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DISCUSSION

Addressing Grand Challenges

Implications for BISE Research

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1 Introduction

As a scientific community, we regularly discuss future research topics and the development of our field. BISE special issue 1/2014 was based on a broad call for papers asking our community where we see key research areas with a high relevance and research potential for the upcoming years. In addition, we deem it important to look at research in our community with a long-term perspective and to ask ourselves which topics our community should focus on, even if these are new fields of research. Such long-term research goals are often called grand challenges.

The term grand challenges was coined in the beginning of the nineteenth century, when the mathematician David Hilbert published a list of important unsolved problems that inspired researchers and encouraged innovation in mathematics research ever since. Different communities have picked up the idea and formulated their set of grand challenges – among them natural sciences or medicine and, more recently, computer science and management. The underlying idea of grand challenges is to focus on ambitious research objectives that harness science, technology, and innovation to solve important national or global problems, and that have the potential to capture the public's imagination (U.S. Office of Science and Technology Policy 2014). Consequently, grand challenges not only aim at inspiring researchers, but also play an increasingly important role for allocating public and private research funds.

In this issue of BISE, two groups of authors have independently of each other taken on the initiative of identifying grand challenges in BISE by conducting surveys and Delphi studies among scholars. The research notes in this issue summarize the results of these initiatives and outline future research opportunities for BISE researchers. Obviously, it is not an easy task to identify grand challenges in general and, more specifically, in a heterogeneous discipline such as BISE. Both research notes come up with a long list of research challenges, which may provide an important impetus in a discourse that we want to continue in this discussion section of BISE and beyond.

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The research notes in this issue go beyond merely presenting research challenges, instead they take complementary perspectives. Becker et al. take an internal view discussing what needs to be done to create a coherent discipline with mutual understanding of scholars' inherent motivation to drive things forward. Mertens et al. elaborate on BISE's possibilities to create societal and economic impact and identify domains and problems where IS researchers should raise their voices, to be heard and to make a difference. Both are grand challenges in themselves.

Both empirical surveys should lead to a discussion in and reaction from our scientific community. Implications for one's own research agenda, however, may vary between downright repulsion of other people's indecent proposals to change the own research direction and acceptance and acknowledgement of a superior societal goal that is worth abandoning all running projects and allocating all resources to. The truth probably lies somewhere in between.

We would like to start the discussion with some viewpoints from scholars who influence research policy in different formal settings. Our discussants hold offices in different research associations or act as advisors for research policy makers. In these functions they decide what the relevant and urgent questions are and where resources should be allocated to. However, everybody in our community who applies for funding or decides which of several overdue publication ideas to push forward also makes that decision.

We suggested the following guiding questions to the authors for creating their reflection statements:

1. Can grand challenges really instill new research goals and re-focus a whole discipline? Do we need to agree on those challenges? Is there the one, the "grand" challenge that unleashes so much more potential than the current sum of our individual, mundane research efforts?
2. Does a research field such as BISE need grand challenges to fulfill a guiding role in attracting the attention of researchers, students, and industry and to focus their efforts on certain research fields? Can we forward the IS discipline and ourselves by joining research efforts in a top–down process, or do we rely on the sum of our individual abilities to create attraction in our direct realm of influence?
3. Should grand challenges be used to allocate scarce research budgets to more focused and promising tasks, or does this involve the risk of resulting in uniform research efforts and cutting off the usual innovation provided by individual, fundamental research? Does such a conflict even exist?

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2 Tackling Grand Societal Challenges as a Science-Policy Goal

2.1 Introduction

The concept of grand challenges has a long and changeable history which can be traced back to David Hilbert's list of unsolved mathematical problems. Today grand challenges are at least as often associated with broad questions of societal relevance as with inner-scientific puzzles. In this respect, the "Grand Challenges in Global Health" presented by the Gates Foundation in 2003 can be regarded as pioneering. Tackling Grand Societal Challenges has even developed into an additional science-policy goal that complements the approaches of promoting basic research as a driver of progress and of supporting innovation processes. This new science-policy goal has far-reaching implications for scientists and for scientific institutions which take on this task. Therefore, the German Council of Science and Humanities (Wissenschaftsrat) recently issued a position paper on grand societal challenges which clarifies their orienting function within the science-political discourse and formulates seven desiderata for the approach taken by science and science policy (Wissenschaftsrat 2015). This position paper is the result of numerous lively discussions of the council and the responsible working group. From my point of view the intensity of these discussions demonstrates the contentiousness of this subject and the necessity of a clarification process. In the following paragraphs I will focus on three desiderata concerning the contribution of science and science policy to the identification and tackling of grand societal challenges. Before going into detail, grand societal challenges have to be characterized in order to understand the implications of tackling grand societal challenges as a science-policy goal.

2.2 Characterization of Grand Societal Challenges

The term "Grand Societal Challenges" is firmly established in the language of science-policy; it has an impact on funding policy and influences the strategic orientation of scientific institutions and organizations in Europe. However, there is no unique or explicit definition of what is meant by grand societal challenges. In most cases, lists of examples with very different thematic ranges are used to illustrate this term. The term grand societal challenges

has also come to figure in the media and in everyday language use. It is used to signal that certain topics have a broad societal impact, are taken very seriously by a significant number of stakeholders[1] and will require special efforts. At the same time, the use of this term invokes particular needs in terms of strategic orientation and resources. It is usually held that the emergence, course and consequences of grand societal challenges are not unalterable. Instead, it is expected that they can be influenced and limited by human activity and steered onto a more manageable course by acting appropriately. All in all, the risks and opportunities, the potential responses and societal impact mean that these challenges are politically contentious issues.

In addition to these three characteristics, grand societal challenges have further typical features of a formal and thematic nature which set them apart from challenges in individual disciplines, challenges in the sense of specific technological projects, or the challenges of individual political areas. In formal terms, many of the grand societal challenges listed as examples are characterized by high levels of complexity, interdependency and polytely, and also by difficulties in defining them precisely. For this reason, grand societal challenges have a lot in common with complex problems[2] and with so-called wicked problems.[3] Grand societal challenges have their own dynamics and can develop in an often unpredictable manner even without external interventions. Numerous, sometimes contradictory goals may overlap with regard to grand societal challenges, as these challenges affect a range of stakeholders with differing social backgrounds, heterogeneous bodies of knowledge, and heterogeneous normative ideas. In thematic terms, grand societal challenges are characterized by the fact that societal problems are turned into scientific challenges. Science has always contributed to the solution of societies' problems. In parallel, science policy has always regarded it as its task to promote scientific contributions to the tackling of societal problems and to communicating these to the public. With the global and transnational context of societal problems, however, grand societal challenges present a new framework for the understanding of the role of science in society.

2.3 Identifying Grand Societal Challenges in Open and Pluralistic Processes

Recognizing and understanding complex interdependencies and developments that have far reaching impacts is a prerequisite for identifying future grand societal challenges as such. The scientific system with its various subject areas, institutions and organizations and its international networking can help to identify global trends and interdependencies, thereby acting as a kind of early-warning mechanism. Science can also contribute to the recognition and understanding of grand societal challenges; however, establishing a societal consensus on the significance of these challenges is a separate task. In this regard, political, scientific and other societal stakeholders[4] must work together in identifying new grand societal challenges. Given finite resources and differing goals and preferences, the decision as to which grand societal challenges should be tackled requires clearly set priorities. This type of deliberation should be based on the current state of scientific knowledge and can be supported by normative reflections on the values contributed by various stakeholders; however, this deliberation must then result in political decisions that should be taken with the broadest possible participation of the interests and parties affected.

2.4 Combining Scientific Knowledge from Various Sources

Knowledge relating to the ecological, technological, social, cultural, and economic aspects of a given transformation process must be bundled and recombined in a flexible manner in order to identify and solve grand societal challenges. For this reason, grand societal challenges cannot be defined in a discipline-specific manner, neither can they be successfully addressed by contributions from a single scientific discipline. Instead, interdisciplinary research approaches and transdisciplinary forms of cooperation that act across disciplinary boundaries are also an essential prerequisite for successful work. Please note that the contributions of science to the addressing of grand societal challenges do not represent another category of research of its own kind alongside knowledge- and solution-oriented research; however, they are also not limited to the development and investigation of new technologies, production processes, and products. In fact, the contribution of science should be interpreted significantly more broadly and can

[1] These include stakeholders from science, politics, industry, the media and the public.

[2] In psychological problem–solution research, "complex problems" are characterized by complexity, interdependence, their own dynamics, intransparency, and polytely. Cf. Dörner (1976), Funke (2003).

[3] The term "wicked problems" originates in Rittel and Webber (1973) and was originally intended to explain the failure of rational planning in the solution of social-policy conflicts.

[4] Depending on the problem area and challenge to be addressed, examples here include civil-society organizations, citizens, affected societal groups, consumers, users, and employees.

receive input from all parts of the existing scientific system.

2.5 Increasing the Diversity and Self-Correcting Capability of the Scientific System

The overall-organization and the funding of scientific institutions and activities must be structured in a way that diversity and freedom of science are preserved and fostered. A substantial component here is funding for research that is not in itself targeted at reflecting on societal challenges and making these challenges the subject of research efforts. The funding of basic research and sufficient basic funding for scientific institutions are indispensable for addressing grand societal challenges in an appropriate manner. Funding targeted contributions to the identification, evaluation, and tackling of grand societal challenges and acknowledging these in evaluations and in other incentive systems are useful additions to independently controlled research, and contribute to the diversity and multidimensionality of the range of capabilities of science. In return, the guaranteed diversity and freedom of research demands a high degree of commitment from researchers, scientific institutions, and organizations to contribute to the tackling of grand societal challenges to the best of their abilities in cases where they have appropriate knowledge and skills.

2.6 Conclusion

The complexity, the dynamics, and the long-term nature of major societal problems require scientific contributions that go beyond one-dimensional, mono-disciplinary analyses and solution approaches. This takes into account the interaction between specialist areas and also between science and other function systems in society. There is no doubt that many researchers are motivated by the fact that they are convinced that their work benefits society. Accordingly, they participate in the public discourse and regard it as their personal task to contribute relevant findings and to ensure that these are visible and effective for society as a whole. In the light of the complexity of the challenges and societal expectations, however, the council still identifies a joint responsibility of scientific and political stakeholders to improve the contribution of science and science policy to the identification, analysis, and tackling of grand societal challenges. The aim should be to foster the potential of the scientific system in a reasonable manner and to take into account a society's legitimate demands. In this context knowledge- and solution-oriented research are equally relevant.

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3 On the AIS Grand Vision Project "ICT-Enabled Bright Society"

In its mission statement, the Association for Information Systems (AIS) states it "…serves society through the advancement of knowledge and the promotion of excellence in the practice and study of information systems." (http://www.AISnet.org, revised 2010).

AIS is a global organization with more than 3800 members in 93 countries grouped into three regions. The three countries with the largest numbers of members in AIS are the US, Germany, and China. The association is represented at the country level through 36 country chapters and special interests of the membership are addressed in 38 special interest groups. Amongst other activities, AIS organizes conferences such as ICIS and AMCIS, publishes four scholarly journals, maintains the AIS eLibrary, and makes the AIS Faculty Directory available to the public.

As AIS president from 2014 to 2015, I described IS academics as "ambassadors of the possible" to which I inevitably added: "Ambassadors have various tasks: they represent their discipline, they influence policy, they help to establish good will in foreign disciplines, they protect IS citizens, they support prosperity by enabling interactions with other disciplines, and finally, they manage their operations. In short: the role of an ambassador is to communicate, inform, and represent. The 'possible' can be seen as good or bad. It can be hoped for or feared. In any case, knowledge is needed to understand where we came from, how we can move forward with our design, and which theories can guide and help us better understand the continual process of digitization. To make this possible IS-academics need to connect and balance exploration in theory and research with exploitation in practice and teaching".

Upon closer examination of its goals and aims, the AIS council agreed that while the organization has focused on the needs of its members as academics, it has not given priority (or deserved attention) to the contribution the IS field makes to society. When it becomes obvious that despite a discipline-oriented mission a professional organization does not master a society-relevant call to action amongst their members, it is time to rally. This situation became the starting point of a discussion about grand challenges within AIS such as processes which would allow all members from any and all countries to contribute and become part of such a discourse.

The result of our rally was the idea of an "AIS Grand Vision Project". The underlying idea, debated during June 2014, was that even though one might worry about the downsides of digitalization, a greater concern is that a concentration on the disadvantages of digitalization might lead to over-regulation and a very real loss of

opportunities. Society, therefore, needs to confront and tackle issues such as cyber security, the societal impact of digitalization and governance. A good starting point to deal with these issues is to evaluate any disadvantages of all the otherwise "positive" aspects of digital vision. Because AIS remains optimistic, we created a project to identify and possibly avoid the downsides of digital progress called the "ICT-enabled Bright Society (Bright ICT in short)" project. The premise underlying our endeavor was: "What issues do we have to master to really promise an ICT-enabled bright society?"

Council, and I as president, were convinced that the best manner for AIS to address these "disadvantage" issues in an association-wide and organized fashion, taking into account the constituencies of all academics and the challenges faced by each of them, would be via a pilot run. AIS sees the Grand Vision Project as a vehicle to attract attention, alert members to the need for open and honest discussion on the pros and cons of digitalization and to get acquainted with the overall process of such an endeavor. With the diversity inherent within the association, especially when it comes to regions, countries, and research perspectives, the idea was to focus on one initiative within an AIS Grand Vision as a starting point for discussion.

To launch our initiative, the AIS Council formed a task force in 2014 to promote the "Bright ICT" initiative in a sustainable manner. The members of the task force were Jae Kyu Lee, Jane Fedorowicz, Helmut Krcmar, Cynthia Beath, Allen Lee, Joey George, Niels Bjørn-Andersen, Jason Thatcher, and Ramayya Krishnan (AIS 2015). The approach for "Bright" was: "Global societal knowledge infrastructures and communication platforms have proliferated to almost all inhabitants of the earth, owing to the ubiquitous penetration of the Internet, mobile phones, and ICT-enabled systems for daily life and business. However, many side effects emerged from ICT platforms in particular countries as well as across borders. AIS aims to take the initiative to investigate the problems in societal knowledge infrastructure and to design the vision of ICT-enabled bright society. The solution space will encompass the development of relevant technologies, business models, public policies, social norms, international agreements and metrics of measuring national progress". To move the initiative forward, the task force encourages the organization of panels and workshops at AIS conferences to exchange ideas about the vision for the Bright ICT initiative. The IS community needs to understand what the vision is, what can be done, and what opportunities are presented by the initiative for IS researchers.

To date, discussions on the Bright ICT initiative have involved many participants and have taken place at ICIS 2014, ECIS 2015, PACIS 2015, AMCIS 2015, and forthcoming ICIS 2015: we intend to keep the momentum going.

In his MISQ guest editorial "Research Framework for AIS Grand Vision of the Bright ICT Initiative", Jae Kyu Lee, AIS president 2015–2016, described the need for research (Lee 2015). His proposed principles for discussion included origin responsibility, deliverer responsibility, rule-based digital search warrants and traceable anonymity. A so-called master plan for discourse has been established, country representatives have been selected and a Delphi study is under way to identify pertinent issues. At ICIS 2015, AIS will sign a MoU agreement with the International Telecommunication Union (ITU) on their collaboration in going through the process of research and implementation particularly focusing on making the Internet platform more trustful ("Bright Internet").

In the opinion of AIS, we have started a necessary and novel way to engage members in a topic that unites science and society. We are looking forward to the many facets of interdisciplinary discourse, to further exploring the focus we have identified and to sorting out the technical, legal, and politico debates which will surely surface. With our Bright ICT initiative, AIS strives to not only attract the attention of researchers and students, but also industry. In the end, AIS hopes that through the Bright ICT initiative, more attention will be given to solving one of the grand challenges of the digital transformation: making sure that its upsides outshine its downsides. Prof. Dr. Helmut Krcmar President, Association for Information Systems 2014–2015 Technical University of Munich

4 "Grand Challenges" and/or "Grand Vision" for BISE?

A list of grand challenges has its merits for the inside and outside of any discipline. It has the prime intention to inspire the imagination of scholars to create an identity of a scientific subject, while for the outside, e.g., for government agencies, customers, or future students, grand challenges have the character of a "shopping list".

Such a list loses its value if the entries do not fit expectations or change very often. Grand challenges should be hard to solve, and conclusions regarding the state of the art should be possible. To ensure a longer lasting duration, grand challenges should be based upon unchallenged "assumptions" and easy to identify with a field, e.g., BISE. Otherwise misguidance is unavoidable as many failed efforts have shown. The assumption that Germany needed to take the lead in a grand challenge for future mobile communication standards resulted in a significant weakening of German providers due to a misjudgment of the

winning technology. Numerous other examples can be listed, many of them failed due to wrong estimations of how technology and societal demand co-evolves, or that technological progress depends on prerequisites in other fields.

We need to extend our view to acknowledge "Grand visions" in order to soften such misguidance and to abstain from proposing both the challenge and implying a possible technological solution at the same time. Grand visions carry interdisciplinarity at the core, they provide permanent qualitative guidance and they allow a flexible evaluation of any possible solution proposal. Electrification was such a grand vision about 100 years ago, while digitalization is today's vision in many engineering fields, also in BISE, where the focus is upon automation in enterprises. Automation needs regular reconsideration due to significant changes in IT – both in capabilities and in their usage outside as well as inside enterprises. The following six observations consider this progress.

First, we approach novel concepts like automation in staged, organized innovation processes. The staged improvement of solutions to problems reduces complexity and generates a theoretically endless sequence of improved solutions to already existing old solutions.

Second, the transformation of scientific results into business use has always taken place when the relationship of cost of technology and business usage drastically changed. Whenever the cost of computing fell below a certain threshold, a new era in BISE began. From mainframes via the PC era to present day's mobile technology and cloud computing, reduced IT costs have challenged existing solutions almost every 10 years. However, the components of any BISE framework consisting of "initiation", "control", "integration", "architecture" have not really changed since the data processing (DP) era. Even increasing "commodization" of technology, or the beginning of the Internet era just limited the impact on the components, instead of opening new areas of automation.

Third, decentralization of modern IT is not just a matter of implementing distributed systems or using mobile devices. We need to understand that the individual device is a window to the enterprise IT and supports a new mode of communication within the enterprise and towards customers and the public. Commodization, Cloud Computing, or Big Data are examples of technologies waiting to be transferred to enterprises to liberate automation from the concept of programmable tasks of the DP era when solving unstructured tasks of today. This requires information systems (IS) to coordinate the knowledge of heterogeneous users who work on very different tasks with mostly standardized technology.

Fourth, the static nature of "traditional IS" when addressing information flow and aggregation limits the development and usage of new solutions for, e.g., renewable energy, smart factories and smart cities, or even a smarter planet (as IBM calls it). All this requires a seamless involvement of people in a complex fabric of modern forms of computing to enable a connection of the cyberspace with the physical world. Wiener's model of "cybernetics" described the conjunction of control and communication, where the control logic was driven by computing, processes, computation, and communication in a closed feedback loop – a model of the DP era. A modern framework of "cybernetics" requires systems to learn from humans, with an open feedback loop to assure a rapid adaptation to a changing physical environment observed, and to transfer the observation to models within the cyberspace – from the sensor to the desktop is the buzzword.

Fifth, the expected embedding of physical entities as in the Internet of Things or connecting eco-systems as in Industry 4.0 has many prerequisites. It needs to guarantee functional safety, achieve low energy consumption, satisfy hard real-time constraints, it needs to prevent chaotic business behavior, fraud or misuse, and to assure security and privacy to protect digitized property and allow goal-oriented actions. Such an extension of Wiener's framework has been proposed by (Müller and Wahlster 2013) to specify a control logic enabling the conceptual conjunction of cyberspace and physical processes. Google, e.g., uses several forms of big data organizations with names such as Colossus and Borg which allow a connection of physical and cyber worlds where machines learn from humans.

Sixth, despite the conceptual and technical advancements, a basic question remains open: "When is a solution acceptable in BISE?" The almost "Cambrian evolution" of the number of services – e.g., in the "app economy" – pretends that all these services are useful solutions, even though BISE may not always agree to the algorithm in an app. Mathematicians distinguish between the solution and the specification of a problem. If the problem solution can be verified in polynomial time, can we also solve it by means of a fast algorithm? If yes, everybody who describes a problem would be just a few steps away from the solution.

With these six initial observations in the context of grand challenges, I intend to stress the argument that an aggregation of detailed grand challenges under a grand vision may support an improved understanding and communication within the BISE community as well as with the outside stakeholders.

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5 Informatics' Grand Challenges – Motivation for and Experiences from the Ongoing Effort by the German Informatics Society

The German Informatics Society [Gesellschaft für Informatik e.V. (GI)] is a non-profit organization with about 22,000 members from across the world. Most of them participate in the development of the discipline of informatics by teaching, researching, or working in the field of informatics, while others are involved in related business and political areas. The main purposes of this network of professionals are to motivate the use of informatics, to develop the scientific discipline, and to promote the impact informatics has on economy, business, and society. Informatics is a synonym for the academic discipline labeled as computer science elsewhere.

In 2013, the GI issued a call to name grand challenges (GC). Out of the many submissions, an expert jury selected five grand challenges, which the GI published in January 2014: (1) saving the digital cultural heritage, (2) securing the future Internet, (3) mitigating systemic risks in global networks, (4) designing ubiquitous human–machine interfaces, and (5) enhancing reliability of software (Informatik Spektrum 2015):

5.1 GC1

The cultural mass production of digital objects has become an integral part of our society. Digital objects are therefore part of our digital cultural heritage, and their long-term preservation and accessibility form one of the most pressing challenges facing our society today. Long-term preservation is not a one-time event but rather an ongoing process that includes a wealth of different recurring tasks and techniques such as migration and emulation.

5.2 GC2

The Internet has emerged as the main communication infrastructure worldwide. However, its concepts have not been tailored for this task. The future Internet is not only fast, it is in particular secure and trustworthy. To meet this claim is the main challenge when designing the future Internet.

5.3 GC3

The world is full of nets which are growing and becoming more complex, implying increasing risks for people, enterprises, countries, and global organization. Informatics' methods and tools should protect them, but a permanent monitoring of all nodes and links would not be affordable. The challenge is to identify systemic elements and to secure them in a systematic way, as well as to look for chances to improve the risk management using well-known and more recent scientific methods.

5.4 GC4

Personal success and participation in society is more and more driven by an effective interaction between people and computers in order to communicate and gain access to online services. It should be intuitively possible to use these services, with a variety of user interfaces, without formal training or reading manuals. In addition to making the services usable for a broad set of people and in a broad set of usage contexts, the users must be enabled to foresee the consequences of their actions. We need to cooperate with other disciplines to design solutions for human–computer interaction that enable all people to use the ubiquitous communication and information services effortless and in a self-determined way.

5.5 GC5

Software is ubiquitous and everywhere in our daily life: in communication, industry, households, medical technology, and safety–critical areas. The crucial point is the reliability, dependability, and security of software in view of its respective application area and with regard to functional requirements, error detection, and self-healing capabilities. The Grand Challenge lies in the development of integrated methods and tools to ensure the aforementioned properties at design time, and to predict software behavior at runtime, with a long-term goal of automated certification capabilities.

Proposals came from nearly all special interest groups within the GI, with additional submissions from individual GI members. The criteria for selection were not easy to discuss and decide on. In the end, the most important one was that the goal should be ambitious and, well, "grand", but that we could expect to reach it in the foreseeable future. In addition, we required a presentation of how the challenge could be met in an easily understandable scenario. This scenario should constitute a substantial progress in economic, social or societal terms for the world at large. Selecting the five grand challenges was not intended to be a singular action. We are well aware that other topics exist that also satisfy all requirements for a GC. We intend to continue the initiative and to invite to monitor the progress of the selected GCs and to identify new ones every few years.

At the start of this process, we communicated five goals of the GC initiative:

- To motivate for informatics as being an attractive science;

- To show young people the interesting challenges that informatics offers, and thus to provide incentives for a corresponding career choice;
- To show society which relevant problems can be solved with informatics;
- To encourage students and scientists to conduct research into these topics;
- To motivate scientific institutions to intensify (and fund) further corresponding research.

The first three goals address the public and society representatives, while the last two address the scientific realm. For the GI, addressing the general public addresses an external audience – people who do not know much about informatics. On the other hand, most informatics scientists are GI members and thus part of an internal audience. Both, addressing internal and external audiences, is of significant importance, and needs to complement each other.

With regard to the external public and society, informatics needs to overcome a latent anxiety. A growing complexity in the IT systems that surround us and on which society increasingly depends, a track record of recurring and seemingly unresolvable IT security problems, and the inconvenient user interfaces which irritatingly still continue to exist, invoke a mixed image of the ability of informatics as an engineering science which should deliver. In the first decade of the twenty first century, informatics student numbers dropped continuously, due to both job fears because of global outsourcing (e.g., from Europe to India) and a job image that largely identified an informatics alumnus as a software programmer coding in a windowless room between stacks of cold pizza boxes. At the same time, the digital economy took off due to the widespread use of the internet; however, the list of requirements to become a successful startup entrepreneur seldom included a finished university degree in informatics. Informatics thus is trying hard to gain public awareness for its contribution to the digital economy.

For the internal, scientific audience, the situation is different. Informatics has grown to become a diversified, multifaceted science, with specialized communities, conferences, publication outlets, methods and instruments. For each topic different challenges exist which must be solved in the coming years, from databases through software engineering to networks. Young scientists, building their careers, stick to their silos and specialize early on a particular topic; publishing in connection with a general informatics conference, such as the IFIP World Computer Congress, does not necessarily add much to their CV when aiming at obtaining tenure. Additionally, engaging oneself in an informatics society competes with other scientific duties, with the consequence of decreasing membership numbers.

Issuing a set of grand challenges is thus a call for concentrated attention by the caller, in this case the German Informatics society. The call goes toward the general public, with the intention that society and politics recognize the extent to which informatics already pervades our everyday life. Some of the problems arising from this are self-made, and we informatics professionals recognize our responsibility to help finding solutions to them. A secure and trustworthy Internet is thus partly an endogenous grand challenge, as well as the quest for an enhanced reliability of software. However, that does not make it less important, as economy and society have come to rely on earlier Informatics successes.

How to proceed with the GCs selected? The authors of the submissions proposed a rough schedule and objectives, which now need to be made more concrete. All five challenges require enormous efforts to overcome, but each in a succession of small steps. Depending on the GC, the steps include policy initiatives, efforts to coordinate research funding, establishment of new scientific conventions, and organizing tracks at successful conferences. We need to harmonize those efforts, so that our calls for funding do not interfere with each other; to develop coordinated strategies for public relations work; to chronologically arrange steps for synergies; and finally to anchor the GCs in the GI society structure so that discussing and solving them is accepted as an internal, well-supported task which GI members can be proud of.

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