Chapter 7

Transparency in Information Systems

Vanessa T. Nunes, Claudia Cappelli, Célia G. Ralha

Abstract

Truthful information has been an important topic on transparency agendas. A considerable amount of work has been done on this theme, but transparency practices remain a challenge to society. This chapter presents the concept of transparency and discusses challenges and opportunities for research giving an overview about Information Systems applications in this area and progress that has been made in recent years.

7.1. Introduction

The growing demand for truthful information has increased around the world. The way organizations operate and provide their services and how they manage information has become an important topic for society (citizens, government and organizations).

Transparency is understood in the context of giving access to information. In government it is believed to promote democracy through participative citizens, providing them with tools to understand and use information that can help develop critical thinking on the way government operates.

In the context of giving access to government information, there is also the problem of corruption. According to the 2015 annual assessment of the Transparency International Organization[1], corruption remains a plague in the world. In 2015 it was made clear that society no longer tolerates these actions and calls for this problem to be faced by all countries. Brazil's score was 38 points (from 0 - highly corrupt to 100 - clean) and has been falling since 2012. In 2015, Brazil was the country that recorded the largest decline in this fight, moving to 76th place

1 https://www.transparency.org

out of 168 assessed. According to this organization countries that perform better share key characteristics such as: free press, access to information, citizen participation, high levels of integrity among people in power, and judicial systems that treat everyone equally and are independent of other spheres of government.

Transparency has also been seen as a challenge for private companies. Tapscott and Ficoll (2003) discuss problems such as Enron and Worldcom that only came to light when the companies became bankrupt, causing shareholders to lose large amounts because of lack of transparency. They also cite companies such as McDonalds and Coca-Cola that are organizing themselves to meet the need for customer and shareholder loyalty, and also to attract others due to recurring questions related to the manufacturing methods.

Transparency, as a transversal aspect of an organization, can be seen from a multidisciplinary perspective of possible benefits. It should provide more quality and reliability to data that is publicized to citizens, such as the source and responsible, date of creation, level of integrity, publicity mechanisms, etc. It might be discussed regarding how to provide a better understanding of processes by citizens and by proposing clarity, uniformity, completeness and auditability mechanisms. When combined with human-interface domain of research it might provide intuitiveness, user-friendliness and enhance the visualization of processes and the transformation of information at runtime.

For these reasons, transparency, or lack of it, is found at the top of public and private agenda. Organizations have been evaluated in their ability to provide trustworthy information and knowledge with transparency considering their operations, performance and results [Fung et al. 2007].

The increasing movement around this theme leads to questions about what exactly means the idea of transparency. What at first seems to be a simple idea needs a formal approach to put in practice. Therefore, it is necessary to deepen knowledge about transparency as well as the existence of methods and technologies that make it possible to establish it in organizations. Organizational transparency has been investigated in order to add social values related to characteristics such as auditability, adaptability, accessibility, usability, understanding, correctness, consistency, dependability, among others [Leite and Cappelli 2010]. The aim is to improve the view of organizational processes and information in order to provide opportunities for knowledge about them, to reduce the possibility of omission, to enable control over the products and services, to facilitate research, and to increase trust between organizations and society. In addition, providing transparency has the potential to enhance collaboration, information reuse and adaptation to the needs of societies [Martano and Craveiro 2014].

Leite and Cappelli (2010) argue that, “in order to implement transparency, society will need to address how software deals with this concept”. Information and communication technologies (ICT) have changed the way of thinking and performing organizational processes. Thus, work has been increasingly supported, conducted or supervised by Information Systems (IS) [van der Aalst 2009]. Their use in different domains increases the importance of the relationship among the three pillars that constitute the computing socio-technical perspective

that relates people, technology and organizational processes. The application of transparency in IS is a new and important concern when designing software that automates the delivery of services and process information, while interacting with people.

With regard to public organizations, they are being increasingly required to ensure that automated processes and information are transparent and accessible. The importance of this has also been highlighted by the increasing demand for the provision of e-government services (e-gov). E-gov is one of the aims of the Brazilian Strategy of Digital Governance (Estratégia de Governança Digital - EGD)[2]. The research on technologies applied to e-gov has increased in recent years with the promotion of transparency as one of its aims. Nevertheless, the Brazilian Government does not address this issue systematically. Accordingly to Coelho et al. (2016), transparency in Brazilian e-gov (a.k.a. e-transparency) is a subject still in the beginning of its maturity process.

This chapter aims to present the concept of transparency and its importance for the IS community, discussing and posing challenges and opportunities for research. This theme complies with the great challenges of the Brazilian Society of Computing (Sociedade Brasileira de Computação - SBC). Regarding transparency research, it relates to the "Participative and universal access of Brazilian citizens to knowledge". Regarding the use of IS for this purpose, it focuses on "Technological development of quality: available, correct, secure, scalable, persistent and ubiquitous systems".

7.2. Background

According to Leite and Cappelli (2010), “Transparency is a concept of information disclosure, having been used in different settings, mostly related to empowering of citizens with regard to their rights”. In this regard, “a wave of transparency policies has swept across Latin America over the last decade or so. Among budget and legislative transparency provisions, political finance disclosure, and open-data portals, freedom of information (FOI) laws occupy a unique space.” [Michener 2015].

In Brazil, the Access to Information Laws, Law nº 12.527[3] and Law nº 131[4], have encouraged active transparency and a growing availability of information about public organizations on their institutional sites. Nevertheless, Michener (2015) analyzed the *de jure* and *de facto* strength of Latin American FOI regimes and shows that there remains much to be done in this area from political, sociological, anthropological, and technological perspectives. It is truly an open invitation for researchers to address gaps in data and methods on FOI. Transparency can also be seen in the private context where the aim is to empower employees and employers with knowledge and skills regarding their context.

Nevertheless, transparency is not a new demand from society. Research in the area of Business Process Management (BPM) [Paim et al. 2009] and Information Technology

[2] See the EGD proposition at: http://www.sisp.gov.br/egd/wiki/download/file/Minuta_EGD. In Portuguese.

[3] http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2011/Lei/L12527.htm

[4] https://www.planalto.gov.br/ccivil_03/Leis/LCP/Lcp131.htm.

Architecture [Armour et al. 2007], [Steenbergen et al. 2007] and [Lankhorst 2013] point to the creation of models that represent the different perspectives of how an organization works. Such models are an important tool to promote the dissemination of knowledge about processes, information and continuous improvement of production and services. In this regard, researchers discuss and propose approaches on how to identify requirements when dealing with process automation support [Araujo et al. 2005], [Bittencourt 2008], [Magdaleno et al. 2008], [Diirr et al. 2009] and [Py et al. 2009]. Such approaches can also be viewed as structures that support visibility and transparency not only of organizational processes, but also of tools for identifying relevant characteristics to promote transparency of information [Cappelli et al. 2007].

It is clear, however, that transparency covers more complex issues than simply providing information and usability features. The difficulties related to the understanding, interpretation, use and verification of information can be impediments to its effectiveness [Fung et al. 2007]. The heavy use of web tools has contributed to the considerable increase in available content in the form of collective knowledge. This content, however, is needy of structure and mechanisms for the delivery, capturing and reuse of this knowledge.

Therefore, for both public and private contexts, transparency establishes a set of aspects that suggest the existence of policies, procedures and technologies to provide not only access, but also use, quality, understanding and auditability of processes and information [Cappelli 2009]. Transparency may improve the view of organizational processes and information, while providing opportunities for knowledge about them, reducing the possibility of omission of information, enabling control over the products and services, facilitating research, and increasing trust between organizations and society.

7.2.1. Organizational Transparency

The concept of transparency seems a simple idea. However, it requires a deepening of its semantics, the existence of methods that make it possible to establish its efficiency and systematization in organizations. In addition, it requires instruments to monitor the way it is established in a particular organization to assess if it meets the organizational strategy and the needs of society [Harrison et al. 2011].

In this regard, Cappelli (2009) deals with the problem of understanding, implementing and evaluating transparency in organizational processes and information, by constructing a definition and systematization for transparency through a transparency catalog. Cappelli (2009) elaborated the Transparency SIG (Softgoal Interdependency Graph) that defines principles for transparency as characteristics represented in a non-functional requirement (NFR) catalogue (Chung et al.,2000), and operationalizations to systematize the incorporation of transparency in organizational processes and information. The Transparency SIG is composed of nodes and links as presented in Figure 7.1. Each node is a transparency characteristic, while each link represents the type of contribution among them (break, hurt, unknown, help and make). There are five groups of characteristics: accessibility, usability, informativeness, understandability and auditability. Each one is unfolded in (sub) characteristics, and for each of them, a set of operationalizations and mechanisms is proposed in order to orient the introduction of

transparency in organizational processes and information. Table 7.1 presents the characteristic of traceability.

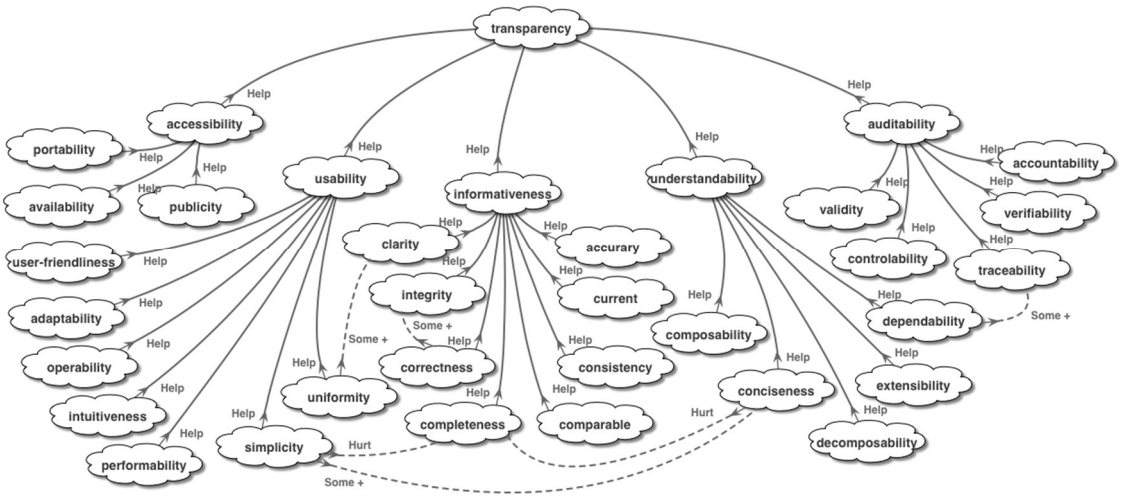

Figure 7.1. Transparency SIG [Cappelli 2009]

Table 7.1. The operationalization of traceability [Cappelli 2009]

Characteristic	Traceability
Definition	The quality of following, discover, or ascertain the course of development of something
Impact	Helps to satisfice the characteristic of auditability
Operationalization	Identify software x activity requirements Identify the context of the change Identify when changes are performed Identify the locale of the change Identify process information x instance Identify reasons for change Identify the responsible for the change Identify predecessors activities Identify successors activities Identify the changes performed in the process Identify dependencies among processes

Regarding organizational context, we may cite approaches such as that used by Carvalho et al. (2016) that aim to enable transparency during the election process at a University through a graphic model using business process modeling notation (BPMN). Engiel et al. (2015) propose a transparency lexicon using the Language Extended Lexicon (LEL) which is a representation approach to register context vocabulary, i.e. the vocabulary of a language spoken in a given context. They created a visualization tool to give more legibility to the LEL and to exemplify how it can contribute to publicizing transparency for citizens.

7.2.2. Transparency in the Software Context

The use of ICT to support execution and management of processes, access and use of information has been at the top of research agendas. The main goal is to provide better ways to support, for instance, decision making, work execution, collaboration, analysis and improvement. Therefore, ICT has changed the business process within and between organizations, in the sense that processes and information are increasingly being conducted and accessed under the supervision of IS [van der Aalst 2009].

The open information flow is highlighted in the context of ICT, and it aims to collaborate with more democratic access to information and how processes are performed [Holzner and Holzner 2006]. Therefore, transparency is seen as a NFR that IS should consider when they are being elicited, designed and implemented. Thus, transparency is seen as a quality issue that is orthogonal to the software functionality, i.e. having transparency or not will not impact what the software does [Leite and Cappelli 2010]. It spreads through different functional parts of an IS and is a new and important concern when designing software that processes information and has an interface with people.

Transparency is also seen in relation to the software itself and its development process [Serrano and Leite 2011], i.e. requirements, design project, codification, the code, test, etc. Its systematic application is still a major concern when designing systems that operationalize services and act as interface mechanisms with people.

In the public context IS designers and software engineers are being asked to address transparency. In the context of understanding political processes, during the impeachment process in Brazil, much was spoken of “pedaladas fiscais” (irregular fiscal maneuvering) and many citizens did not understand the meaning of this term, what it was and how the impeachment process was conducted. An interesting initiative was the release of a point of view of this process in an “easier” language, showing step-by-step stages of the process and its results[5]. In the context of a citizen audit, the site of the Citizen Audit of Debt[6] was created to carry out an audit of the Brazilian public debt and demand transparency about the debt process.

[5] http://especiais.g1.globo.com/politica/2015/entenda-o-processo-de-impeachment/

[6] http://www.auditoriacidada.org.br/

Several public transparency web portals such as the city of Sao Paulo[7] and Cuiaba City Hall[8] aim to stimulate society's control and ensure public transparency. "Lupa" (magnifying glass) site[9] checks the veracity of information circulating in Brazil. DataViva[10] is an open platform that provides economic data from government sectors. It promotes data transparency to help identify the best ways to diversify the production structure and promote economic development. Votanaweb site[11] contains all proposed law projects and citizens can give their opinions on them.

Research on technologies applied to e-gov has also increased in recent years, focusing on various fields of research, such as software engineering, engineering knowledge, interoperability at all levels (semantic technological) and business processes [Vitvar et al. 2010] [Pinheiro et al. 2014].

In Ambekar et al. (2015), the authors propose a multi-agent system (MAS) framework to manage the Indian Public Distribution System of food and improve transparency in actions and data. According to Chen et al. (2014), "in order to achieve information transparency, both human and the machine agent must have an awareness of each other's internal status". They discuss transparency in human-robot interactions, in a scenario of Unmanned Aerial Vehicles. They focus on the access of information by both human and software agents. In Müller et al. (2014), how to model MAS description and enforce the provision of transparent models as a requirement is discussed. In Tanajura et al. (2013), they apply the MAS paradigm to model the management of distributed manufacturing on onshore oil fields. A benefit of introducing MAS is the transparency that agents' perspective provides to users and developers.

In Bodea and Mogos (2013), the use of MAS is proposed because it may provide a transparent negotiation process between programmers and resources managers in order to find a good solution to the problem of resource allocation. Again, transparency is related to providing access to intermediate results to all participants. In another approach, Carneiro et al. (2013) proposed an agent oriented architecture to increase effectiveness and awareness of dispute resolution of court cases by increasing the amount of meaningful information and possible outcomes that are available for the parties, using case-based reasoning techniques.

The importance of IS as the main enabler of services to society is obvious as it helps organizations to make themselves more and more present. It is also a fact that the introduction of ICT has improved transparency and access to information and processes [Bertot et al. 2010]. Therefore, when thinking of transparency in the provision of services one has necessarily to think

[7] http://transparencia.prefeitura.sp.gov.br/Paginas/home.aspx

[8] http://circuitomt.com.br/editorias/cidades/73029--escola-transparente-vai-garantir-controle-social-dos-gastos-publ.html

[9] http://piaui.folha.uol.com.br/lupa/

[10] http://dataviva.info/pt/

[11] http://www.votenaweb.com.br/

of how to deal with this aspect in the development of IS in a formal way. In Section 7.3 we discuss some challenges related to this.

7.3. Challenges

Technology solutions that automate processes and process information are sources of competitive and social advantages. There is a great concern about the collection, organization, representation, storage, processing and transmission of information, in order to promote the efficiency of decision-making, organizational management and education in general. In this context, an agenda for the challenges in transparency is discussed below.

7.3.1. Elicitation and Evaluation of Transparency Characteristics

This issue here is how to make an abstract concept such as transparency more concrete in order to define actions and forms to implement it in organizations and evaluate their level of transparency.

There is a need for methods that make it possible to implement transparency and for models to check whether the way it is implemented meets demands. In order to make the use of the transparency concept feasible, it is necessary to use methods that help to understand and plan how a transparent deployment project can be conducted and how to guide the selection and insertion of transparency mechanisms in an organization. For example, based on the Transparency SIG [Cappelli 2009], how should the simplicity or user-friendliness characteristic in an organization be implemented? Or at what level should a specific characteristic be implemented?

Several initiatives to promote the establishment of mechanisms to demonstrate transparency have been made. Some of them, such as the Sarbanes-Oxley Act[12] (SOX) [SOX 2002], the Basel Committee on Banking Supervision (BASEL Agreement)[13], the Extractive Industries Transparency Initiative (EITI)[14], the Organization for Economic Co-operation and Development (OECD)[15] and the Open Government Partnership (OGP)[16] provide guidelines for governments and civil societies on how to provide organizational transparency in specific business domains. Other organizations such as Transparency International[17], Brazil Transparency (Transparência Brasil)[18] and the Federal Government Disciplinary Board (Corregedoria Geral da União)[19] discuss this theme and create knowledge networks suggesting practices for achieving transparency.

Regarding the institutionalization of practices and evaluation, Cappelli et al. (2013) propose[20] an Organizational Transparency Maturity Model that defines an evolutionary path for

[12] https://www.sec.gov/about/laws/soa2002.pdf

[13] https://www.bis.org/bcbs/

[14] https://eiti.org

[15] http://www.oecd.org

[16] http://www.opengovpartnership.org/

[17] https://www.transparency.org

[18] http://www.transparencia.org.br

[19] http://www.cgu.gov.br

[20] https://sites.google.com/site/ciberdem/modelo-de-maturidade-em-transparncia-organizacional

the deployment of transparency in organizations and provides items for the evaluation of this implementation. The Maturity Model organizes transparency characteristics in five stages. Each maturity level combines characteristics that help the organization to reach the goal of the level. An evaluation method to measure the organization's level of adherence to a transparency level was also proposed.

Another challenge is related to provide transparency accordingly to a specific context which could be a user's profile, a specific event, a specific process, etc. The increasing importance in associating context to processes and information is related to the fact that it provides a temporal cause-effect relationship characterization between the consumer and its demands [Rosemann et al. 2008]. The authors argue that the context identification and analysis comprise the foundation for understanding the relationship between changes in the scenario of an organization and its processes. Therefore, regarding transparency, the surrounding context could be used as a parameter to select and prioritize transparency characteristics that meet their current needs.

7.3.2. Improving Transparency from Strategy to Technological Perspective

Organizations need to "describe and control an organization's structure, processes, applications, systems, and technology in such an integrated way" which is called Enterprise Architecture (EA) [Lankhorst 2013]. In essence, these data need to be modeled in an interrelated way so as to provide the organization with more reliable skills for reasoning and decision making.

However, organizations face problems regarding data awareness and quality. There are situations in which the quality of data is challenged, these include not being detailed enough, or when transparency is not desired as it may conflict with confidentiality, the data source is dubious, etc. This can affect strategic, procedural, informational, systemic or technological aspects of the organization. It poses challenges on how to comply with different interests so as to provide transparency to a specific data in all levels of the organization, from strategic to technological without the risk of inserting inconsistencies and incoherencies.

To address this issue, Santos et al. (2014) proposed treating transparency as a cross cutting concern, by defining a method for identifying and representing transparency characteristics at an EA level. They propose the use of aspects which are abstractions that aim to modularize concerns that cut across all levels of EA. There is a need to systematize the implementation of transparency through automation when developing and using EA given the high amount of information. Another challenge is related to the reuse and interoperation of transparency aspects throughout the organization.

7.3.3. Organizational Transparency through IS support

There is a need to systematize the definition of transparency requirements to generate IS that implement transparency throughout the actions they support. This means that the operationalization of transparency must start at IS design-time. Therefore, how should we design an IS in order to provide transparency to the actions and data manipulation undertaken by it? The challenge resides in how to understand and define how to translate transparency characteristics into functional and NFR.

An example of the lack of transparency in e-gov in Brazil is the distribution of judicial lawsuits which is performed by an automatic random draw. According to the National Council of Justice (Conselho Nacional de Justiça), since 2011 more than 5 million lawsuits have been processed by the Electronic Judicial Process System (PJe). By 2018 all Courts and Councils must implement PJe adding more than 20 million lawsuits. The system is being increasingly used but it is still heavily criticized because of the lack of transparency[21]. In the Superior Labor Court (TST) of Brazilian Justice Power, the electronic program that distributes lawsuits is closed to users, only the results can be accessed. It is not clear how legal and internal rules are applied. When someone wants to know why lawsuit X was distributed to Minister Y, it is necessary to audit the database, which is time consuming and mostly provides little explanation. In [Albuquerque et al. 2016] and [Albuquerque et al. 2017] the authors address the problem of how to implement transparency characteristics in e-gov through the use of MAS, based on the research of Cappelli (2009) and Leite and Cappelli (2010). The authors advocate that agent-oriented characteristics such as sociality, proactivity, communicative and cooperative abilities have a natural relation with transparency concepts which might help to materialize transparency in IS.

7.3.4. Software Transparency

Software Transparency enacts the transparency point of view of the IS development and operation. For example, the software development process should allow a person to demonstrate that the IS follows requirements. Nevertheless, software transparency is a flexible goal that is subjective and poorly understood, and is dependent on the views and expectations of stakeholders. It is up to the final users, as the ultimate interested party in the software, to say how transparent software should be.

It is necessary to be able to show the interested parties that a particular requirement is present in the code or that a code snippet contributes to one of the requirements. Even flexible goals (or quality criteria) requested by interested parties must be explicitly present in the software. Therefore, a number of challenges for the implementation of software transparency emerge and include: (i) how to provide forward and backward traceability between requirements and code (ii) how to elicit transparency requirements at software design-time (iii) how to validate transparency requirements with stakeholders considering a multi-party agreement (iv) how to explicit flexible goals in the software code? (v) how to attach the information to the produced artifacts about how they were produced, i.e. how to achieve the pre-traceability of artifacts (vi) how to treat antagonistic NFR (vii) how to select transparency characteristics based on the software context of use and (viii) how to systematize reusability of transparency operationalization mechanisms?

In order to cope with some of these challenges, Serrano and Leite (2011) proposed an approach to capture requirement patterns through argumentation by identifying on argumentation graphs the NFR operationalization needed to implement a software transparency characteristic[22]. In the context of human-computer interaction **(**IHC), some concepts of semiotics engineering such as communicability, which deals with qualification of the communication between the system designer (developer) and users, can also be used in an attempt to reduce the communication problems of the stakeholders in the development process. The aim is that, by outlining the results and the challenges for software transparency,

[21] http://www.conjur.com.br/2014-jul-12/advogados-exigem-transparencia-relacao-processo-eletronico

[22] http://transparencia.inf.puc-rio.br/wiki/index.php/Catálogo_Transparência

one can leverage the expected results and benefit from facing organizational transparency as a whole.

Software transparency challenges are also enhanced when considering large scale and globalized platforms. In bringing together various projects and products around a core software technology, these platforms originate more complex systems that integrate a network of diverse actors and artifacts, both internal and external, called Software Ecosystem [Santos et al. 2014(a)]. The need to deal with the transparency of the platform is a critical factor for quality software development. An imminent issue is how to produce / purchase software and manage business and information from ecosystems in a transparent way. This poses challenges related to: (i) how to expand the information sharing of resources, artifacts and information and develop ways to handle this in software repositories (ii) how to manage and monitor dependencies of suppliers, technologies and distributed business goals in a transparent way (iii) how to deal with access to the large volume of information required for decisions on partnerships or admission of members and (iv) how to deal with elements that interfere with or affect the success of the ecosystem and need to be investigated, as well as permissions and access levels of the actors to shared information.

7.3.5. Transparency in HCI and social networks

In HCI and social networking fields of research, transparency is also a very important requirement. Social networks consist of a set of autonomous participants, linking ideas and resources around shared values and interests [Marteleto 2001].

A user can publish any information, truthful or otherwise, to a huge and diverse public with low levels of segmentation. The dynamism of information coupled with the paradox of its relevance from the point of view of each person, the use of colloquial language, information overload and anxiety of users are the prime examples of auditability problem in social networks [Agarwal and Yiliyasi 2010]. Publication of information on social networks, without any prior assessment of the quoted source, results in an accumulation of irrelevant or not credible information [Pinheiro et al. 2016]. The reliability of information is vulnerable due to the dynamic nature of information made available on the Internet. Given this, it is essential to constantly evaluate the information sources in order to determine responsibility for authorship and update frequency [Serzedello and Engelmann 2006]. Another challenge is related to reinforcing the idea that the IT team should be concerned about the development of IS that enables usability and auditability of information. The development of tools focused on auditability are aligned with critical design issues in HCI [Pierce et al. 2015], since the developer needs to analyze the impacts the software may cause (such as cultural or ethical impacts) due to the emerging possibilities of design.

Pinheiro et al. (2016) proposed a catalog that organizes characteristics and operationalizations to support auditability of information in social networks and a guide that helps developers to build software that can evaluate information reliability. There is much still to be investigated regarding the expansion of more operationalizations, the focus on other transparency characteristics and the implementation of mechanisms to be used and tested in social networks. For example, in social networks such as Facebook, it is possible to create third-party tools such as plugins that connect the system through their APIs providing missing information auditability options. The ubiquity of social networks also increases the challenge of

evaluating information credibility and may change operationalization mechanisms selected by the IT team. Therefore, studying the limits of auditability and other transparency characteristics in different programs and devices is also recommended.

7.3.6. Transparency to create a citizen language

We have mentioned some of the laws that have been put in place to guarantee transparency within organizations such as SOX, BASEL, EITI and the OGP. In Brazil, the Transparency Law [Law 2008] and the Access to Information Law [Law 2011] set limits for public organizations in publishing information.

However, besides giving access to information, to be transparent, organizations have to guarantee citizens' understanding about what is happening and how information is generated and used. Business process models may help because they comprise important information about organizational processes (e.g. actors, activities, rules, inputs and outputs). To represent process models, organizations may use a methodology [Sharp 2008] and a language. However, ordinary citizens have little understanding of these technical aspects and diagram interpretation suggested by processes modeling methodologies and this hinders the transparency, clarity and ease of interpretation of an organization's procedures. This prevents not only process understanding, but also service use and analysis. The simple presentation of a technical model may be ineffective.

Although there are several works focusing on defining, organizing and detailing characteristics that can be applied when designing public service process models to provide more understandability to process models, much still needs to be done. A citizen language has been defined [Carvalho et al. 2016], but there remains an open invitation for research on the theme.

7.4. Progress Evaluation

Addressing transparency challenge in organizations involves quantitative and qualitative aspects. Firstly, it is necessary to encourage participation. Transparency approaches focus primarily on people in two ways: internally so they can improve organizations by leveraging their participation and externally, so they can improve the level of trust in the service and/or products that are offered. Therefore, promoting discussion at all levels of society and academia can contribute to fostering transparency among academia.

Quantitatively speaking, the growing research on transparency should consider: the monitoring of the number of publications by Academic Institutions, the number of conferences and events discussing theoretical and practical transparency aspects as well as proposing solutions for challenges as the ones discussed above, and the dissemination of research artifact monitoring such as methods, standards, processes and IS. Considering the qualitative aspects could measure the benefits that people perceive through the proposed artifacts and the level of reliability people perceive regarding the provision of electronic services with transparency skills.

7.5. Final Remarks

We have argued that transparency is a concern that IS designers must address as society requires more information and process openness. We believe that the most pressing issues when putting transparency in focus during IS designing and implementation are: (i) finding ways

to provide transparency without increasing the cost of providing a service (ii) assuring transparency without interfering with system performance (iii) to enhancing computer-human interaction skills to deal with all sorts of transparency required by "customers" in a country with such diversity and plurality as Brazil.

Transparency and communication are becoming a competitive advantage because of the moral perspective and effectiveness of providing ways and meanings of how services are provided by organizations. The outcome of this is the high investment being made by Brazilian organizations in the development of ICT.

The development of mechanisms to systematize transparency in the provision of e-services is a challenge that requires the introduction of new methodologies and technologies to IS development. Furthermore, its planning and implementation should be carried out from a broad and multidisciplinary perspective with the support of approaches from domains such as the Semantic Web, Intelligent Search Engines and Social Networks.

References

Agarwal, N. and Yiliyasi, Y. (2010) "Information Quality Challenges in Social Media", In: 15th International Conference on Information Quality, Arkansas, USA.

Albuquerque, D. J., Nunes, V. T., Ralha, C. G., Cappelli, C. (2016) "Implementing E-government Processes Distribution with Transparency using Multi-Agent Systems", iSys: Revista Brasileira de Sistemas de Informação, v. 9, p.118-138.

Albuquerque, D. J., Nunes, V. T., Ralha, C. G., Cappelli, C. (2017) "E-gov Transparency Implementation Using Multi-agent System: a Brazilian Study-Case in Lawsuit Distribution Process", In Hawaii International Conference on Systems Science (HICSS-50), Big Island, Hawaii, v.1, p. 2772-2781.

Ambekar S., Kapoor, R. and Mehta, P. (2015) "Structural mapping of public distribution system using multi-agent systems", Business Process Management Journal, v.21, n.5, p.1066-1090.

Araujo, R. M., Mknight, D., Borges, M. R. S. (2005) "A Systematic Approach for Identifying System Requirements from the Organization´s Business Model" In: II Simpósio Brasileiro de Sistemas de Informação, Florianópolis.

Armour, F., Kaisler, S. H. and Bitner, J. (2007) "Enterprise Architecture: Challenges and Implementations", In 40th Annual Hawaii International Conference on Systems Sciences (HICSS), p.217.

Bertot, J., Jaeger, P. T. and Grimes, J. M. (2010) "Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tool for socities", Government Information Quaterly, v.27, issue 3, p.264-271.

Bittencourt, R. V., Araujo, R. M. (2008) "Identificando Expectativas de Qualidade de SIs com o apoio de Modelos de Negócio" In: II Workshop de Gestão de Processos de Negócio, Vitória. (In Portuguese)

Bodea, C. N. and Mogos, R. I. (2013), "A Multi-Agent System for Resource Allocation to Education Programmers in Higher Education Institutions", Journal of e-Learning and Higher Education, p.1-9.

Cappelli, C, Leite, J., Tanaka, A., Santos, G., Araújo, R., Nunes, V., Engiel, P. (2013) "Um Modelo de Estágios para avaliar Transparência Organizacional", Revista

TCMRJ, n. 53, p.77-85. (In Portuguese)

Cappelli, C. (2009) "Uma abordagem para transparência em processos organizacionais utilizando aspectos", Ph.D Thesis, PUC-Rio. (In Portuguese)

Cappelli, C., Oliveira, A. P. and Leite, J. (2007) "Exploring Business Process Transparency Concepts", RE'07, 15th IEEE Joint International Requirements Engineering Conference, Delhi, India.

Carneiro, D., Novais, P., Andrade, F., Zeleznikow, J. and Neves, J. (2013) "Using Case based Reasoning and principled negotiation to provide support for dispute resolution", Knowledge and Information Systems, Springer, v. 36, p. 789-826.

Carvalho, L. P., Santoro, F. M. and Cappelli, C. (2016) "Using a citizen language in public process models: the case study of a Brazilian university", 5th Int. Conf. on Electronic Government and the Inf. Systems Perspective (EGOVIS), Porto, Portugal.

Carvalho, L. P, Santoro, F. M. and Cappelli, C. (2016) "Transparência no processo eleitoral: Um caso de uma universidade pública", IV Workshop de Transparência em Sistemas (WTranS), Rio de Janeiro, Brasil. (In Portuguese)

Chen, T. B., Campbell D., Gonzalez, F. and Coppin, G. (2014) "The Effect of Autonomy Transparency in Human-Robot Interactions: A Preliminary Study on Operator Cognitive Workload and Situation Awareness in Multiple Heterogeneous UAV Management", Aust. Conf. on Robotics and Automation, Melbourne, Australia.

Chung, L., Nixon, B., Yu, E. and Mylopoulos, J. (2000), Non-functional requirements in software engineering, International Series in Software Engineering, v.5, Springer, Kluwer Academic Publishers.

Diirr, B., Araujo, R. M. and Cappelli, C. (2009) "An approach for defining Digital Democracy support based on ICT", In 13th International Conference on Computer Supported Collaborative Work in Design (CSCWD), p.203-208.

Engiel, P, Pivatelli, J., Portugal, R. and Leite, J.C.S.P (2015) "Representando o Conceito de Transparência Através de um Léxico Ampliado da Linguagem", III Workshop de Transparência em Sistemas (WTranS), Manaus, Brasil. (In Portuguese)

Fung, A., Graham, M. and Weil, D. (2007) "Full disclosure, the perils and promise of transparency", Cambridge University Press, Cambridge.

Harrison, T. M., Guerrero, S., Burke, G. B., Cook, M. E., Cresswell, A. M., Helbig, N., Hrdinová, J. and Pardo, T. A. (2011) "Open government and e-government: democratic challenges from a public value perspective," 12th Int. Conf. on Digital Government Research: Dig. Govern. Innovation in Challenging Times, p.245-253.

Holzner, B. and Holzner, L. (2006) "Transparency in global change: the vanguard of the open society", University of Pittsburgh Press, Pittsburgh.

Lankhorst, M. (2013) "Enterprise Architecture at Work: Modelling, Communication, and Analysis", Springer-Verlag Berlin Heidelberg.

Leite, J. C. S. P. and Cappelli, C. (2010) "Software Transparency", Business and Information Systems Engineering, v.2, issue 3, p.127-139.

Magdaleno, A. M., Cappelli, C., Amorim, F. A. B., Santoro, F. M. and Araujo, R. M. (2008) "A Practical Experience in Designing Business Processes to Improve

Collaboration", BPM Workshops, Berlin/Heidelberg: Springer, v.4928, p.156-168.

Martano, A. M. R. and Craveiro, G. S., (2014) "Abertura e Disponibilização de Dados Abertos. Governamentais: Estudos de Caso" II Workshop de Transparência em Sistemas, In: Simpósio Brasileiro de Sistemas de Informação, Londrina. (In Portuguese)

Marteleto R (2001) "Análise de Redes Sociais – Aplicação nos estudos de transferência da informação", Programa de Pós-Graduação em Ciência da Informação - UFRJ/ECO. (In Portuguese)

Michener, R. G. (2015) "Assessing Freedom of Information on Latin America a Decade Later: Illuminating a Transparency Causal Mechanism", Latin American Politics and Society, v.57, issue 3, p. 77-99.

Müller, B., Balbi, S., Buchmann, C. M., et al. (2014) "Standardised and transparent model descriptions for agent-based models: Current status and prospects", Environmental Modelling & Software, 55, p.156-163.

Paim, R., Cardoso, V., Caulliraux, H., Clemente, R. (2009) "Gestão de Processos – pensar, agir e aprender", Bookman. (In Portuguese)

Pierce, J., Sengers, P., Hirsch, T., Jenkins, T., Gaver, W. and DiSalvo, C. (2015) "Expanding and refining design and criticality in HCI" In Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems, pp. 2083-2092.

Pinheiro, A., Cappelli C., and Maciel C. (2014) "Increasing Information Auditability for Social Network Users", Human Interface and the Management of Information. Information and Knowledge Design and Evaluation, Springer, p.536-547.

Pinheiro, A., Cappelli C., and Maciel C. (2016) "Checking information reliability in Social Networks regarding user behavior and developers' effort to avoid misinformation", Workshop on Social Computing and Social Media, 8th Int. Conference on Human-Computer Interaction, Toronto, LNCS, v.9742, p.151-161.

Py, H., Castro, L., Baião, F. and Tanaka, A. (2009) "A Service-based approach for data integration based on business process models" In: 11th International Conference on Enterprise Information Systems (ICEIS), Milan.

Rosemann, M., Recker, J. and Flender, C. (2008) "Contextualisation of business processes", Int. J. of Business Process Integration and Mng., v.3, n.1, p.47-60.

Santos, R. P., Cappelli, C., Maciel, C. and Leite, J. C. S. P. (2014) "Qualidade em Ecossistemas de Software: Desafios e Oportunidades de Pesquisa". In: Anais do V CBSoft, VIII WDES, Maceió, v. 2, p.41-44. (a) (In Portuguese)

Santos, F. J. N., Santoro, F. M. and Cappelli, C. (2014) "Addressing crosscutting concerns in Enterprise Architecture", In: Enterprise Model Analysis Workshop (EMA), Berlin.

Serrano, M. and Leite, J. P. S. (2011) "Capturing Transparency-Related Requirements Patterns through Argumentation", In: 2011 First International Workshop on Requirements Patterns (RePa), p.32-41.

Serzedello, N. and Engelmann, A. (2006) "Seleção de Fontes de Informação Eletrônicas em Redes Sociais", In Proceedings of the XV EAIC e VI EPUEPG, Universidade Estadual de Ponta Grossa, Paraná, p.22-25. (In Portuguese)

Sharp A. and Mcdermott P., (2010) Workflow Modeling: Tools for Process Improvement and Application Development, Norwood, Ma, USA: Artec Sarbanes-Oxley House.

SOX - Sarbanes-Oxley Act of 2002, Publication Law 107-204, 116 Stat. 745 (codified amended in scattered sections of 15 U.S.C.).

Steenbergen, M., Berg, M., Brinkkemper, S. (2007) "A Balanced Approach to Developing the Enterprise Architecture Practice", In 9th International Conference on Enterprise Information Systems (ICEIS), LNCS, v.12, p.240-253

Tanajura, A. P. M., Oliveira, V. L. C., Lepikson, H. A., Freires, F.G.M. (2013) "Distributed Manufacturing System in a Multi-Agent Approach: An Application for Oil Field Management", 23rd Int. Conf. on Flexible Automation & Intelligent Manufacturing, Lecture Notes in Mechanical Engineering, Springer, p.1347-1357.

Tapscott, D., and Ticoll, D. (2003) "The naked corporation: How the age of transparency will revolutionize business", Ed. Simon and Schuster.

van der Aalst, W. M. P. (2009) "Process-Aware Information Systems: Design, Enactment, and Analysis", Wiley Encyclopedia of Computer Science and Engineering, p.2221–2233.

Vitvar, T., Peristeras, V. and Tarabanis, K. (2010) "Semantic Technologies for E-Government: An Overview", In: Semantic Technologies for E-Government, Springer-Verlag Berlin Heidelberg, p.1-22.

Vanessa Nunes

CV: http://lattes.cnpq.br/2043415661294559

DSc in Computing and Systems Engineering from Federal University of Rio de Janeiro (COPPE-UFRJ), Vanessa is post-doc fellow at the Computer Science Department of the University of Brasilia, Brazil. Her research interests focus on dynamic process adaptation, mainly working with Process-Aware Information Systems, business process management, knowledge management, Enterprise Architecture and organizational transparency. e-mail: vanunes@gmail.com

Claudia Cappelli

CV: http://lattes.cnpq.br/4930762936357558

Ph.D. degree in Computer Science from Pontifical Catholic University of Rio de Janeiro and M.Sc. degree in Computer Science from Federal University of Rio de Janeiro (UFRJ), Claudia is a professor and a member of the post-graduate program at Applied Informatics Department of the Federal University of the State of Rio de Janeiro, Brazil. She worked many years in multinational industry

companies. She held a Post-Doctoral internship at Unirio (2010). She is the Regional Secretary of the SBC (Southeast Region) in Brazil. Over the years she has developed several partnerships and work with government entities. Her research focuses on Information Systems, especially on the following subjects: Business Process Management, Enterprise Architecture, E-Government/E-Participation and Organizational Transparency. e-mail: cappelli@uniriotec.br

Célia G. Ralha

CV: http://lattes.cnpq.br/5632722847264046

Ph.D. degree from Leeds University, England, UK in 1996 and M.Sc. at the Aeronautics Institute of Technology, São Paulo, Brazil. Célia is an Associate Professor at the Department of Computer Science, University of Brasília, Brazil. She has experience in Computer Science, focusing on Intelligent Systems, with research interest in the treatment of information and knowledge using multi-agent systems, intelligent agent interaction protocol and association to other technologies, such as Business Process Modeling, Automated Planning and Knowledge Management. e-mail: ghedini@unb.br