

Investigating Software Transparency: Preliminary Studies

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***Abstract.** The importance of Software Transparency has grown in last years in favor of the software information disclosure. This work applies the Software Transparency SIG, as a checklist, in the field of different use scenarios in order to conduct preliminary studies centered on Software Transparency. The demand of the investigation is embedded in the context of usability, accessibility, clarity and other issues that impact on Software Transparency concern. Games, accessibility-based software and others were analyzed.*

1. Introduction

Transparency [Holzner and Holzner 2006] is an emergent concern. The interest in this concern has been increasing around the world from the last years. The information access has allowed the participation of citizens in different contexts of society, such as social, politics, organizational and, as expected, software engineering. According to Cappelli's work [Leite and Cappelli 2010], the investigation of this concern in software context is called Software Transparency. As also defined by Cappelli, Software Transparency is an abstract concept. Moreover, it can be impacted by different non functional requirements, such as: Usability, Understandability, Accessibility and other third level non functional requirements (ex. Clarity and Intuitiveness).

Considering the personalization tendencies while developing software products, centered on users' profiles and other issues, it is relevant to investigate the Software Transparency issue. In this paper, we describe our efforts as a Software Engineering Group at University of Brasilia, Gama Faculty, on dealing with this concern by analyzing some non functional requirements that also impact it in different use scenarios.

This paper is organized in sections. Section 2, Research Goals, describes our main objectives while conducting this work. Section 3, Expected Contributions, presents our working prospective. Section 4, Obtained Results, summarizes the results obtained with this research. Finally, the conclusions are detailed.

2. Research Goals

The main goal of this work is to conduct preliminary studies by considering the Software Transparency and its related issues while analyzing games, accessibility-based software, news websites, and e-commerce software. Therefore, we applied the Software Transparency SIG as a checklist in the field of different use scenarios. During the investigation process, we analyzed the non functional requirements with more impacts for each scenario. This process allowed us to obtain specific SIGs while dealing with

four software contexts: (i) games, (ii) accessibility-based software (e.g. software for senior), (iii) news websites, and (iv) e-commerce software. The idea of our research group is to conduct other investigation processes in order to evolve the obtained results, by constructing specific SIG-based catalogs centered on Software Transparency concern. Common issues (i.e. non functional requirements and operationalizations) have been filtered to compose a generalized SIG. Specific issues allowed us to obtain specialized SIGs for each mentioned software contexts by focusing each of them on a central concern. For example, in the case of accessibility-based software, the central concern is the accessibility and its impacts on Software Transparency issue.

3. Expected Contributions

We have been investigating the Software Transparency concern to construct a SIG catalog, specialized in four software context: (i) games, (ii) accessibility-based software, (iii) news websites, and (iv) e-commerce software. In order to conduct preliminary studies in this field, our research involved four groups of undergraduate students. The studies were performed at University of Brasilia, Gama Faculty, Software Engineering Group, Software Design Course. This course is a 300 level course, with theory and practices focused on Software Design. Table 1 summarizes the involved groups.

Table 1. Groups' Description

Group 1	4 members	Transparency & Games
Group 2	2 members	Transparency & Accessibility-based Software
Group 3	3 members	Transparency & News Websites
Group 4	5 members	Transparency & E-commerce Software

Each group investigated a specific software context. First of all, each group analyzed different software products. For example, Group 3 analyzed various news websites (e.g. Uol, Terra, Yahoo and others). For each analysis, the group identified the main non functional requirements that impact, according to the group members' opinions, on the software context under investigation. Therefore, the group constructed a specific SIG, including operationalizations and other details for the software context. Moreover, the group compared the obtained specific SIG with the general one, the Software Transparency SIG proposed by Leite and Cappelli [Leite and Cappelli 2010]. Similarities were annotated as well as differences for each use scenario.

Finally, with all performed analysis and comparisons, it was possible to filter common non functional requirements by composing a general SIG, which is applicable for all investigated software contexts. Furthermore, we also obtained specific SIGs that have been evolved, with other conducted investigation processes, in order to construct a SIG catalog. The main intention is to facilitate the design of software products centered on Software Transparency issues, especially Usability, Understandability, Accessibility and the associated ones (e.g. clarity and intuitiveness). It is relevant to mention that the groups also defined operationalizations for each specific SIG using the knowledge of [Nielsen 2015] and [Usability.gov 2015]. Other details about the preliminary studies, such as the obtained results, will be provided in the next section.

4. Achieved Results

The preliminary studies contributed to construct the first version of our SIG catalog, specific for the four software contexts mentioned before. As follows, we summarize the investigation process for each use scenario.

In the case of game context, we observed that this context is really complex. For each game type, it is possible to construct a more specific SIG. For example, it is completely different the usability issue analysis if we are considering a desktop game or a mobile device game. Therefore, in order to properly deal with this context, Group 1 decided to conduct the preliminary analysis in a reduced scope by considering platform games, specifically developed for mobile devices. It demands complementary studies over other concerns (e.g. memory and processing capacities and responsive design). Figure 1 illustrates the obtained SIG for this use scenario. Some non functional requirements and most of the operationalizations were omitted to facilitate the visualization. Some of them are: (i) maintain the usage of navigability patterns, which all game users well-know and (ii) prioritize the development of entertainment game, as simple as possible. The specification of these operationalizations demanded an investigation about game usability issue, which was conducted by considering some related work, such as [Isbister and Schaffer 2008]. Some useful techniques for mobile game are: (i) prototype to adequately identify the controls, get the level of challenge right, define design aspects, figure out the real purpose of the game under development and others; (ii) storyboard validation, for example, to help understand marketing issues, and (iii) development oriented by user-centred perspective. In this last case, the common sense is a quick and easy access to save the mobile game.

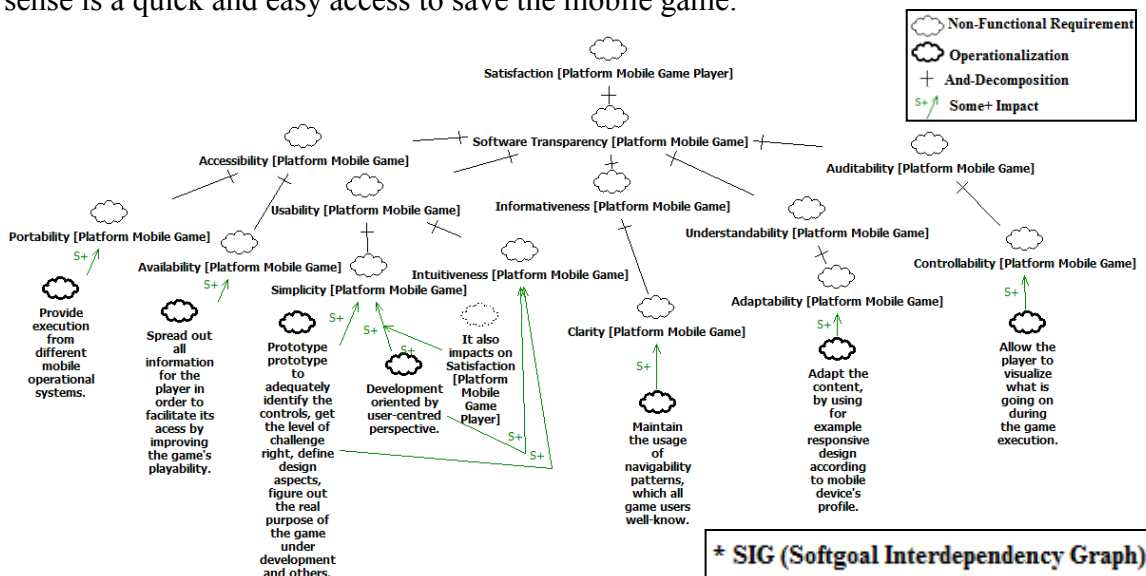


Figure 1. SIG for Platform Game Context (Mobile Devices)

In the case of accessibility-based software context, Group 2 also focused its attention to construct the SIG centered on software for the elderly. The members identified various operationalizations that differ from other obtained SIGs, such as: (i) to increase the font to facilitate the reading by senior users, and (ii) to prioritize the usage of colors (for fonts and backgrounds) with high contrast. Figure 2 illustrates a very simplified version of the obtained SIG for this use scenario, centered on accessibility

issue. The obtained SIG differentiates from the Software Transparency general SIG as we adapted it according to the Web Content Accessibility Guidelines (WCAG) from the World Wide Web Consortium (W3C) [W3C® 2015]. The guidelines provide some essential quality criteria to better deal with accessibility concern. In this case, we focused our attention on the non functional requirements that directly impact on accessibility, such as: Perceivability, Operability, Understandability and Robustness.

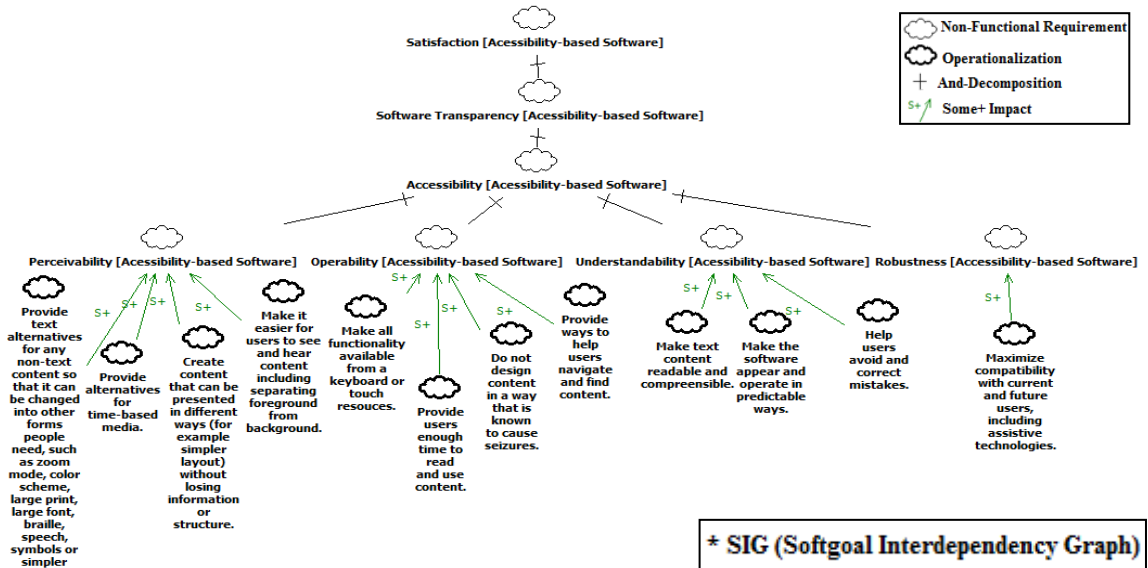


Figure 2. SIG for Accessibility-based Software Context

In the case of news websites context, the responsible group analyzed five websites specialized on news propagation. The investigated websites were: Uol, Terra, Yahoo, IG, and Folha de São Paulo. Basically, all these websites prioritize: (i) the accessibility by making the information available as simple as possible and spreading out the most relevant news; (ii) the usability by making an intuitive navigation and simple interfaces (e.g. popups, large fonts, white background and other standards resources); (iii) the informativeness by maintaining the clarity of available news as well as the consistency of them; (iv) the understandability by also applying clarity. Moreover, all websites try to spread out the information using conciseness descriptions. More details are available by alternative links, only if the reader wants to access, and (v) the auditability by tracing the news back to their respective sources (e.g. authors and other). Additionally, it is relevant to mention that the user first understands how the website works before understanding the website's content. This aspect is related to layout, clear instructions and labeling on a website. In this use scenario, Group 3 also observed that the common news websites usually choose to limit the variety of website typefaces to only a few which are of a similar style, instead of using a wide range of typefaces. This practice standardized the typefaces and type styles. Furthermore, we also perceived that the central theme is the development of a web navigation interface that maximizes usability [Kalbach 2007]. Figure 3 illustrates the obtained SIG for this use scenario, centered on the usability issue. Some non functional requirements and most of the operationalizations were omitted to facilitate the visualization.

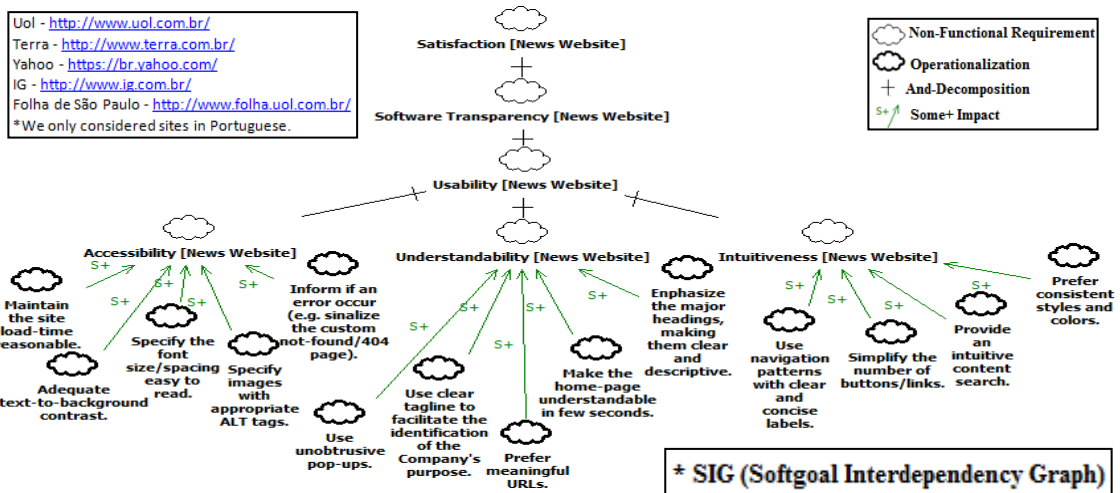


Figure 3. SIG for Website Context

In the case of e-commerce software context, Group 4 considered frequently used e-commerce sites (e.g. Amazon.com, Americanas.com, Submarino, Extra, Walmart, Ponto Frio, Saraiva and Centauro). In addition, e-commerce sites that are innovators (e.g. Discover Sony Store, Reebok E-Commerce and My Own Bike) were also investigated. The students observed that all these e-commerce sites prioritize: (i) the accessibility, for example, by organizing the contents using specific categories; (ii) the usability by facilitating the search for desired contents as well as by avoiding various clicks while navigating to find a specific content; (iii) the informativeness by clearly informing the clients about prices, discounts and additional information of the offered products; (iv) the understandability by extending the provided information about the product using additional tabs (e.g. technical information, clients' opinion about the product and other details). Moreover, some sites (for example, MagazineLuiza) also offer videos to explain the guarantee terms and products' usage, and (v) the auditability by tracing the products back to its suppliers. Figure 4 illustrates a very simplified version of the obtained SIG for this use scenario, centered on usability.

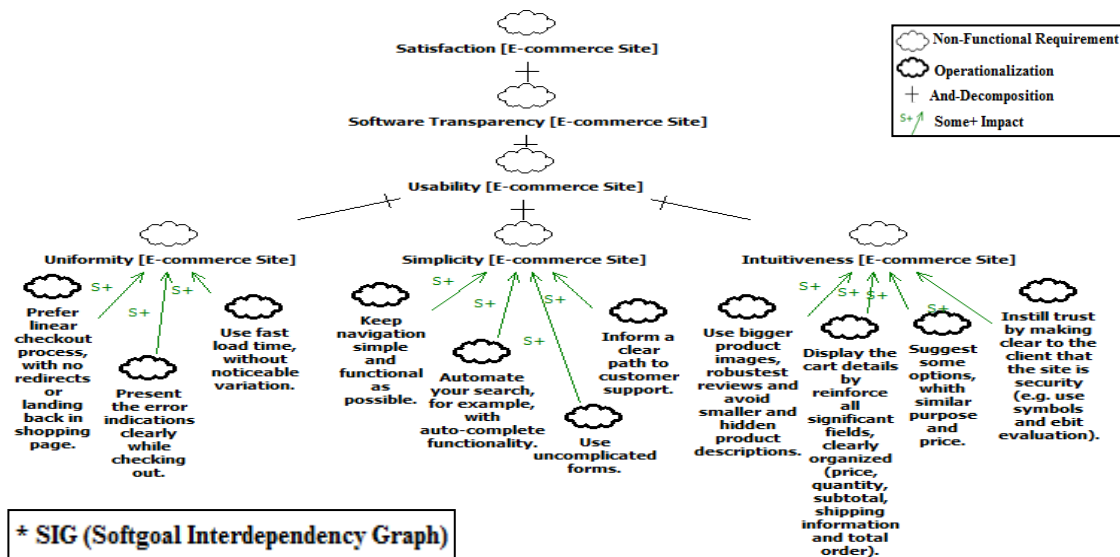


Figure 4. SIG for E-commerce Context

5. Conclusion

The presented work allowed us to obtain preliminary studies about Software Transparency issue by considering four software contexts. Specific SIGs were provided as well as annotations about similarities, peculiarities and other relevant information to construct a specialized catalog. The intention is to improve this catalog to help software engineers while developing software for those contexts. The catalog, among other contributions, facilitates to visualize the non functional requirements' impacts; to know how to operationalize to improve the satisficing [Chung et al. 2000]; and to reduce time and efforts expended during the elicitation, modeling and analysis activities.

The catalog has been evolved. Therefore, its non-functional requirements, operationalizations and impacts are in constant refinement based on the application of the preliminary catalog in complementary use scenarios. Moreover, there is a wiki under construction, in which the catalog will be available for public consultation. The community may help us in the catalog's evolutionary process by consulting, applying and reporting their viewpoints. Our research group will consider these perspectives by trying to filter the common sense points to adequately validate the catalog. Furthermore, some studies have been performed to appropriately categorize the catalog's contents, such as categorization by context [Attardi et al. 1998], hyperlink structure [Chakrabarti et al. 1998], similarity [Pedersen et al. 2004], and lexical database [Fellbaum 1998]. The purpose is to improve the catalog's intuitiveness and usage by third parts (collaborators).

References

- Attardi, G.; Gulli, A.; Sebastiani, F. (1988) Theseus: Categorization by Context. *Journal of Universal Computer Science*.
- Chakrabarti, S.; Doma, B.; Raghavana, P.; Rajagopalana, S.; Gibsonb, D.; Kleinbergc, J. (1998) Automatic resource compilation by analyzing hyperlink structure and associated text. *Int. World Wide Web Conference*, vol. 30 (1–7), pp. 65–74.
- Chung, L. K.; Nixon, B. A.; Yu, E. and Mylopoulos, J. (2000) *NonFunctional Requirements in Software Engineering*. Kluwer Publishing.
- Fellbaum, Christiane. (1998) *WordNet*. Blackwell Publishing Ltd.
- Holzner B., Holzner L. (2006) *Transparency in Global Change: The Vanguard of the Open Society*. University of Pittsburgh Press; 1 Edition.
- Isbister, K. and Schaffer, N. (2008) *Game Usability: Advancing the Player Experience*. ISBN 9780123744470, 400 pages.
- Kalbach, J. (2007) *Designing Web navigation*. 394 pages, O'Reilly.
- Leite, J. C. S. do P.; Cappelli, C. (2010) Software Transparency. *Business & Information Systems Engineering*, vol. 2(3), pp. 127-139.
- Nielsen Norman Group. (2015) Available at: <http://www.nngroup.com/> (categories: e-commerce, web-usability, accessibility, navigability, visual design, content strategy, eye tracking, search, advertising and standard) (May 2015)
- Pedersen, T.; Patwardhan, S. and Michelizzi, J. (2004) *WordNet: Similarity: measuring the relatedness of concepts*. *Proc. of HLT-NAACL*, Pages 38-41, Stroudsburg, USA.
- Usability.com. (2015) Available at: <http://www.usability.gov/> (categories: methods, templates & documents and guidelines) (May 2015)
- W3C®, *Web Content Accessibility Guidelines (WCAG) 2.0* (2015) Available at: <http://www.w3.org/TR/WCAG20/> and <http://www.w3.org/WAI/> (May 2015)