In Search of Information Systems (Grand) Challenges – A Community of Inquirers' Perspective

Jörg Becker, Jan vom Brocke, Marcel Heddier, Stefan Seidel

Bus Inf Syst Eng 57 (6) (2015)

Appendix (available online via http://link.springer.com)

Appendix

Appendix A

A.1 Participants in preliminary workshop

Participant	Country	Academic position	Gender	Selected research interests
1	Finland	Full professor	M	Management of networked activities, e-commerce
2	France	Associate professor	M	Supply chain management
3	France	Full professor	F	Operations research, decision making
4	France	Associate professor	M	Data analysis, text mining
5	Germany	Senior lecturer	M	Conceptual modeling, diversity, supply chain management
6	Germany	Full professor	M	Operations research, business intelligence
7	Italy	Full professor	M	IS development, IS impact
8	Liechtenstein	Senior lecturer	M	ERP systems
9	Liechtenstein	Full professor	M	Business process management, IS-enabled transformation
10	Lithuania	Full professor	M	Software engineering, business process modeling, knowledge management
11	Lithuania	Associate professor	M	User requirements analysis, information systems development
12	Norway	Full professor	M	IS development, business process management, enterprise content management
13	Poland	Full professor	M	Systems analysis and design, customer relationship management
14	South Korea	Affiliate professor	M	Strategic planning, IS strategies, inter-organizational management, performance management, software policy

A.2 Participants in qualitative stage

Participant	Country	Academic position	Gender	Selected research interests
1	Australia	Full professor	M	Business process management, business transformation, green information systems
2	Austria	Full professor	M	Semantic web, knowledge management
3*	France	Full professor	F	Operations research, decision making
4	Germany	Full professor	M	Information management, process management, e-government, retail IS
4	Ireland		M	IS-enabled organizational innovation,
5	Italy	Full professor	M	Business process management, organizational change
6	Italy	Associate professor	M	Social media, collaborative work
7	Lithuania	Full professor	F	Software engineering, business process modeling, knowledge management
8	New Zealand	Full professor	M	Decision making, e-commerce, information systems management
9	Russia	Full professor	M	Business process management, enterprise content management
10	Slovenia	Full professor	M	IS innovation
11	Spain	Full professor	M	Entrepreneurship, open source software, innovation management
12	Switzerland	Full professor	M	Collaborative technologies, e-government

Participant marked with an "*" already participated in the preliminary workshop.

Appendix B

Grand Challenges – Overview
C1 – Identifying IS as an Academic Discipline During the last several decades, the IS discipline has been striving for being recognized as an academic discipline. A plethora of paradigms, theories, models and methods have been proposed since then; however, no coherent theoretical-methodological IS foundation has been established yet. The Challenge is to do exactly this.
C2 – Adapting IS teaching to current IS research developments IS research has changed significantly since the discipline emerged. The initial rather technical focus has widened. IS research topics range from a very technical IT perspective over organizational issues right up to highly interdisciplinary topics. IS teaching, however, is often enrooted in the IS origins and insufficiently aligned with the current research culture. The challenge is not to include every new technology and IS research topic into teaching. This would lead to much disturbance and low sustainability and would only confuse students. The challenge is rather to establish means and structures that continuously identify those parts of IS research that are universal and sustainable and transfer them into IS teaching.
C3 – Proving Relevance of IS Research A lot of IS research lost relevance. It will be vital for the IS community, however, to regain relevance. Time is right to do so, since our economy and society is facing global challenges that IS can contribute to as a problem solver.
C4 – Rethink the theoretical foundations of the IS discipline When the discipline emerged it had a strong relation to computer science, then new lenses have been provided from a sociological, and psychological perspective. The challenge would be to consider both perspectives in a single angle.
C5 – Streamlining and providing equal quality standards for different strands of IS research. Coming to terms with how design science should be conducted or evaluated, e.g., with high quality standards.
C6 – Mastering the methodological breadth/richness. IS (and also CS) rely on several major methodological approaches: i) logics/mathematic (inference and deduction); ii) natural science with hypothesis formulation and testing; iii) design science and engineering. And in some cases also qualitative views need to be integrated (e.g., in case studies, hypothesis formulation, framework developments). One needs to know when to apply which method (and how); and also this needs in-depth knowledge of the different views. Very often they all need to be applied.
C7 – Increasing theoretical/methodological sophistication. To become better social scientists, and more aware of important debates in the philosophy of social science. Due to the technical backgrounds of a lot of IS students, levels of social science knowledge can often be poor. This kind of challenge might mean that we become less obsessed with trying to establish the distinctiveness of the IS 'discipline' (a political project) and embrace other areas more openly (like Science and Technology Studies, for example).
C8 – Providing ubiquitous access to IS services By means of cloud computing and virtualization users and businesses should be provided with natural, safe, responsive and self-adaptive means of ubiquitous access to IS services by use of sensors, blend of internal and external systems as well as broadband ICT superconnectivity.
C9 – Integrating information systems in one single virtual space Technologies are ubiquitous. A number of technological systems for managing information are available. Usually, such IS are specialized by certain criteria or type, e.g. IS for managing learning processes, financial investments, healthcare information, synchronous and asynchronous communications, and others. The challenge is to integrate the very high number of different kinds of IS in order to provide individuals (citizens) with a unique “virtual space” where, through single sign-on, they can find all information related to them. In other words, instead of using many applications and devices we may want to use one single application that gives us access to our information anytime, any device, anywhere, anyhow, in a secure manner.
C10 – Making different IT generations work together The widespread adoption of ICT technologies has contributed to outline two different generations called sometimes digital natives or digital immigrants, other times X and Y generations. Evidences testify that these generations deeply differ in the way they process information and in the way they use ICTs. These differences are actually emerging in organizational contexts where web 2.0 technologies and social networks are being more and more introduced to let digital natives work immersed in a more motivating environment. This aspect has impact on IS design, implementation, use, appropriation, and training. As technology evolves at high speed, different generations of technologies are expected to appear in the future. As a consequence, different generations of digital natives can emerge. This issue is then expected to replicate in the future opposing these different generations in the same organizational work environments.
C11 – Developing universal methods for the translation between different coding systems This comprises methods for synchronizing, integrating and translating coding systems, be it natural language or structured data. One example is the description of some entity in a standard way, e.g., in the field of Medical

Informatics. The entity to be described here is the human body and health: “A complete computer-based patient record that could serve as regional/national/multinational resource and a format to allow exchange of records between systems” (Sittig 1994, p. 413). Further, flawless automatic translation between two full-scale traditional languages would be a major triumph. However, how can we define that translation is flawless enough?

C12 – Aligning organizational objectives with IT by developing and establishing efficient communication means

Conceptual modelling facilitates the communication between different stakeholders. The task of conceptual modelling is both error prone and time consuming. Myriads of heterogeneous modelling techniques exist. They are being used on different levels of abstraction for different purposes (from natural language to formal UML Models) by different stakeholders (Managers, Process Designers, Workflow Modelers, IS Developers, Legal Experts, Common employees). Incomprehensible, complex, and badly aligned information models are the result. Solving these problems will lead to a better communication among stakeholders, thus simplifying the alignment of organizational objectives with IT.

C13 – Developing model-driven methods and tools for the full-scale automated generation of implementation-ready IS.

At the moment, various R&D groups and entire organizations work on model-driven techniques to automate certain steps of information systems development life cycle. In the last decade, OMG has also proposed its vision on this subject – it was called MDA (Model-Driven Architecture). However, up to now one may still call it a “vision” – as of yet, no one has proposed a practical method (and its implementation) to support automated ISD life cycle (“from business level models to working code models”).

C14 – Leveraging the “fun” in Information Systems Applications.

Several of the most successful applications in the B2C e-commerce arena (as a major “application” field of IS research) have little to do with work and the so-called “lean-forward” concentrated mode. They rather support the relaxed and also fun mode – and this is not only related with gaming. This raises also a challenge w.r.t. to innovation research – many innovation proposals need to start with a problem to be solved, e.g. which problem is solved by twitter?

C15 – Integrating human and machine problem solving.

In IS (in contrast to maybe other sciences) it is well acknowledged that Information Systems are man-machine systems. This corresponds to the view that problem solving needs and is a mix of human as well as machine problem solving capacities. This is also coherent with new developments such as social computing (and crowd sourcing), where problem solving tasks are split among humans and machines. This raises challenges regarding this “optimal” split, machine and human readable service descriptions (when services are shared), or also w.r.t. to the computational power of such systems.

C16 – Leveraging knowledge from data, with the related management of high data volumes.

The Web is increasingly becoming a mirror of the world – reflecting the static “knowledge” as well as the dynamic behavior of users (as well as machines). This huge amount of information can be used by individuals and companies – needing (semi) automatic tools for interpretation of data, and putting also emphasis on privacy issues. And this data together with proper tools will also change social sciences.

C17 – Developing effective IS for emergency management

Establishing an effective flow of information related to the different phases of emergency management poses a major challenge to the stakeholders involved. The diffusion of mobile technologies, e-collaboration solutions and social media presents new opportunities for community involvement, which also represents new challenges for information management. This objective thus focuses on establishing ICT support for effective sharing and managing of information throughout the phases of emergency management.

C18 – Utilizing Energy informatics

Utilizing the potential of IS to develop energy effective systems in different areas of society like house building, traffic, etc. This challenge thus goes beyond the focus on the environmental issues of IT industry ("Green IT") itself, and takes into account the potential represented by embedded sensors and the Internet of Things.

C19 – Supporting effective collaboration and learning through evolving media repertoires

The continuous development of communication media poses new challenges for effective collaboration and learning in industry and academia. The new generations of students and employees bring with them new use patterns from various social media that differ radically from the senior workforce. There is a need to build knowledge on how we can capitalize on these evolving media repertoires for enhancing work and education.

C20 – Raising collective consciousness

Collective consciousness rising seeks for full use of people's intellectual potential. IS shall supervise how this latent force drives (1) technological convergence towards persuasive systems against brain illnesses (e.g., stroke, depression, addiction), (2) crowd sourcing to exploit collective intelligence, (3) social business models to fight technological exclusion.

C21 – Embedding systems in real-life environments

The past decades have been characterized by a trend towards smaller devices showing a certain degree of interoperability (see the app development, for example). The future is to have such system embedded in real-life environment and, never the less, interacting with each other. Sensor networks for smarter homes good are examples.