Chapter

1

Introduction

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Information Systems (IS) have been one of the main agents of economic growth and social transformation in Brazil and in the world in recent decades. It is clear that they will persist as such in the coming years. The importance of IS to the functioning of today's organizations and society justifies the debate on guidelines and an agenda for IS research, which is widely carried out both in Brazil and internationally.

The area of Information Systems research understands computing as a means or instrument for solving problems in the real world, society and organizations. Its applied and multidisciplinary character makes it a challenge, requiring a deeper reflection not only on the constructed technologies but also on their unfolding when applied in practice. The establishment of a common vision of the challenges faced by the area is necessary as a way of directing efforts towards the real solution of the country's great current problems.

1.1.   The GranDSI-BR Seminar

The Research Challenges in Information Systems in Brazil - GranDSI-BR - seminar called the Brazilian scientific community and national industry to answer the following questions:

- What are the challenging IS research domains and problems in Brazil?
- What are the IS challenges for solving problems in these domains?
- What are the challenges in developing, using and analyzing the impact of IS in solving problems in different domains?
- Which IS challenges are independent of specific domains? What are the specific issues of the IS artifact itself (such as integration, complexity, and utility) which need to be addressed?
- What are the challenges of the IS research area considering its development in the future? How should the area position itself to achieve its goals, particularly in Brazil?

To this end, the characteristics of a Research Challenge were defined, based on previous definitions proposed by SBC:

- It should be geared to significant advances in the field and hence to science, rather than based on incremental results of existing progress.
- The research to address a challenge should go well beyond the work and results that can be developed and achieved in a conventional individual research project.

- The research progress must be incremental and evaluated so that its progress can be analysed and necessary changes to the research strategy can be made.
- The success of research should be able to be evaluated clearly and objectively.
- Challenges are possibly multidisciplinary in nature and in solution opportunities.
- Challenges emerge from a consensus of the scientific community to serve as a long-term scenario for researchers, regardless of funding policies or short-term issues.

The first stage of the prospection of research challenges in the scientific community comprised a call for the submission of challenge proposals by the scientific community, industry professionals and experts in the field. Proposals could be submitted freely, limited to 3 pages, containing (at least) the following items: i) what was the great challenge proposed; ii) what were the specific context(s) related to the challenge and its relevance in the national and/or international context of Information Systems research; iii) what national initiative the challenge was it related to (if any); and iv) ways of assessing the progress of the proposed challenge.

18 proposals were submitted and evaluated by the organizing committee, according to the following criteria:

- Relevance to IS: if the proposed challenge was clearly identified and aligned with the research area in Information Systems.
- Scientific progress: if the challenge points to significant advances in the field and, consequently, science, rather than based on incremental results of existing progress.
- Coverage: if the research identified by the challenge goes beyond the works and results that can be developed and achieved in a conventional individual research project.
- Progress evaluation: if the proposal presents a way of evaluating the community research progress addressing the challenge in an incremental way, so that its evolution can be analyzed.
- Perception of success: whether the success of this challenge can be assessed clearly and objectively.
- Multidisciplinarity: if the challenge requires multidisciplinary views.
- Sustainability: whether the challenge represents a possible consensus of the scientific community to serve as a long-term scenario for researchers, regardless of funding policies or short-term issues.

Of the 18 proposals, 15 were selected for presentation, discussion and consolidation during the seminar in May 2016, during the Brazilian Symposium in Information Systems, in Florianópolis, Santa Catarina, Brazil. The Seminar lasted one day. 13 of the 15 proposals were presented by their authors who attended the event or participated by videoconference. A brainstorming session was organized with the whole audience so as to deepen and align the proposals among participants. These reflections led to the identification of four major themes, defining the major challenges for the area [Araujo, Maciel and Boscarioli 2017].

1.2. Challenges Overview

The major challenges identified by the IS community led to the issue of how to conceptualize, build and evaluate a new generation of information systems to cope with the increasing technical complexity and social diversity of the contemporary society.

Challenge 1 - Systems of Information Systems. In the open, globalized and connected world information systems not only support a high diversity of application domains, such as business, health, and crisis response but perform several tasks and complex functionalities. Systems-of-Information Systems (SoIS) are a specific type of Systems-of-Systems (SoS) that presents new

challenges for Information Systems (IS) development and research community. SoIS exhibits all SoS characteristics with an additional strong business nature. SoIS are made up of several IS that combine their capabilities.

Challenge 2 - Information Systems and the Open World Challenges. The world is a network. The challenge is to understand its dynamics and to propose, build and understand the impact of information systems to support it. A long list of aspects should be considered when associating information systems to the open and virtual world. These include: mobility, collaboration, empowerment, interoperability, knowledge sharing, scalability, transparency, privacy, security, flexibility, value, reliability, diversity, licensing… the list is endless. New technology trends also must be taken into account: open and linked data, social networks, multi-agent systems, just to mention a few. The open world is true and necessary for different application domains, from service provision to innovation, including society's access to information, and participation, both in the public as well as private sectors. Different relationships between consumers and providers are emerging. Anyone can be a producer, anyone can be a consumer in the open world. New ecosystems arise from this connected world and new approaches to designing and providing information systems to support these ecosystems are needed, challenging Brazilian legislation, government, industry and market production processes and people's behavior, education and culture.

Challenge 3 - Information Systems Complexity. Current and Future Information Systems comprise several components. These components could be other systems, software or sensors hosted on different computational platforms. Due the diversity and quantity of components IS are becoming more and more complex. In the context of information systems, information exchange and interaction between users frequently occurs across heterogeneous environments. Interoperability is a key requirement to support activities in heterogeneous environments efficiently and effectively. Additionally, concerning information technology infrastructure for information systems, virtual support and development platforms are changing the way customers interact with data and applications.

Challenge 4 - Sociotechnical View of Information Systems. Information systems are not just software or people using software. They are the full integration of people and technology and the multitude of relationships that arise from this integration. Information systems today and in the coming years cannot be designed, developed, researched, used or learned without consistent approaches to address the complexity of the sociotechnical system that our society is and will continue to be. Effectively solving of information systems problems means developing competencies in IS research, education and in the professional community to fully understand what a sociotechnical view is, and to consistently apply interdisciplinary methods and practices in order to understand and solve real world problems.

1.3. Book Structure

In order to consolidate the challenges identified during the seminar, the authors were invited to elaborate extended versions of their proposals, based on the discussions held at the workshop. The extended papers underwent a peer review process to reinforce the characterization of proposals as challenges and were finally organized as chapters in this digital book.

In Chapter 2, Graciano Neto et al. draw attention to Smart SoIS, a subcategory of SoIS. Besides (i) managerial independence; (ii) operational independence; (iii) distribution; (iv) evolutionary development; and (v) emergent behavior inherent from SoS characteristics, Smart SoIS also have two novel dimensions: (vi) evolutionary or dynamic architecture, and (vii) full

interoperability. An assessment model named SoISAM (Smart SoIS Assessment Model) is established as a reference to classify the level of development of research in Smart SoIS to address this challenge in the next years. Bernadini et al., in Chapter 3, discuss Smart Cities, an example of SoIS. Smart Cities should possess several "smart" dimensions such as Smart Economy, Smart Mobility, Smart Environment, Smart People, Smart Life and Smart Governance. They present a general landscape on Smart Cities from IS perspective to address this challenge.

Araujo proposes in Chapter 4 the discussion of the new requirements brought by the open world to information systems specification, design, implementation and evaluation. Information systems can be seen as new digital information ecosystems based on the epistemological view of cyberdemocracy. Siqueira et al. (Chapter 5) call the IS community to embrace the challenge of developing, managing and evolving linked open data innovative ecosystems. Maciel et al. discuss the challenge of defining methodologies and technologies for public electronic participation in Chapter 6. In Chapter 7, Nunes et al. draw our attention to the need to focus on information transparency and how information systems should cope with it. Silva et al. (Chapter 8) discuss the challenges faced by small IT companies in providing services to Brazilian public administration agencies.

Maciel et al. (Chapter 9) argue that full interoperability - the interoperability support required by a system, a system of a system and platforms such as Cloud or IoT (Internet of Things) -is a key aspect of dealing with IS complexity, and the research community needs to explore new interoperability models. Carneiro and Paula (Chapter 10) point out that Cloud Computing (CC) is a promising technology for software development, changing the way customers interact with data and applications. Switching to the cloud means giving up incumbent information systems practices and facing the initial perception of losing control of data which in a previous scenario had been stored on local servers. Strategies for CC adoption, calculating the cost-benefit of the adoption and selecting CC providers are highlighted as challenges.

Cafezeiro et al. (Chapter 11) argue in favor of a sociotechnical approach to knowledge construction in information systems. This idea is supported by Pereira and Baranauskas (Chapter 12) when affirming that the technical, social, legal and ethical problems in the development and use of information systems arise from a narrow understanding of information systems which separates its role in the complexity of the social systems where people interact. Maciel and Pereira (Chapter 13) discuss the cultural and technological scenarios needed to address the phenomenon of death and the urgency for the design of solutions for the digital legacy of deceased users as an example of one sociotechnical challenge. Finally, Silva et al. (Chapter 14) focus on the relevance of Data Science for the area of Information Systems and the challenges to carrying out effective research and education in this field.

References

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