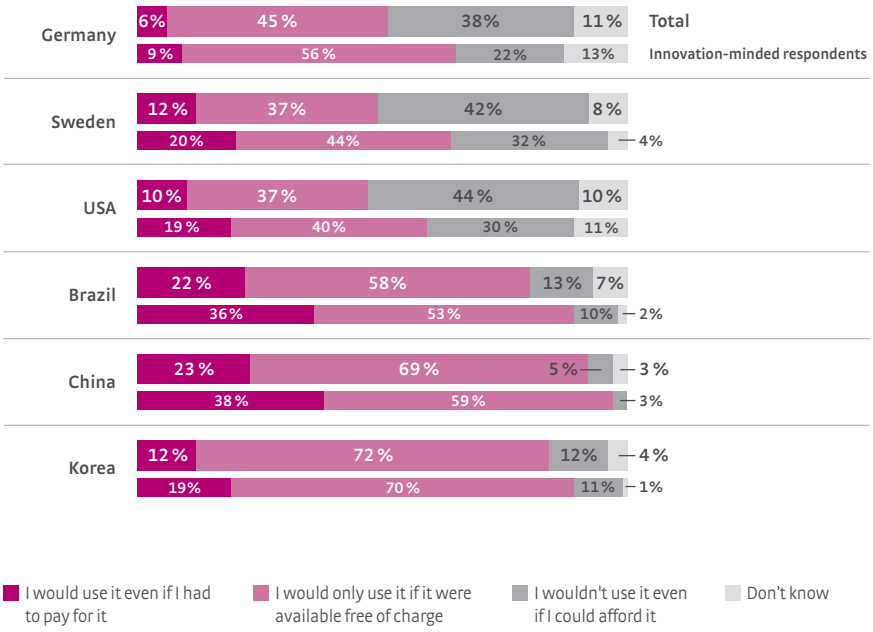
	DE	SE	USA	BR	CN	KR
Likeable	3.7	3.7	3.7	2.7	2.5	3.5
Realistic	2.7	2.9	2.5	2.4	2.5	2.1
Relevant	3.6	3.7	3.6	2.7	2.4	3.3
Transparent	2.5	2.9	2.5	2.5	2.1	3.0
Unique	2.5	3.0	2.6	2.3	2.4	3.0
Attractive	3.6	3.6	3.6	2.6	2.3	3.0

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=300, Sweden (SE) n=305, USA (USA) n=307, Brazil (BR) n=305, China (CN) n=301, Korea (KR) n=303

FIG. 105: Willingness to pay for »mobile shopping on my cell phone«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=300, Sweden (SE) n=305, USA (USA) n=307, Brazil (BR) n=305, China (CN) n=301, Korea (KR) n=303;
Innovation-minded respondents: Germany (DE) n=93, Sweden (SE) n=106, USA (USA) n=83, Brazil (BR) n=92, China (CN) n=78, Korea (KR) n=88

relevance of the future scenario. China and Brazil see relatively high relevance in comparison (average values of 2.4 and 2.7, respectively), while the other countries – particularly Sweden, with an average value of 3.7 – do not believe that mobile shopping on cell phones will become very relevant.

The Chinese find this future scenario particularly attractive in international comparison, with a value of 2.3. Germany, Sweden and the USA find it less attractive, with participants in each country assigning it an average value of just 3.6. The future scenario is perceived to be most unique in Brazil, China and Germany (with average values of 2.3, 2.4 and 2.5, respectively), while Sweden and Korea see it less so (average value 3.0).

Greatest willingness to pay for mobile shopping on cell phones is expressed by the Chinese – especially by the innovation-minded participants.

A full 38 percent of innovation-minded participants and 23 percent of all people surveyed in China would use this future scenario, even if they had to pay extra for it (see FIG. 105).

Brazil takes second place, with 36 percent of innovation-minded participants and 22 percent of all people surveyed.

It is also noteworthy that most of the surveyed Koreans and Chinese would use mobile shopping on cell phones if the service were provided free of charge. This is not the case in the USA or Germany, in contrast. Around 40 percent in each country would not use this future scenario even if they could afford it. A major difference of opinion is discernable between innovation-minded participants in Germany and all the surveyed Germans: more than half of innovation-minded participants (56 percent) would use mobile shopping on cell phones if the service were provided free of charge, while only 45 percent of all people surveyed would do so. The situation in China and Korea is reversed: the share of all people surveyed who would use the future scenario if it were free of charged there is higher than among innovation-minded participants (69 vs. 59 percent in China, 72 vs. 70 percent in Korea).

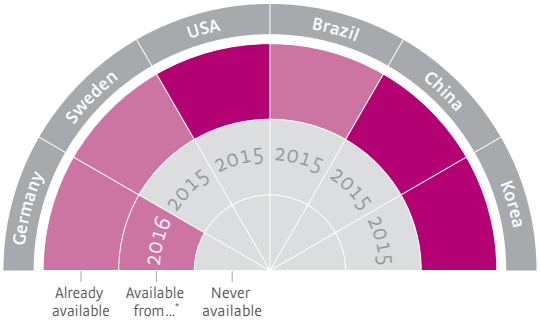
While around three-quarters of those surveyed in China and Korea say that something like mobile shopping on cell phones already exists, only around a third of Germans and Swedes say the same (see. FIG. 106)**.**
A large number of those surveyed in Germany and Sweden believe that this future scenario will become reality in coming years, in around 2016 or 2015 (29 and 24 percent, respectively). All the same, 15 percent of Swedes think that mobile shopping on cell phones will never become reality. Nine percent of Germans share this opinion.

When asked when they would like this future scenario to become available to the majority of residents, the most frequent answer in Brazil, China and Korea was *"Immediately"* (see FIG. 106). In contrast, around a quarter of those surveyed in Sweden, Germany and the USA hope that this future scenario will never become available, a desire shared by only three percent of Chinese participants.

FIG. 106: Expected availability date for »mobile shopping on my cell phone« vs. preferred availability date for »mobile shopping on my cell phone«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"

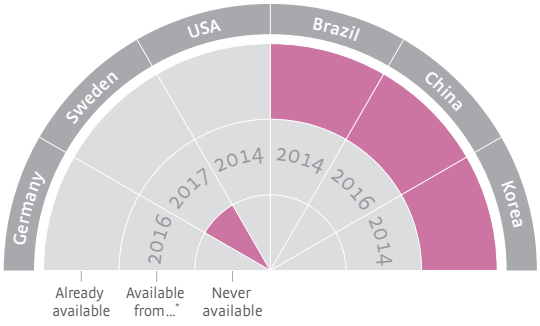
Expected availability date



51+% 26-50% 0-25%

	DE	SE	USA	BR	CN	KR
Already available	31%	33%	51%	47%	78%	72%
Available from ...	29%	24%	17%	19%	9%	12%
Never available	9%	15%	4%	4%	3%	3%
Don't know	31%	29%	29%	30%	10%	13%

Preferred availability date



51+% 26-50% 0-25%

	DE	SE	USA	BR	CN	KR
Immediately	19%	21%	11%	43%	40%	28%
Available from ...	15%	12%	11%	20%	24%	22%
Never available	23%	29%	22%	5%	3%	8%
Don't know	44%	38%	55%	32%	34%	43%

"15 percent of Swedes expect that this future scenario will never become available – and many hope that it will never become available."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=300, Sweden (SE) n=305, USA (USA) n=307, Brazil (BR) n=305, China (CN) n=301, Korea (KR) n=303;
Preferred availability date: Germany (DE) n=206, Sweden (SE) n=201, USA (USA) n=168, Brazil (BR) n=159, China (CN) n=74, Korea (KR) n=83

“Like with physical shopping, a personal relationship of trust between seller and customer is a success factor here, as well.”

Interpretation

Mobile shopping on my cell phone – buying everyday consumer products 2.0?

The picture of the future “mobile shopping on my cell phone”describes a scenario that could become reality in the near future and is already a reality in some countries today. Most of the required technologies already exist and have achieved a high degree of maturity. This picture of the future vividly illustrates and examines whether consumers are prepared to interact with this type of bridging the media discontinuity between analogous shopping on the one hand and digital handling on the other.

The functions examined here should also be considered in the broader context of trends and developments involved in the overall shopping experience. Together with other future scenarios described in this study – particularly in this section but also in others – a general trend can be seen clearly: e-commerce functions, which are already widespread in the professional, industrial and business sectors around the world are increasingly making inroads to the private sector, as well. The major drivers of this trend are the user interfaces, which are evolving to match the needs of everyday life. Consumption, shopping and payment patterns in everyday life are undergoing structural transformation as a result of ICT solutions. It must also be noted that these novel ordering systems will have a fundamental impact on future logistics processes.

The future scenario of mobile shopping on cell phones describes a real model of shopping for everyday products, in which “virtual” supermarket shelves – in the form of posters in subway stations – present the available products. Tesco, a British supermarket group, already offers this novel type of shopping – also in Korea, whose residents were included in this survey. According to information from Tesco, the approach is very successful. A QR code and the current price appears beneath each product picture. Shoppers can scan the QR codes to place the desired products in their shopping carts. Once they have scanned all the relevant products, customers send the orders from their smartphones and a delivery service brings the ordered products to the consumers’ homes the very same day.

The results of this survey reflect the economic and cultural differences in the six surveyed countries surprisingly strongly. While the results are heterogeneous, global trends are also discernable.

Positive general attitude, but significant country-specific differences.

Overall, opinions of the surveyed users are cautiously optimistic in all countries, although there are significant regional differences: China, Brazil and Korea are more positive overall, while Sweden, Germany and the USA gave more reserved responses in comparison (see FIG. 102). Nonetheless, the overall results seem to indicate that mobile shopping on cell phones is clearly relevant as a scenario. In detail, however, it is clear that the success of this and similar business models will lie in its country-specific form: enthusiasm, assessment of personal benefit, concerns and even willingness to pay differ so widely that it will be necessary to further examine the different needs of people in the individual countries.

The survey respondents’ positive overall attitude is accompanied by a certain amount of uncertainty, which can be divided into the areas of privacy, monitoring and subordination, and quality. The attractiveness of this future scenario among the respondents in the individual countries also differs in a detailed examination: while the Chinese, for example, expressed good, positive assessments for likeable, attractive and unique, the estimations of the Swedish respondents were much more negative. The answers to rational estimation and realism also reflect this difference. The Chinese respondents rate realism, relevance and transparency of the future scenario consistently high – Swedes gave much lower marks. The other countries lie somewhere in between, with some rating the future scenario more positively and others more negatively (see FIG 104). The results of this example clearly show that the respective socio-cultural and economic backgrounds are crucial for their interpretation and shaping, especially when it comes to future updates.

Concerns about the future scenario differ around the world.

A comparison of the most significant barrier in each country shows that the practical design of the idea of mobile shopping on cell phones will require a separate focus for each country: while 46 percent of German respondents and 47 percent of Chinese expressed the concern that their data might be misused, 58 percent of Swedes said their primary concern was that the products might not be fresh or free of defects; 53 percent of Chinese are especially worried that the product assortment might be limited or out of date and 51 percent of Americans and 47 percent of Brazilians are concerned that the costs would be too high (see FIG. 103). As such, we see an extremely heterogeneous spectrum of opinion, which continues throughout the other concerns as well.

In detail, one finding is confirmed by many of the other future scenarios in this study: that Germans, in particular, are concerned about privacy and potential misuse of their data. In contrast, concerns that the "mobile shopping on my cell phone" scenario could be too impersonal and too expensive, and that the delivered goods might not be fresh or free of defects, were only listed in third, fourth and fifth place, respectively. In brief, this means trust-building activities are needed in Germany in particular, to counter concerns regarding data security and privacy. Like with physical shopping, a personal relationship of trust between seller and customer will be a key success factor. This could be achieved, for example, through an outstanding customer service hotline, which counters concerns and builds trust; but also through rating systems or portals, for instance.

Swedish respondents expressed much different opinions: they have concerns about quality, followed by the lack of personal contact and the fear of only having a limited, outdated, overly expensive assortment of goods to choose from compared to over-the-counter retail stores. The surveyed Swedes see misuse of their data as the fifth-place risk (23 percent). This example alone demonstrates that the success of the "shopping on my cell phone" scenario is dependent to a significant degree on other factors. In particular, success will depend on the range of offerings itself, that is, the product assortment and the associated pricing and quality. If these factors can be shaped convincingly, the concerns of Swedes can be addressed effectively.

Americans, who also have serious concerns with regard to product and assortment, are similar. Their reservations about costs, a limited range of goods and a lack of quality also top the list, making them similar to Sweden overall. Concerns are more differentiated in Brazil, China and Korea (see FIG. 103).

While the top-named concerns differ between these countries – Brazilians are worried about costs, Chinese doubt a broad product assortment will be available and Koreans have reservations about quality – the topic of data misuse takes second place in all three countries. The third and fourth-most frequently named concerns also differ between the countries: Brazilians name the concern that that their habits will be recorded and saved, followed by fear of a limited product assortment. Concern among Chinese respondents that the technology might be unstable or not always available is unusually strong compared to other countries, at 46 percent. The concern that their habits will be recorded and saved was expressed fourth most frequently. In Korea, concerns about lack of assortment take third place, while doubts about the technology come in fourth.

All the same, some trends are common in all countries. While the strategies for the industrialized countries offer a clear picture for potential starting points at first, the results from Brazil, China and Korea indicate that the dynamic development in these countries and the associated cultural and economic differences require a differentiated approach: Germany and Brazil need activities to alleviate consumers' fears that their personal habits might be recorded and their data misused. Strategies to build trust in security are also recommended in China and Korea, although with the difference that the measures here must not only be directed toward the consumers' personal data, but also address reservations about the technology; the available product assortment will also have a major influence. Therefore, the strategy must be much broader in scope. An interesting aspect about this result is that China and Korea are the two countries in the survey where mobile shopping on cell phones is already reality. For Sweden and the USA, in contrast, strategies based on product and assortment ranges are recommended to spur development and the eventual market launch.

Flexibility and mobility – technological progress is promoting societal transformation and trends.

The results for Germany show that the survey respondents have a very rational assessment and pragmatic demands of mobile shopping on their cell phones. In the general trend toward greater mobility, increasingly blurry lines between personal life and work and the increasing importance of greater flexibility overall in many aspects of life, many people would appreciate targeted support in this area. They rate aspects that represent independence from time and location as particularly attractive. They see it positive that they no longer have to visit supermarkets and that they can shop around the clock, independently of store opening times. The respondents also emphasized

that they expect mobile shopping on their cell phones to reduce their burdens. In this context, as well, the results are strongly focused on the topics of flexibility, independence and mobility. The ability to control delivery time individually as a service and to choose the desired payment method are the primary items that German respondents rated positively. But the demands placed on the products also make it clear: the respondents are very concerned that the goods must be "always fresh" (see FIG. 101).

Mobile shopping on my cell phone – heterogeneous economic findings.

The initially described groups of Chinese, Brazilians and Koreans, who are more receptive overall, also demonstrate more openness in willingness to pay – although the connection between trial and purchase is very clear. As a result, this point also makes it clear that extremely different, country-specific approaches to realization strategies will be needed to achieve success.

While 45 percent of German respondents and 37 percent of Swedes and Americans said they would at least use mobile shopping on cell phones if it were free of charge, the results from the three other countries surveyed are entirely different: The greatest willingness for use was expressed in China, where 92 percent of respondents would use the future scenario and 23 percent would even pay extra for it – the highest value in the country ranking. 84 percent of Korean respondents could also imagine using this scenario – twelve percent are willing to pay extra for it. The response from Brazilians is similar, with 80 percent willing to use and 22 percent willing to pay extra for the scenario. In Germany, in contrast, only six percent of respondents would pay extra to use this service; twelve percent of Swedes and ten percent of Americans also indicated a willingness to pay more for this scenario (see FIG. 105).

It is apparent that in Germany, Sweden and the USA, which have a relatively high socio-economic standard and where service is already a major component of everyday consumer products, there is only low willingness to pay extra for a service that is apparently interpreted as a "customer service". In Brazil and China, in contrast, where the service component is not taken as much for granted, the scenario is interpreted as an add-on service for which many are willing to pay. This is particularly apparent in a comparison of the innovation-minded respondents in the various countries. Willingness to pay among this segment is always higher than the values from the overall population – particularly noteworthy in Brazil and China. For example, 38 percent of innovation-minded respondents in China indicated willingness to pay for this future scenario.

The country-specific findings are similar with regard to the preferred availability date of mobile shopping on cell phones: Brazil, China and Korea would like immediate realization and assume that this future scenario is either already available today or will become available soon, while a considerable portion of Swedish respondents would rather not have it at all (see FIG. 106).

The "mobile shopping on my cell phone" scenario can be successful if sufficient attention is paid to country-specific peculiarities.

In summary, it is apparent that a uniform global approach to introducing a service such as "mobile shopping on my cell phone" will likely be unsuccessful, due to vast differences in the respective societal and economic frameworks. Intercultural differences, particularly those involving the purchase of everyday goods, have too vast an effect. While supply and supply infrastructures are excellent in industrialized western countries, which means the success factor will lie in increasing flexibility of consumers individual life organization through granting independence from time and location, goods and services in Brazil, China and Korea are either not available to the same extent or inconvenient for consumers. Therefore, mobile shopping on cell phones could represent a personal benefit, since availability combined with goods quality and flexibility would represent real progress.

This future scenario describes a situation that will not only change the familiar routines of shopping. In addition, entirely new value maps will be created for rendering the service, from shopping to delivery. Shopping for everyday products, which is the focus here, will pose particular demands

for rapid, reliable delivery. As such, it will require a significant increase in individual delivery service and automotive traffic. The staging and delivery organization represents a basic logistics problem, one which will be intensified further by this new form of shopping and will require new solutions based on new "district functions".

In this context, the Internet creates a physical network around the user's location with new functions, tasks and business potential. The various sources that can be accessed through the Internet and that are close to the user's geographic location will materialize. Goods have to be delivered, for example, and/or stored temporarily in a protected area, from which they can be delivered or picked up.

The principle of the "district" function can also be transferred to completely different application areas, such as shared services (cars, offices etc.) or healthcare services. The new local geography around an Internet user is another element in the "district" discussion, which also plays a role in the areas of need associated with "residential living".

In addition to the mobile, brand recognition-based selection and shopping cart features that are the focus of this scenario, a number of additional functions that are already familiar from PCs and the stationary Internet are also involved, only with a GUI for mobile shopping. Such information is suitable, for example, for product comparison, price comparison, ingredient details, health compatibility, nutrition information and information about the quality of the supply chain and freshness guarantees. The difference is that all this information is now available, in consolidated form, at the moment of purchase. Of course, these functions will also need counterparts during goods receipt, to verify the properties promised at time of purchase.

To ensure the efficiency of this new mobile ordering system, it will surely be necessary to investigate the impact and potential solutions with regard to the logistics supply chain to the user's residence, for example, through simulation of goods and logistics streams in megacities, municipalities and rural areas with new "district functions" for local goods dispatching.

Summary and recommendations.
In conclusion, the survey results indicate that the "mobile shopping on my cell phone" scenario has a realistic chance of acceptance and use in all the surveyed countries, although the approaches will likely differ widely as a result of the heterogeneous needs structures.

For Germany, which has always had an excellent infrastructure for over-the-counter retail and increasingly liberal store opening times, success will primarily involve emphasizing the flexibility and convenience components for consumers and addressing concerns about the misuse of personal data. Personal contact, costs and quality in over-the-counter retail are already at a very high level, which consumers demand as the standard. Mobile shopping on cell phones will represent a gap in users' everyday lives between shopping in retail stores and electronic shopping on the Internet, because it corresponds to the societal transformation toward more flexibility and mobility. Success will not lie in monetization of the service component itself, however, because willingness to pay is very low. Instead, profits will probably have to come from higher volumes, through reaching a segment of consumers who didn't buy as much or shopped elsewhere previously. There is no pressure to implement the scenario any time soon, because German consumers, at least, neither expect mobile shopping on cell phones nor demand it. However, given the rapid, highly dynamic development of mobile broadband applications, along with the evolution of devices such as smartphones and tablet computers and the development and implementation of smart service platforms based on mobile approaches, rapid movement must be expected on the consumer and user side, as they recognize the clear benefits of this new, smart, mobile, user-friendly world.

"The staging and delivery organization represents a basic logistics problem, which will require new solutions based on new 'district functions'".

The smartphone wallet.

FIG. 107: Evaluation of individual aspects of »the smartphone wallet«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

I don't always want to have my entire wallet with me when I am out and about, because all the cards and change make it heavy and bulky. Nonetheless, I want to be able to pay for anything I want to buy and have access to all my payment cards, customer loyalty cards and vouchers.

There is now a cell phone wallet. I can use my cell phone wallet for convenient, secure payment on the go, just like with my conventional wallet. My cell phone stores my **customer loyalty cards**, tickets, other tokens and vouchers electronically, which means I always have my entire wallet with me in electronic form.

21-30%
of respondents marked this.

To pay when I am out and about, I simply need to hold my cell phone against a touch point and it shows me the appropriate vouchers and tickets that I can use for that touch point. The (payment) transaction is absolutely secure, because I have to enter a PIN code on my cell phone if the card demands it.

This means even if my cell phone is lost or stolen, there is dual-layer protection against unauthorized access: with the PIN codes of the cards and my cell phone PIN. Furthermore, I can block my cell phone wallet quickly and completely with a single phone call. And by the way, I can also use it at home for convenient, secure payments on the Internet.

Liked Viewed critically

Percentage ranges are visualized in different font sizes
Basis: all people surveyed about this scenario, Germany (DE) n=300

"By 2024 at the latest, it will be possible to pay at retail outlets and restaurants with a mobile device (mobile wallet) worldwide, with standardized technology." (Estimation by Germany experts)

(Result from the second phase of the study, thesis 7)

FIG. 108: Visualization of »the smartphone wallet«

“The wallet of the future combines the digital wireless technology and Internet capability of smartphones with the smartcard features of the mobile communication operators’ SIM card.”

Dimension

The Pictures of the Future. Chapter 7
Consumption and payment.

The smartphone wallet.

The future of the wallet – the wallet of the future.
The future is becoming more and more digital. In addition to ever-increasing Internet sales, the experience of in-store shopping is also converging. The smartphone wallet works in both worlds, creating a standardized, all-encompassing security system for modern people. It contains virtual cards such as credit cards and customer loyalty cards, as well as coupons and vouchers. It can also hold tickets, access cards for buildings and, last but not least, cards for logging on to Internet services securely. As a result, an Internet login will become as safe as with a smart card, yet much simpler. Small amounts can be paid with a touch, while larger sums will require PIN entry. Parents can pay their children’s allowances from smartphone to smartphone. The device will also protect its owner’s data and privacy. Anonymous payment and pseudonyms will be possible, along with control of the data customer loyalty programs receive.

The wallet of the future combines the digital wireless technology (NFC – near field communication) and Internet capability of smartphones with the smartcard features of the mobile communication operators’ SIM card. The model introduced here places these capabilities in users’ hands and gives known – and new – issuers of cards and tickets the option to “rent” space on the SIM card instead of producing plastic cards with chips themselves, which are expensive, difficult to distribute and less useful by far. A prerequisite is an implementation that protects users’ data at all times. The transactions and data on one card are inaccessible for all other cards and for the mobile communication provider; the user alone decides whether a card, coupon or ticket is added to the wallet. Tickets can be purchased on the web, credit cards distributed at a bank branch and discount coupons “retrieved” from an advertising poster. It is far easier to manage the variety of cards and coupons on the smartphone than in a physical wallet. Cards that a store does not accept aren’t even displayed and expired coupons are deleted – a warning can be generated before they expire.

NFC is being tested worldwide, as major cell phone manufacturers increasingly include this capability in their devices. The costs are considerable: it makes the phones more expensive and millions of new SIM cards have to be issued; cash register systems also have to be upgraded. While the telecommunication industry is already working decisively on implementation, the upgrade of cash register systems in retail lies further in the future – but there is interest here as well and the initial trials have been promising. Once people have become used to the convenience, they don’t want to give it up. London visitors know the Oyster Card from public transportation – and rave about its simplicity, which has clearly paid off for the transport operators as well.

Using smartphones for secure Internet transactions and logins seems less obvious, but is comparable to the identity management functions of the new European electronic ID card. Cheap NFC readers can be connected to a PC, if not already integrated in a laptop or keyboard. Current password-based logins can be supported with a password-safe function, but secure, all-encompassing procedures will have to be established first. At the same time, the end-to-end security of the digital wallet can even enable credit card payments at an Internet cafe – the PC “sees” the credit card number encrypted in code.

Description

Receptiveness for this future scenario varies widely in international comparison.

The survey respondents in the various countries showed widely differing receptiveness toward the smartphone wallet. While 41 percent of respondents in China each said they would definitely or probably try it, the corresponding figures in Germany are just 16 and 18 percent, respectively. This is also reflected by the average value for this question: China tops the list at 1.8, while Germany comes in last at 3.2. 25 percent of Germans report that they would definitely not try a payment function in a smartphone. While Brazilians are nearly as receptive as the Chinese (average value 1.9), Americans' skepticism nearly matches Germans' (average value 3.0; see FIG. 109).

An unmistakable difference becomes apparent in a closer examination of the results from the innovation-minded respondents. Although Germans once again fall behind in their willingness to try this future scenario, the average value of 2.8 signals greater readiness to at least test smartphone payment. The survey respondents were asked to highlight the key words and passages in the description of the future scenario that they found especially appealing or especially critical.

Only the term "customer loyalty cards" was highlighted as positive by more than 20 percent of German respondents.

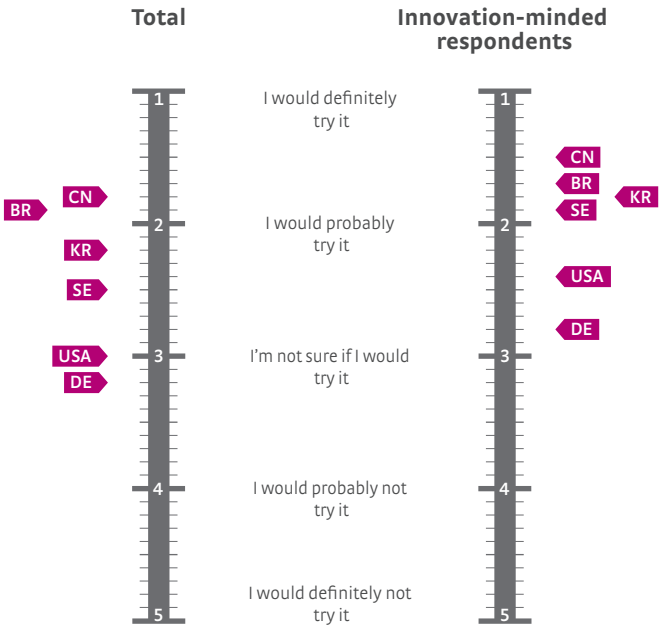
21 to 30 percent of Germans appear to like the possibility of having their personal loyalty cards readily accessible in their smartphones in addition to their payment cards (see FIG. 107). Not a single word in the description of the future scenario was highlighted as critical by more than 20 percent of the respondents.

Germans' greatest fear with regard to the smartphone wallet is fear that their data might be misused.

53 percent of German respondents say they are worried their data might be misused if they used this future scenario. This concern is much less widespread in the other survey countries: just 39 percent of Swedes, Americans and Brazilians expressed this fear. One interesting finding in this context: the innovative-minded respondents in all countries are even more worried about data misuse. 64 percent of innovation-minded German respondents indicated this, as well as 48 percent of innovation-minded American respondents. The most common concern in China is that the payment

FIG. 109: What respondents think about a trial with »the smartphone wallet«

"How likely is it that you would try out this scenario?"



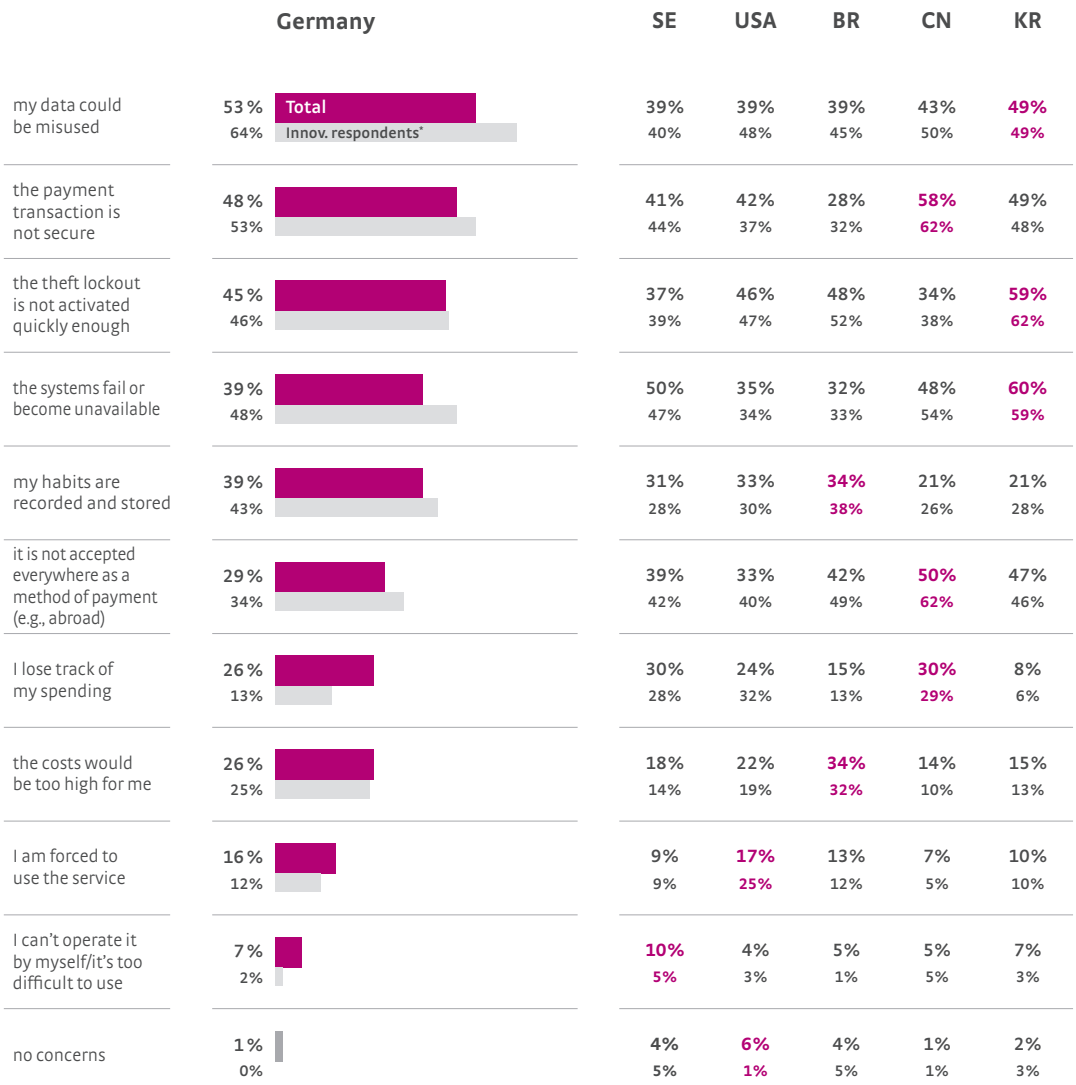
Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=300, Sweden (SE) n=303, USA (USA) n=302, Brazil (BR) n=301, China (CN) n=298, Korea (KR) n=304;
Innovation-minded respondents: Germany (DE) n=91, Sweden (SE) n=84, USA (USA) n=88, Brazil (BR) n=93, China (CN) n=98, Korea (KR) n=92

FIG. 110: Respondents' concerns about »the smartphone wallet«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.

I would be concerned that …"



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=300, Sweden (SE) n=303, USA (USA) n=302, Brazil (BR) n=301, China (CN) n=298, Korea (KR) n=304;
Innovation-minded respondents: Germany (DE) n=91, Sweden (SE) n=84, USA (USA) n=88, Brazil (BR) n=93, China (CN) n=98, Korea (KR) n=92

transaction might not be secure (58 percent), a fear also reported by 48 percent of Germans surveyed. In Brazil, in contrast, less than a third of respondents share this concern (28 percent). The description of this future scenario also mentioned that the smartphone wallet could be blocked completely, quickly and easily, with a single phone call, for instance. 45 percent of German respondents doubted this statement, however, and fear they wouldn't be able to activate the theft lockout quickly enough. This concern was the most frequently named by Brazilians and Americans (48 and 46 percent, respectively). The greatest concern in Korea and Sweden, in contrast, is that the technology might fail (60 and 50 percent, respectively) – this fear came in fourth place in Germany (39 percent).

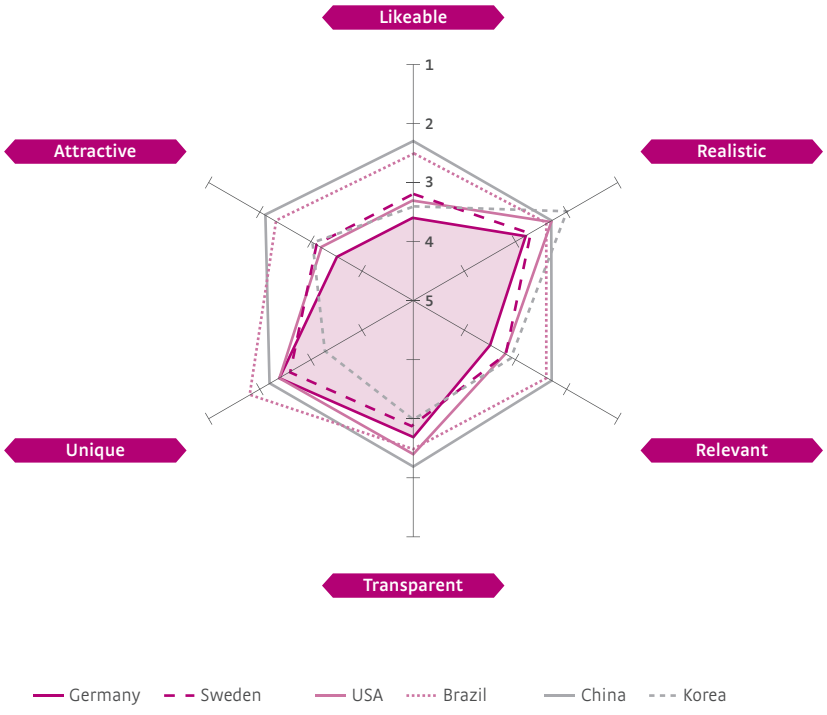
More than a fifth of respondents are concerned that their habits could be recorded and saved: 21 percent of Chinese and Koreans expressed this concern; it was the most frequently named fear among German respondents (39 percent). Moreover, many respondents expressed worries that payments with a smartphone wallet might not be possible everywhere, for example, on trips abroad. Half of all respondents in China (50 percent) expressed this opinion, along with 47 percent of Koreans and 42 percent of Brazilians. Germans expressed this concern the least in international comparison, with 29 percent of respondents.

On average, Germans only reasonably like the idea of a smartphone wallet.

Germans rated the likeability of this scenario the worst (average value 3.6), while Chinese like it considerably more (average value 2.3; see FIG. 111). As such, the general likeability of the smartphone wallet varies widely in international comparison. Assessments of attractiveness and relevance are similarly broad: here, as well, Chinese ratings (average value 2.1 and 2.3, respectively) are much higher than the Germans' (average value 3.5 each). While the Chinese find this picture of the future very likeable, very attractive and very relevant, Germans only find the smartphone wallet somewhat likeable, somewhat attractive and somewhat relevant.

FIG. 111: Ratings for individual aspects of »the smartphone wallet«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



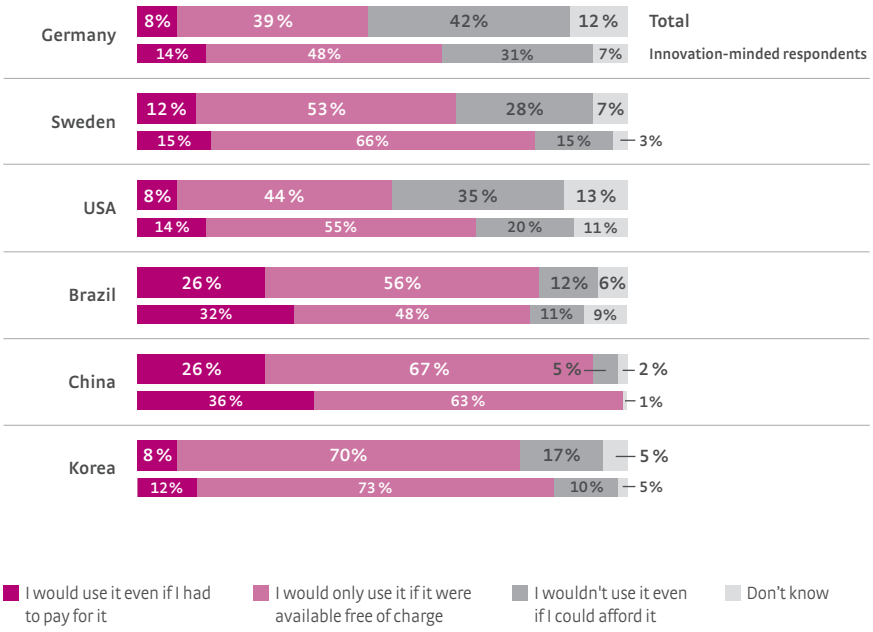
	DE	SE	USA	BR	CN	KR
Likeable	3.6	3.2	3.3	2.5	2.3	3.4
Realistic	2.8	2.7	2.3	2.4	2.3	2.0
Relevant	3.5	3.2	3.2	2.4	2.3	3.1
Transparent	2.7	2.9	2.4	2.5	2.2	3.0
Unique	2.4	2.6	2.4	1.8	2.2	3.3
Attractive	3.5	3.1	3.2	2.3	2.1	3.0

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=300, Sweden (SE) n=303, USA (USA) n=302, Brazil (BR) n=301, China (CN) n=298, Korea (KR) n=304

FIG. 112: Willingness to pay for »the smartphone wallet«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=300, Sweden (SE) n=303, USA (USA) n=302, Brazil (BR) n=301, China (CN) n=298, Korea (KR) n=304;
Innovation-minded respondents: Germany (DE) n=91, Sweden (SE) n=84, USA (USA) n=88, Brazil (BR) n=93, China (CN) n=98, Korea (KR) n=92

The realism and uniqueness of this picture of the future are also perceived differently in the various countries surveyed. Koreans believe the scenario to be highly realistic, while Germans only find it somewhat realistic (average values 2.0 and 2.8, respectively). Here, once again, Germany gives the lowest marks. In contrast, Korea is near the bottom end of the scale when it comes to rating the uniqueness of this future scenario. Koreans believe the smartphone with integrated wallet is only somewhat new and unique (average value 3.3). Apparently, this idea or application is no longer new for Koreans. Brazilians believe the future scenario to be very new and unique (average value 1.8), an opinion shared by Chinese, Germans and Americans (average values 2.2, 2.4 and 2.4, respectively).

Willingness to pay for a smartphone wallet is very low in all countries.

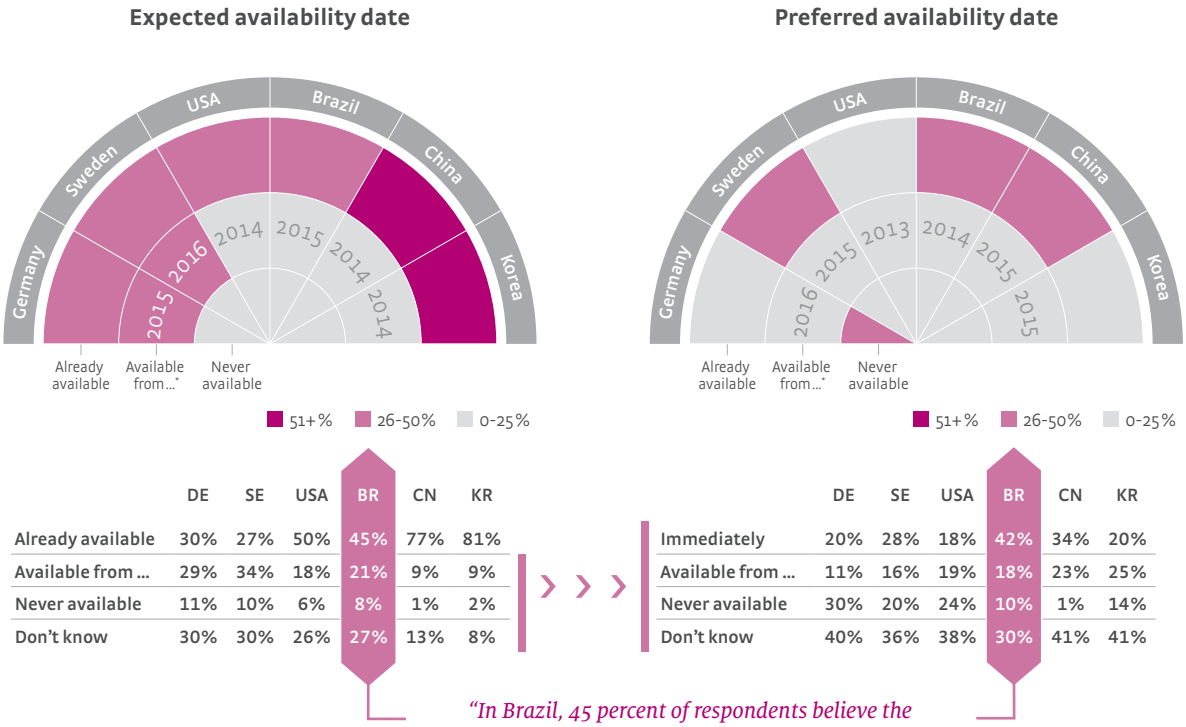
Only eight percent of Americans would be willing to pay to use a smartphone wallet (see FIG. 112). This figure is matched by the German and Korean respondents. As such, Americans, Germans and Koreans lie far behind Brazilian and Chinese respondents, 26 percent of which say they would be willing to pay. Germans also lag significantly in willingness to use the future scenario even if it were free of charge. Just 39 percent say they would use the service if it didn't cost extra. In contrast, 44 percent of Americans and more than half of Swedes (53 percent) would be willing to do so, along with more than two thirds of Koreans and Chinese (70 and 67 percent, respectively). Accordingly, probability of use would be very high in these latter two countries if it were offered free of charge. Only in one country did the majority of respondents indicate that they would not use a smartphone wallet even if they could afford it: Germany, where 42 percent of those surveyed would not be willing to use the future scenario even then. Around a third of Americans and Swedes expressed a similar sentiment (35 and 28 percent, respectively).

A majority of Koreans and Chinese expect the cell phone wallet to become available in 2011.

81 percent of Koreans and 77 percent of Chinese surveyed are certain that this option for smartphone payment already exists or will be introduced this year at the latest (see FIG 113.). Nearly a third of Germans share this conviction (30 percent). In Sweden, in contrast, around a third does not expect it to become available for several years. On average, 34 percent of Swedes expect that the smartphone wallet will be available to a majority of people in their country starting in 2016. The survey respondents who expect availability after 2012, later or never were also asked when they would like this scenario to be available. In Germany and the USA, a large portion of respondents expressed the preference that the smartphone wallet will never become available for the majority of people in their countries. In Brazil, China and Sweden, in contrast, most people would prefer it be available immediately (42, 34 and 28 percent, respectively).

FIG. 113: Expected availability date for »the smartphone wallet« vs. preferred availability date for »the smartphone wallet«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	30%	27%	50%	45%	77%	81%
Available from ...	29%	34%	18%	21%	9%	9%
Never available	11%	10%	6%	8%	1%	2%
Don't know	30%	30%	26%	27%	13%	8%

	DE	SE	USA	BR	CN	KR
Immediately	20%	28%	18%	42%	34%	20%
Available from ...	11%	16%	19%	18%	23%	25%
Never available	30%	20%	24%	10%	1%	14%
Don't know	40%	36%	38%	30%	41%	41%

"In Brazil, 45 percent of respondents believe the smartphone wallet will be available for the majority of people in their country by the end of 2011. 42 percent of those who believe this would like to have it immediately."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=300, Sweden (SE) n=303, USA (USA) n=302, Brazil (BR) n=301, China (CN) n=298, Korea (KR) n=304;
Preferred availability date: Germany (DE) n=215, Sweden (SE) n=224, USA (USA) n=159, Brazil (BR) n=171, China (CN) n=66, Korea (KR) n=56

“Tests have shown that contact with the actual technology seems to have a strong impact on opinions.”

Interpretation

Widespread skepticism – but waning as the day progresses?

Can an idea with 16 percent approval from the survey become a success in Germany? With a share of more than one-fifth of respondents saying they never want to see the digital wallet become reality? For the first contact with the subject – and a subject as critical as people’s own money – experts see the response within the expected framework. After all, credit card companies have found Germany to be a difficult market as well. Credit card penetration here is among the lowest in the world – although disposable income is among the highest. This is paired with a general skepticism of new technologies – whimsical innovations that are very well received in Asia seldom have a chance in Germany – at least initially. As such, the fact that 16 percent would be willing to use a high-tech wallet is a relatively high figure in itself. At the same time, solid engineering work is in demand, and helped make online banking a driver of online business in Germany in the 1980s and 90s. This trend could repeat itself with the smartphone wallet.

Are Germans hostile to innovation or merely cautious?

The figures reported for realism (2.8) and attractiveness (3.5) of the electronic wallet could give rise to this impression. Nowhere else did respondents assign such poor values. In fact, the smartphone wallet is a product that requires a great deal of explanation. But any attempt at explaining it will be confronted by internalized concepts and perceptions of how payments are made, what electronic payment means and which dangers lurk in this environment – various mental obstacles must first be navigated. This effect explains the difference in values between transparency of the future scenario (2.7) and its acceptance (3.2), but also documents a high degree of misunderstanding (see FIG. 111 and 109). An entirely different picture arises when demonstrators and prototypes are used. Every presentation of the technology is met with reactions ranging from interest to amazement – especially among less technophile respondents. The surprisingly few doubters are met with a majority of people who spontaneously express their hope that the technology will become available soon, or at least confirm that this trend is completely logical and inevitable. There is at least congruence with the expected availability date, as a large portion of Germans believe it is already available or will become available this year (see FIG. 113).

Research with demonstrators and prototypes reveals exciting insights. Tests show that contact with the actual technology seems to have a strong impact on opinions. There are several reasons for this:
(1) Virtual versions of cards that are already known are used – brands from banks and credit card companies breed trust and help counteract supposed monopolization of the means of payment by mobile communication operators.
(2) Using NFC – paying by touch demands immediate proximity, promising security and control. The technology is also extremely easy to use: once a card is selected, the smartphone behaves exactly as if it were that card.
(3) NFC support – benefits such as a large potential number of cards that can be reduced automatically to just a few based on the context and storing cash register receipts on the smartphone are perceived to be an aid in the vast jungle of payment and bonus systems.
(4) Additional information – PIN protection of the smartphone, wallet program and individual cards, combined with the simple, all-encompassing lockout in case of loss and recovery of a lost wallet on a different smartphone are all very well received.

Many of these aspects represent obstacles to acceptance in Germany that do not even need to be addressed in countries like Brazil; 45 percent of respondents in the latter country expect the smartphone wallet to be available by 2011 at the latest (see FIG. 113).

Innovation-minded German respondents seem to have recognized some of these potential benefits, as the rating of 2.8 for a trial period shows. Figures from the international survey also show that countries in which NFC technology is already familiar have a much higher opinion of this future scenario than the Germans, who have not had much contact with it. Ratings for realism in Korea (2.0), where NFC has been used for many years, and China (2.3), which has also deployed NFC in public transportation, clearly show its potential (see FIG. 111).

Digital wallet ecosystem.
According to initial industry studies, the number and variety of available cards is extremely important for acceptance. In general, test subjects and observers of trials and demonstrations expect the issuers to make their cards available in the digital wallet as a matter of course. Issuers of conventional plastic cards and printed tickets are not yet sufficiently aware of this driver, often taking a wait-and-see attitude or shy away in fear of potential additional costs. Issuers of credit cards would even have an easy job in Germany, however: 21 to 30 percent of respondents like the aspect of being able to use their credit cards on smartphones (see FIG. 107).

Issuers are faced with a further obstacle that mobile communication operators only have little influence over: acceptance of NFC technology by retail cash register systems. Modern systems can easily be upgraded to the new technology, but register manufacturers often demand high prices for such upgrades and the use of older systems is even more expensive. As a result, the number of customers who have the technology and wish to make payments with their smartphone wallets at retail outlets will be small at first. Many retailers will hardly see this as a call for immediate action. Nonetheless, larger retail chains are showing interest: NFC can reduce transaction times at the register – particularly in combination with customer loyalty cards and discount coupons, which the system finds and selects automatically with just a few simple steps. Knowledge of consumer movements and interests can be improved greatly through a combination of payment, collecting points and claiming discounts; integrating a check-in at the entrance – which is normally rewarded with special promotion discounts – can help achieve new quality levels in market and consumer research.

Smaller retailers will encounter new possibilities that they will first need to explore – comparable to the teething pains in the consumer area. The local kiosk and corner bakery will be able to introduce virtual bonus cards that are used regularly, thanks to automation and availability of the smartphone. For occasional use – at a snack bar, for example – it even seems possible to use the owner's NFC-capable smartphone as a supplement to the cash register system, to accept such payments. Developments of this nature are already in progress.

Launch from Asia and from closed systems.
Public transportation operators in Japan, with their high demands for efficiency, were the first users of a system launched by NTT DoCoMo that helped increase passenger throughput at entrance gates dramatically during peak travel periods. Today, these systems are found in Europe (such as the Oyster Card in London), as well as China and Korea. While practical encounters are still rare in Germany, the Asian respondents already have a good feeling for the realism of this vision, as the figures show (see FIG. 111). The Touch&Travel system deployed by Deutsche Bahn, a national German rail operator, represents one of the first uses of NFC on smartphones in Germany. It underscores the benefits of the approach in local public transport, but is based on specific software support that does not currently support other uses.

Once the systems are established, use by kiosks and snack bars often increases. They clearly demonstrate the suitability of the technology for payment scenarios, but cannot surpass the obstacles posed by passive plastic cards or adhesive NFC tags and lack transparency by design. The integration of NFC systems in the smartphone wallet clearly marks the next generation of contactless payment, access and identity functions with significantly more user control.

There are signs that Germany may experience a macroeconomic effect known as leapfrogging. Germany, with its established, widely accepted banking and payment systems, needs more than just faster handling on the subway or the casual touch of a card when buying a snack to make the leap toward NFC. At the same time, the German government is promoting the implementation of NFC technology with the introduction of new electronic identity cards (eID) equipped with the same technology, which means NFC will enjoy strong support ranging from age verification on cigarette vending machines to readers on Internet PCs.

Efficiency gain and risk management.

The greatest macroeconomic benefits can only be captured if cash is replaced. Cash costs society a lot of money – its transport, handling and associated risks represent a lever that can help reduce transaction costs significantly. Practical examples include areas where NFC – or at least an equivalent with conventional cards – is already in use: cashfree canteens and cafeterias. Throughput times, which are extremely important at peak mealtimes, can be reduced while potential hygiene problems resulting from handling both food and money can be eliminated. These systems are closed systems, in which the card issuer also operates the cash register systems and the business itself, where the potential savings are captured directly.

New technologies to which we entrust our money first have to prove that they deserve this trust. Fears of data misuse (53 percent of Germans) and a lack of security (58 percent in China) are characterized primarily by the respective culture, but are generally high in all the surveyed countries. Germans, for example, express clear acceptance of keeping only customer loyalty cards in their smartphone wallets (21 to 30 percent; see FIG. 110 and 107). The financial risk is low here, while a potential loss will only affect what is perceived as a gift anyway. Trust in the technology for payments is determined primarily by the issuers, however – first and foremost banks and credit card companies. They can largely assume the risk in case of loss or theft from users. After all, these are the very cases that make the electronic wallet interesting. The loss of a conventional wallet often goes unnoticed for hours; the cash is gone and usually untraceable. The replacement of lost cards is tedious, time-consuming and harbors a particular risk for the issuer: the customer could even decide that they can do without a rarely-used customer loyalty card or cancel the credit card that was misused in the time until it was blocked. In comparison, the modern wallet is contained in a smartphone – a device that many people use several times per hour, if only to check for missed calls and messages. Any loss is discovered sooner, the lockout immediately blocks all contained cards and misuse in the interim is much less likely, because the phone itself, the wallet function and every individual card is protected by PINs or other security mechanisms. Even though the new risks that arise from networking mobile devices partly offset the benefits, the targeted use of phone location services, spending limits and other measures can significantly reduce overall risks for both issuers and users.

The real world is getting more digital, the virtual world more secure.

The sheer use of smartphones with NFC harbors numerous potential improvements in retail and security technology. For tickets and unstaffed sales through vending machines, efficiency gains and risk reduction can help capture substantial business benefits. The smartphone wallet also gives a significant boost to security in Internet commerce. In Germany, in particular, many people do not want to risk shopping on the Internet because they are afraid of identity theft and misuse of their card and account data. A truly secure, widely implemented system with smartcard-level security could help capture a great deal of potential for Internet services in – and from – Germany. The immense potential combinations of use at cash registers, from device to device and on the Internet can hardly be predicted. Nearly all payment cards can be paired with an online function: discount coupons can be earned on the Internet and redeemed at the cash register in over-the-counter retail, while vouchers can be purchased as gifts on the Internet and sent directly to the recipient's wallet. Since this study focused on consumers, the information it can supply about interest or potential in this domain is limited; a survey of retailers and advertisers could provide further insights.

The digital and physical worlds are converging.

Internet use in Germany still lags in international comparison (see ITU 2011), yet misuse is rampant – through identity theft, for example, and in online banking. The latter can be combatted effectively by the smartphone wallet, which should help calm skeptical users. Security on the Internet and in mobile services consists of more than just secure proof of identity and reliable payment methods, however. Privacy protection, in particular, could be simplified by managing different identities – pseudonyms – for an individual. While a high degree of authentication makes sense for using an electronic identity card and the data derived from it on an e-government platform, a pseudonym would be sufficient in an online gaming community, but would still require password protection against misuse. The same user could have other identities with the same service – and a different one on an opinion forum. This isn't because the average German harbors fantasies of being a secret agent with multiple aliases; it is because these measures are needed to maintain distance to earlier remarks, hobbies and contacts – which is normal, and perhaps even an essential prerequisite, for social interaction across different phases of life.

In addition to increased security, the spread of a medium that supports the convergence of the digital and physical worlds will also result in entirely new application scenarios: direct communication and the establishment of trust can be transferred from the physical world to the virtual world of the Internet. Not just virtual money, but also authorizations and tickets can be exchanged in personal contact; neighbors can be allowed to share the photos of the last block party, visitors can access the home WLAN or parents allowed through the school gates to attend the class party. Touching two NFC devices together enables secure transmission, without having to detour through the Internet. At the same time, there is major interest in the secure transport of access keys over the Internet, for example, to let a neighbor into your residence remotely to deal with a burst pipe while you are away.

What will change – and what can we change?

Mistrust of the technology cannot simply be abolished per caveat – nor should it; after all, the first versions of NFC that were deployed in Japan and Korea had serious security gaps that business and society do not have to tolerate. Enthusiasm for new technology instead of mistrust is also related to the image of technology and engineers. Obstacles to acceptance are market barriers that must be apparent to anyone planning to invest in Germany. Schools and politics are still called upon to improve the foundations for innovators and investors.

With NFC technology the financial sector is faced with a potential surge in innovation, as the concept of the virtual wallet can be implemented quickly, cost-effectively and manageably for customers. At the same time, product definitions and regulations that have been stable for decades, if not longer, will have to be adjusted. The new risk management that will become possible will have to protect customers against trust-destroying losses. The assumptions made for magnetic strips will apply even more to valuable technology with Internet access. The potential savings must be reflected in cheaper products, which can then increase competitiveness in turn.

Of course, many of the addressed issues are very sensitive: many see anonymous payment with cash as a basic right, yet it is not possible to imitate it with electronic money. Potential conflicts with money laundering laws, for example, will require improvements to the legal framework before cash can be replaced. No one can be forced to maintain anonymity or use synonyms, but it will have to become the normal case on the Internet – even a civil right – if privacy concerns are to be taken seriously. The fear of data misuse is extremely high among Germans – and even higher among innovation-minded respondents, at 64 percent, compared with that of the average (53 percent; see FIG. 110). The digital wallet does not just create another problem area, one that can be managed through an effective design, but also represents an approach to solving many of the existing security problems in the digital world. To map identity aspects from the identity card scope, however, it must be possible to selectively open the identity silo around the eID. Why shouldn't people be able to transfer some of the data from their eID to a separate card on their smartphone via NFC, to refer to the identity card but only use some of the information it contains?

Summary.

The smartphone wallet faces an interesting future – worldwide. The skeptical attitudes of Germans are more telling of the big picture than a contradiction. The wallet of the digital future must satisfy the highest security requirements. The challenge is to make the most and the best of the existing possibilities – a challenge that Germans certainly understand. Many of the digital achievements from recent decades have major security and privacy deficits – which are nearly perfectly illustrated by the fact that 64 percent of innovation-minded respondents are concerned about this issue – more than the total survey sample, only 53 percent of which fear the problem. With the right cards in the digital wallet, many of these topics could be addressed transparently and safely – good reasons to be receptive to the subject – even, and especially, for technophobes. A special challenge for the various industry sectors will be to constructively shape their roles in the new ecosystem with regard to security, payment, selling and "understanding and delighting customers".

Opening bank accounts on the Internet and electronic bill management.

FIG. 114: Evaluation of individual aspects of »opening bank accounts on the Internet and electronic bill management«

"What do you particularly like about this scenario?"
"Is there anything about it that you view critically?"

I would like to open new bank accounts online, but this was not possible because I always had to identify myself in person at the bank or a post office. I would also like to manage my bills digitally and get rid of all the paper.

21-30%

My bank now offers me the possibility to **open an account completely on the Internet**, by **identifying myself** with my **electronic driver's license or identity card (eID).** This saves me from having to visit the bank or post office and **I can open an account outside regular business hours** I sign the contract with my electronic driver's license or eID and a click of the mouse button and can start using the account immediately. This new online account model can be combined with optional electronic bill management. This means that all my bills from retail stores, repairmen etc. are delivered to me electronically – I can then pay them through my online account, if I want to, and manage them simply there.

31-40%
of respondents marked this.

The **electronic bill management** feature in my online account has other benefits, as well – for example, I can include them easily in my electronic tax return. The bill management feature also takes care of my household account book and saves my bills in case of warranty claims. Every bill is protected by an electronic signature that protects the integrity of the content and, at the same time, makes it a legally binding document.

Liked Viewed critically

Percentage ranges are visualized in different font sizes

Basis: all people surveyed about this scenario, Germany (DE) n=302

FIG. 115: Visualization of »opening bank accounts on the Internet and electronic bill management«

"By 2030 at the latest, globally compatible key management (cryptographic keys, public key infrastructure) will be used." (Estimation by Germany experts)

(Result from the second phase of the study, thesis 39)

“In the future, it should be possible to open a bank account over the Internet without media discontinuities.”

Dimension

Enhanced online banking including electronic account opening and electronic bill management.

Online banking has enjoyed widespread use for many years now. Bank customers can not only see their current financial status, but also carry out transactions such as transfers and securities purchases and sales over the Internet. Transactions are authenticated with TANs (transaction numbers), which customers receive by letter, on their cell phones or through a TAN generator. Although these procedures offer a high level of security and are largely accepted in practice, they do not have the legal quality of a qualified electronic signature. This is why the extension of online banking is hindered by legal restrictions in many countries, particularly in Europe. For example, many countries do not allow a new bank account to be opened in a completely electronic procedure. Current practice demands identification of new customers, usually by presenting an identity card at a bank branch. If the transaction originates in the Internet, the Post-Ident procedure is used in Germany and selected other countries, in which a post office employee verifies the customer’s identity and documents that process. This procedure is complex and results in delays and additional costs.

In the future, it should be possible to open a bank account over the Internet without media discontinuities. To do so, the function of the new electronic identity card (eID) will be used. The bank identifies the new customer based on their eID and opens the account immediately. It is not necessary for the eID to bear a certificate for a qualified electronic signature. As long as local law does not demand written form, contracts can also be concluded with a click. A prerequisite for this is that the new customer has been identified with the eID, which means the bank can be sure of who it is communicating with. In Germany, contracts for current accounts could be concluded in this manner. If the customer also requested granting of a credit line, an additional written agreement would be needed.

Legal obstacles to the use of electronic bills also existed for a long time, for example, the requirement to use a qualified electronic signature, which made automated generation impossible. This obstacle will be eliminated soon, thanks to new laws at the federal level. As a consequence, electronic bills may become more attractive for users.

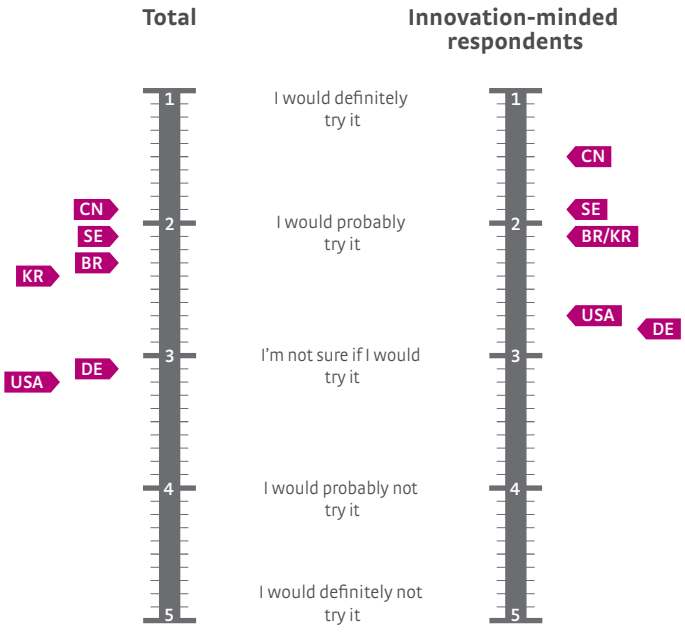
An enhancement to online banking with an additional function for integrated electronic bill management would address this development and give consumers an easy way to manage and pay their bills. If a customer loaded an electronic bill received by e-mail, for example, into his or her online banking area, it would generate a pre-completed wire transfer form. Moreover, the bill would remain accessible and could be exported for use in other programs (such as tax software) as necessary.

Description

The probability of a trial for opening bank accounts on the Internet diverges widely among the surveyed countries.
A large number of respondents, especially in Sweden and China, indicated they would definitely try out this future scenario (43 and 41 percent, respectively). On average, the respondents indicated that they would probably try it (average value 2.1 and 1.9, respectively; see FIG. 116). With average values of 2.3 and 2.4, respectively, Brazilians and Koreans share this opinion. In comparison, this future scenario does not seem to be particularly well received in Germany or the USA (average value 3.1 and 3.2, respectively). Just 16 percent of German respondents say they would definitely try this future scenario, compared to 25 percent of respondents who say they are not sure whether they would try it. The picture is similar in the USA: only twelve percent would definitely try it, while 26 percent definitely would not. Among innovation-minded respondents, Germany comes in last with an average value of 2.8, while China leads the surveyed countries with 1.5.

The survey respondents were asked to highlight the text passages in the description of the future scenario that they found especially appealing or especially critical.

FIG. 116: What respondents think about a trial with »opening bank accounts on the Internet and electronic bill management«
"How likely is it that you would try out this scenario?"

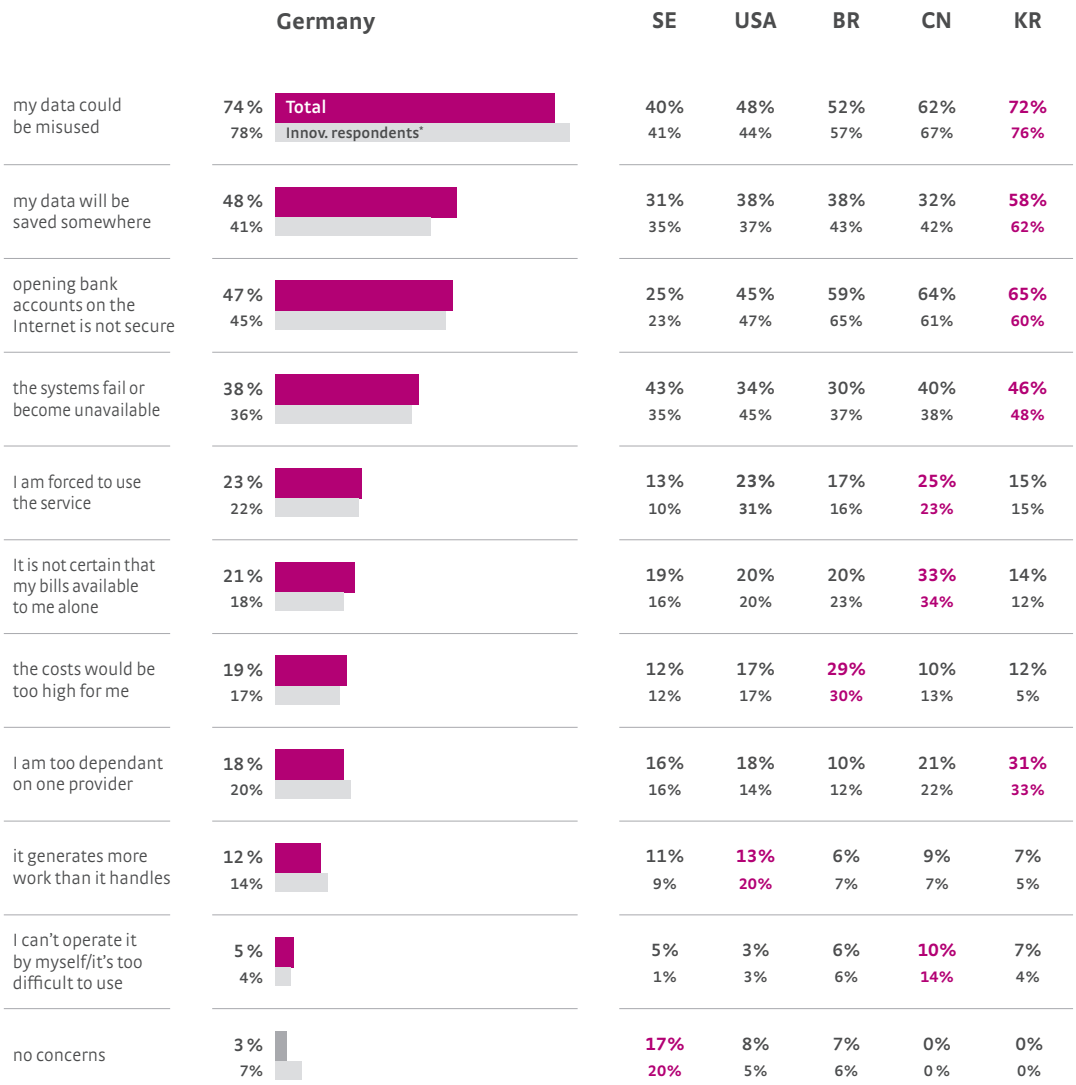


Average values shown

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=302, Sweden (SE) n=297, USA (USA) n=301, Brazil (BR) n=302, China (CN) n=300, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=101, Sweden (SE) n=89, USA (USA) n=87, Brazil (BR) n=98, China (CN) n=93, Korea (KR) n=91

FIG. 117: Respondents' concerns about »opening bank accounts on the Internet and electronic bill management«

"In the following, you will see a list of potential arguments against this scenario. Please indicate which four arguments you are most concerned about. Please select a maximum of four answers.
I would be concerned that ..."



* Innovation-minded respondents

Basis: all people surveyed about this scenario;
Total: Germany (DE) n=302, Sweden (SE) n=297, USA (USA) n=301, Brazil (BR) n=302, China (CN) n=300, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=101, Sweden (SE) n=89, USA (USA) n=87, Brazil (BR) n=98, China (CN) n=93, Korea (KR) n=91

Many respondents in Germany liked the fact that bank accounts could be opened entirely over the Internet.

The text passage *"open an account completely on the Internet"* was highlighted as positive by 21 to 30 percent of Germans (see FIG. 114). They also greeted the aspect of no longer being dependent on opening times – *"I can open an account outside regular business hours"*(21 to 30 percent). The *"electronic bill management"*, which was described as well, also seems to appeal to Germans (21 to 30 percent).

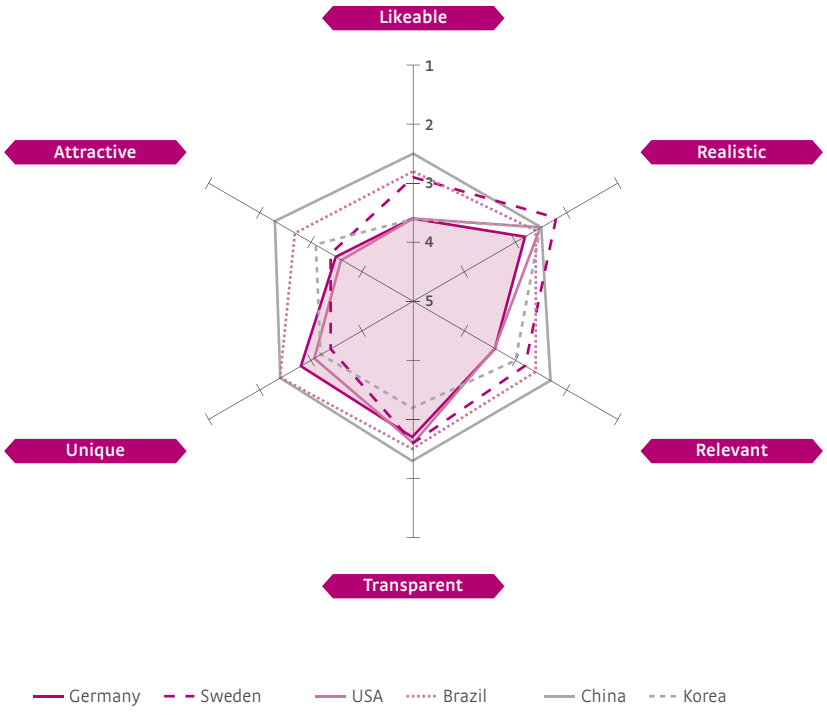
It is noteworthy that the same number of respondents see the opportunity to open a bank account entirely *"on the Internet"* as something critical (21 to 30 percent). These respondents might fear that their personal data could be misused on the Internet. The aspect of *"identifying myself with my electronic ID card"* was also highlighted as critical by at least 21 to 30 percent of German respondents – another likely sign of fear of data misuse.

Three-quarters of German respondents are worried that their data could be misused (74 percent; see. FIG. 117)**.** An even higher number of innovation-minded respondents, 78 percent, express this concern. Many respondents in Korea and China share this concern (72 and 62 percent, respectively). In fact, it is the concern that Koreans express most frequently for this future scenario. In Brazil and the USA, in comparison, "only" around half of respondents fear misuse of their data (52 and 48 percent, respectively), while the corresponding figure in Sweden is 40 percent. Swedes also seem to be relatively untroubled by the possibility that their personal data might be saved somewhere (only 31 percent see this as a concern), while it is the second-greatest concern in Germany (48 percent). In China, this fear – like in Sweden – only seems to be shared by a small share of respondents (32 percent).

Only a quarter of Swedish respondents expressed the concern that opening bank accounts on the Internet could be insecure, while 65 percent of Koreans and 64 percent of Chinese did so. In Germany it is the third-greatest concern, at 47 percent. The most frequently expressed concern among Swedes is that the technology behind the future scenario could breakdown or become unavailable (43 percent), a concern shared by 46 percent of Koreans, while Brazilians – at 30 percent – seem somewhat less worried. In nearly all the countries surveyed, the above four concerns were checked off most

FIG. 118: Ratings for individual aspects of »opening bank accounts on the Internet and electronic bill management«

"Which statement best describes how much you like this scenario?"
"How realistic do you find this scenario?"
"How relevant does this scenario appear to you?"
"After reading about it, how well would you say you understand what you can expect from it?"
"Which of the following statements best describes how new and unique you think this is?"
"How attractive do you find this scenario?"



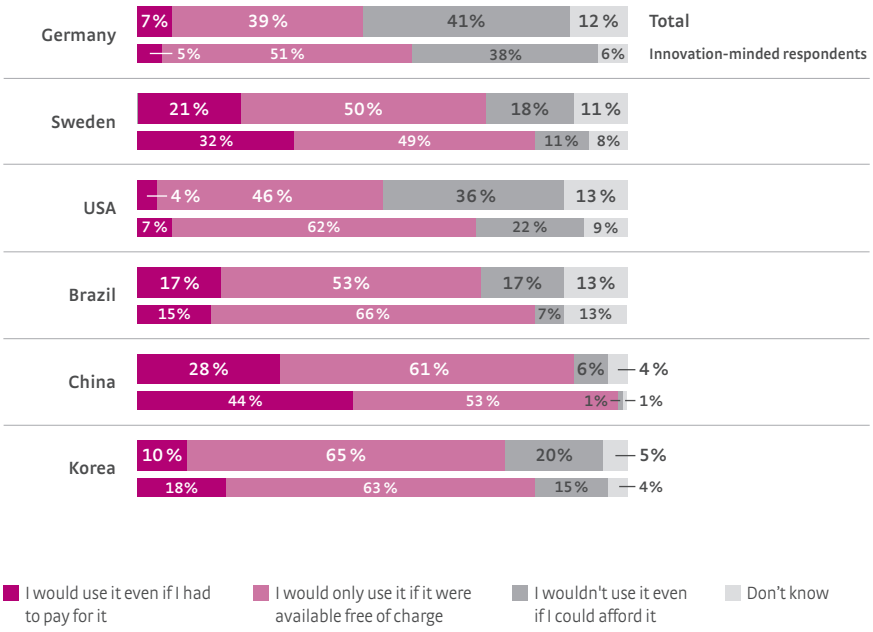
	DE	SE	USA	BR	CN	KR
Likeable	3.6	2.9	3.6	2.8	2.5	3.6
Realistic	2.8	2.2	2.5	2.6	2.5	2.5
Relevant	3.4	2.8	3.4	2.6	2.3	3.0
Transparent	2.7	2.6	2.6	2.5	2.3	3.2
Unique	2.8	3.4	3.1	2.4	2.4	3.2
Attractive	3.5	3.4	3.6	2.7	2.3	3.1

Scale of 1 to 5, where 1 is the highest and 5 the lowest rating, average values shown

Basis: all people surveyed about this scenario; Germany (DE) n=302, Sweden (SE) n=297, USA (USA) n=301, Brazil (BR) n=302, China (CN) n=300, Korea (KR) n=302

FIG. 119: Willingness to pay for »opening bank accounts on the Internet and electronic bill management«

"When you picture this scenario, which of the following statements do you agree with most?"



Basis: all people surveyed about this scenario;
Total: Germany (DE) n=302, Sweden (SE) n=297, USA (USA) n=301, Brazil (BR) n=302, China (CN) n=300, Korea (KR) n=302;
Innovation-minded respondents: Germany (DE) n=101, Sweden (SE) n=89, USA (USA) n=87, Brazil (BR) n=98, China (CN) n=93, Korea (KR) n=91

frequently, whereas the other concerns only worry a small portion of respondents. In an interesting side note, 17 percent of respondents in Sweden do not have any reservations at all about using this future scenario.

The likeability of this picture of the future also varies widely in international comparison.

In Germany, the USA and Korea, this picture of the future is only somewhat likeable on average (average value 3.6 each; see FIG. 118). Opening bank accounts on the Internet and electronic bill management only get a moderate reception in the other surveyed countries as well; the best average value is achieved in China, with 2.5. The surveyed Swedes and Brazilians, with average values of 2.9 and 2.8, respectively, also like the scenario much more than the Germans, Americans and Koreans. Swedish respondents find the future scenario the most realistic (average value 2.2), while the Germans think it less so (average value 2.8). In their assessment of the relevance of opening bank accounts on the Internet and electronic bill management, Germany and the USA tie for last place (average value 3.4 each), while China comes in first, assessing the future scenario as very relevant with an average value of 2.3. The idea seems to be relatively well-known in Sweden and the USA, as the aspect of novelty and uniqueness receives the worst marks here (average value 3.4 and 3.1, respectively). In comparison, Chinese and Brazilians find the future scenario to be very new and unique (average value 2.4 each). Americans rated attractiveness the worst, with an average value of 3.6, closely followed by the Germans (average value 3.5). In contrast, the Chinese rate this picture of the future as very attractive (average value 2.3).

Willingness to pay for opening bank accounts on the Internet and electronic bill management is very low overall.

In the USA, just four percent of respondents would use this future scenario if they had to pay for it (see FIG. 119); the corresponding figure in Germany is also low, at seven percent. The figure is even lower among innovation-minded Germans (five percent). Willingness to pay is highest in China: nearly a third of respondents would use the service of opening bank accounts on the Internet if they had to pay for it (28 percent), and even 44 percent of innovation-minded respondents. While 65 and 61 percent of respondents in Korea and China, respectively, would use this future scenario if it were free of charge, the corresponding figures for the

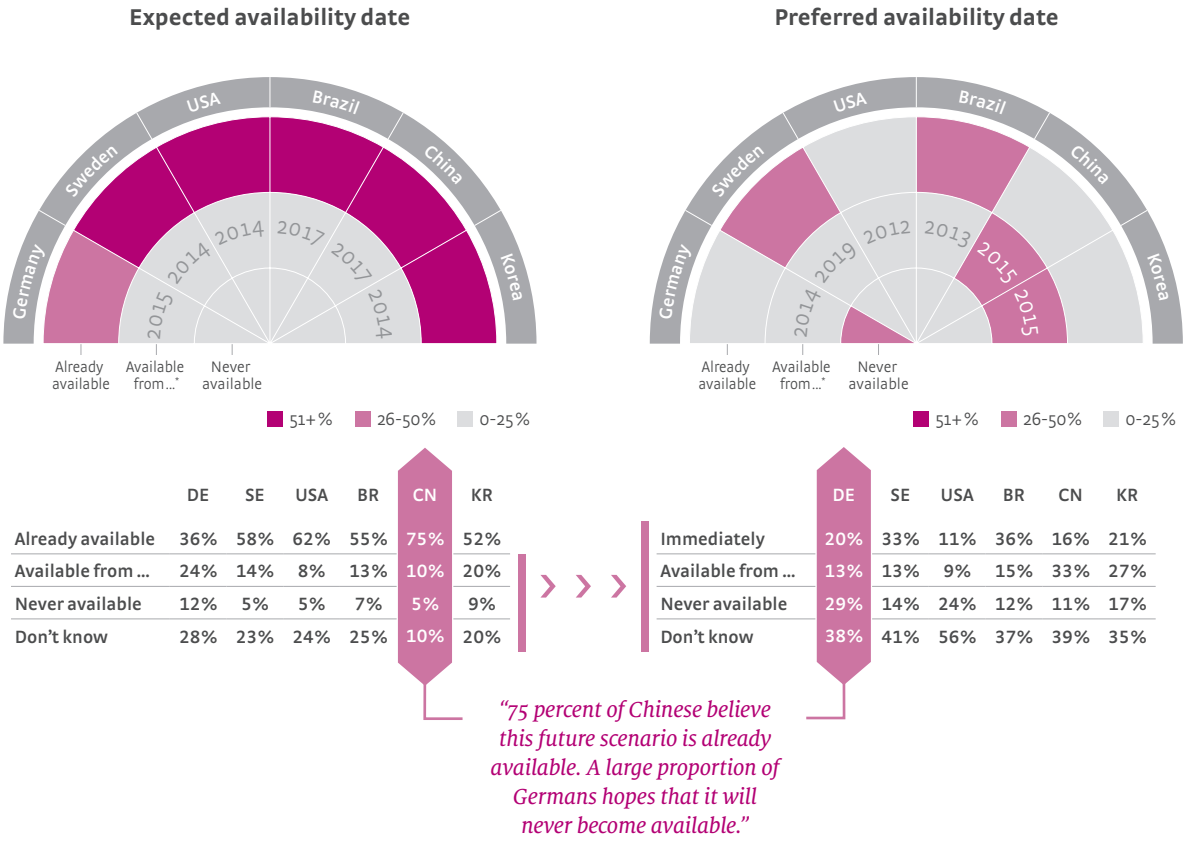
USA and Germany are much lower. 46 percent of Americans would use it if it were free of charge and just 39 percent of Germans. The number of respondents who would not use this scenario even if they could afford it is similar: 41 percent of Germans share this opinion, along with more than a third of Americans (36 percent). As these figures confirm, Germans and Americans seem to be the least open to this future scenario.

With the exception of Germany, a majority of those surveyed in every country say that this future scenario is already available.

Three-quarters of Chinese believe that something like opening bank accounts on the Internet is already possible, while the corresponding figure in Germany is just 36 percent and another twelve percent of Germans believe it will never become available (see FIG. 120). The respondents who do not believe it is already available were also asked when they would like it to become available. Every third Brazilian and Swedish respondent answered *"immediately"* (36 and 33 percent, respectively). In Germany and the USA, in comparison, around a quarter hopes that it will never be possible to open bank accounts over the Internet (29 and 24 percent, respectively). This is a vast contrast to China, where only eleven percent shares this hope.

FIG. 120: Expected availability date for »opening bank accounts on the Internet and electronic bill management« vs. preferred availability date for »opening bank accounts on the Internet and electronic bill management«

"When do you expect this scenario to be available for the majority of people in your country?"
"When would you like this scenario to be available for the majority of people in your country?"



	DE	SE	USA	BR	CN	KR
Already available	36%	58%	62%	55%	75%	52%
Available from ...	24%	14%	8%	13%	10%	20%
Never available	12%	5%	5%	7%	5%	9%
Don't know	28%	23%	24%	25%	10%	20%

	DE	SE	USA	BR	CN	KR
Immediately	20%	33%	11%	36%	16%	21%
Available from ...	13%	13%	9%	15%	33%	27%
Never available	29%	14%	24%	12%	11%	17%
Don't know	38%	41%	56%	37%	39%	35%

"75 percent of Chinese believe this future scenario is already available. A large proportion of Germans hopes that it will never become available."

* Average values shown

Basis: Expected date: all people surveyed about this scenario; Preferred date: all people surveyed about this scenario who expect availability from 2012 or never;
Expected availability date: Germany (DE) n=302, Sweden (SE) n=297, USA (USA) n=301, Brazil (BR) n=302, China (CN) n=300, Korea (KR) n=302;
Preferred availability date: Germany (DE) n=193, Sweden (SE) n=127, USA (USA) n=138, Brazil (BR) n=147, China (CN) n=76, Korea (KR) n=141

> **“As a result, the business case as it is now can only be justified through savings in internal financial industry processes.”**

Interpretation

Some respondents cannot wait to have the scenario, while others have concerns.

Online banking, or the electronic handling of banking transactions on the Internet, is an established procedure in many countries. More than 26 million customers handle their banking transactions electronically in Germany alone (see BITKOM 2010). At the same time, the conventional bank branch, supplemented with self-service terminals, continues to be a central contact point for many customers. As a result, the large number of online banking users is matched by a similarly large number of people who do not want to use online banking for a variety of reasons.

This societal division between proponents and skeptics of online banking is reflected in the survey results for the enhanced online banking functions. On one side, a considerable share of respondents – up to 36 percent in some countries – would like the described enhancements to online banking to be available immediately, while on the other side up to 29 percent of respondents in the various countries hope that the new applications will never become reality (see FIG. 120).

While the great skepticism in Germany is unsurprising, due to the intensive discussions about data protection and widespread doubts in technology, it is indeed surprising that these concerns are matched in the USA, while Swedes and emerging countries like China and Brazil are much more open to the described application (see FIG. 116).

Opinion remains divided on online banking, for new features as well.

Online banking is an application well known to customers. As a result, the enhancements described here achieve good marks when it comes to transparency and realism. At the same time, online banking does not raise any emotions at all with consumers, which is reflected in the comparatively low ratings for attractiveness and likeability. Much more emotionally charged are fears that one’s data could be misused or that the scenario of opening bank accounts on the Internet might not be secure overall. Germany tops the list in international comparison of the fear of data misuse, with three-quarters of respondents, while between 21 and 40 percent of Germans explicitly indicated in the future scenario that they see identification with the eID as critical (see FIG. 114). It is interesting that these fears do not decrease when the new eID in Germany is used, but instead increase. The negative reporting that accompanied the launch of the eID seems to have a major impact.

In comparison, the cost issue is largely secondary, although customers who have experience with existing online banking services will likely assume that such services are generally provided free of charge. Although understandable for opening bank accounts, it is somewhat remarkable that customers overwhelmingly expect even additional services such as electronic bill management to not cost anything extra. As such, while electronic bill management could increase the attractiveness of online banking, it is unlikely to generate additional revenue. This fact will probably limit the potential of such developments for the near future, despite the high number of respondents who expressed positive opinions about the enhancements to online banking and would like to try out the new functions.

As a result, the business case as it is now can only be justified through savings in internal financial industry processes; at the same time, due to the high number of people who refuse to use it, it is clear that it will not be possible to replace the existing (branch banking) systems in the foreseeable future. Although the business case for opening bank accounts on the Internet seems feasible, due to the high costs of the current Post-Ident procedure, if additional features such as electronic bill management are added it will be all the more difficult to achieve a profit. This explains why there has been so little movement in this direction to date, although the fundamental technical prerequisites are available and the legal obstacles to electronic bills can surely be overcome.

In light of the survey results, little is likely to change for this situation in the short term. The automatic opening of bank accounts on the Internet only has potential as a niche application. For electronic bills to be used in significant numbers and in online banking, the initiative must be seized by the large companies and companies that issue large numbers of bills. Unless and until this occurs, the processing of electronic bills in online banking will remain a vision.

Security concerns must be addressed.

Even if the services were available free of charge, half the population in Germany and the USA would not use them. This is a wake-up call that reflects deep mistrust of the Internet as a platform for managing financial affairs. The figure corresponds to the nearly three-quarters of respondents in Germany and the USA who fear their data could be misused or saved in unknown areas (see FIG. 119 and 117). Mistrust of this magnitude is surprising, given that online banking has been a widely-used application for over a decade and losses are extremely rare in relation to the huge number of transactions executed. If security concerns were based on the implemented PIN/TAN procedure, then they should drop sharply upon deployment of the new electronic identity card as an officially verified security tool. However, a large proportion of German respondents – 21 to 40 percent – is also critical of deployment of the eID (see FIG. 114). From these results, we can deduce that the expressed security concerns arise independently of which procedure is used, and also that it has not yet been possible to gain the population's trust in the new eID card. These security concerns must be taken seriously and addressed, and not just as part of a banking industry project. A comprehensive societal debate involving both researchers and government is needed. After all, a look beyond the borders proves that some countries see the risks and opportunities much more positively.

Looking beyond the borders: emerging countries see the glass as half-full, not half-empty.

A look beyond German borders shows that security concerns, in particular, vary significantly in international comparison. 74 percent of Germans fear misuse of their data, for example, while only 40 percent of Swedes fear the same. Around half of Germans believe opening bank accounts on the Internet will be insecure, but just 25 percent of Swedes and nearly two-thirds of Chinese and Koreans (see FIG. 117). While trust in the security of online banking is apparently higher in Sweden, people in Asia have even greater concerns about security than respondents in Germany. This could be due to the fact that security standards in Asia do not meet European standards. Nonetheless, the consequences of these results for acceptance in the respective countries are highly relevant.

While security concerns result in skepticism toward enhanced features in online banking in Germany (proponents and skeptics are nearly balanced), acceptance of the scenario if offered free of charge is not only high in Sweden, with nearly three-quarters of respondents, but also in China and Korea, where 89 and 75 percent of respondents, respectively, would be willing. Some would even use it if it cost extra (see FIG. 119). It is also noteworthy that innovation-minded respondents in Germany are even more worried about data misuse, and willingness to pay for the service is lower comapred with the average for all respondents. This reflects the extremely critical position of German opinion leaders in international comparison.

In light of this, it is hardly surprising that willingness to try the described application is greatest in China and Sweden and lowest in Germany and the USA (see FIG. 116). This low acceptance in the USA is not apparent at first glance, particularly since the security concerns described above are below average in the USA Also noteworthy is the frequently expressed concern by innovation-minded respondents that they might be forced to use this service and that using it would create more work than it saved. As a result, it becomes clear that the convenience factor, which has always been important in the USA, could have a very strong influence. As such, it is no surprise that the questions on likeability and attractiveness receive correspondingly low marks.

Efficient financial transactions support global trade.

The majority of payments that people make as consumers is private. But anyone who has won an auction for a product from Great Britain or Hong Kong on eBay knows that our familiar payment methods are not transferrable to international transactions. Efficient, automated online banking is a key to creating an international payment area that consumers can also use, as SEPA has largely achieved in Europe. If there were a standardized electronic bill that could be sent by e-mail and that could be paid conveniently with online banking, it would greatly simplify cross-border payment transactions. Moreover, electronic bills of this kind could be traded or borrowed against, for example, if a craftsman wanted to pre-finance outstanding bill amounts. This is currently a complex process and therefore expensive. For this reason, it would be desirable if electronic bills were implemented globally.

In comparison, opening bank accounts on the Internet will remain a niche application. It could be useful in individual cases of cross-border trade, however, if it enabled a customer to open an account quickly and easily in a different country to handle (domestic) payments with it. In particular, this could be necessary in countries with largely closed markets.

Security infrastructures represent the starting gate for new forms of participation.

The structure and typical applications of online banking are quite similar to those of e-government: both involve the submission of declarations of intent with a high legal relevance. At the same time, transactions can be automated in both areas, offering significant potential for efficiency gains. Since online banking is used much more frequently on average and because risk assessments under economic aspects are possible due to the private nature of the business, online banking is easier to implement than e-government. As soon as the existing security infrastructure that both require is generally accepted, however, it can be utilized generally for e-government, e-participation and even online voting as a long-term goal. To this extent, the greater use of online banking might also result in greater acceptance of typical e-government functions, which means this topic has societal relevance as well. For this development to be successful, however, positive experiences with the security infrastructure and the resulting high acceptance are needed. This must be worked on in the interest of everyone involved. The concerns voiced by the respondents show that there is still a great deal of work to be done, as does the low proportion of German citizens who activate the eID functions of their new identity cards. Until trust in the processes is established, online banking and other comparable functions will face a difficult future.

What can be done?

A primary factor for the described enhancements to online banking and other applications that place high demands on security is a functional, generally accepted security infrastructure. Germany has created such a central infrastructure with the eID function integrated in the new electronic identity card. However, there are major reservations against the new card and particularly the eID feature among the German public. This is reflected in both the survey results and in the large number of citizens who elect to deactivate the eID function. It is up to politicians and scientists to appeal to society and help convince it of the benefits of using the new identity card. This could be achieved through greater transparency, as well as through greater emphasis on its potential benefits. The primary goal should be to ground the eID more effectively, to counteract the various security concerns. The failure of the new electronic identity card would be a major setback.

Potential uses of the eID function are limited to date. A clear legal definition of what can be done with the eID function is lacking. Opening bank accounts on the Internet will only be a niche application at first, yet restrictions apply here as well. For example, both the granting of an overdraft facility (which is common for current accounts), the notification of potential losses for securities purchases and even a credit check requires approval in written form, in turn demanding a qualified signature that cannot be rendered by the eID. The same applies to many e-government processes. The legislator should review existing formal requirements critically and better adapt them to the principles and requirements of a digital world.

Standardization and more simple legal recognition are major keys to promoting electronic bills. Without standardization, the automatic processing of bills will not be possible. If legal certainty is lacking, as is currently the case, and time-consuming procedures utilizing (personal) qualified signatures are needed, the recipients of electronic bills risk losing their eligibility to deduct input tax. As a result, electronic bills are hardly used, even between large companies. The planned new law is an important, correct step in this direction. The next step must involve promoting standardization. Here, as well, the public sector can play a crucial role as a demand generator.

Summary.
Online banking is a good example of how customer friendliness and efficiency gains can be achieved by automating repetitive processes from business and private life on the Internet. The greatest obstacle seems to be breeding trust for such a system. The results show that major persuasion is needed that the mere deployment of state instruments, such as the electronic identity card in Germany, does not make the procedure a sure-fire success. At the same time, a look beyond the borders of Germany shows that the described enhancements to online banking can be very well received, despite existing reservations. We must build on these findings.

“A primary prerequisite for the described enhancements to online banking is a working security infrastructure that is generally accepted.”

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