Managing Transparency Guided by a Maturity Model

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Abstract

Transparency is a concept that is widely shared, but with a wide spectrum of distinct interpretations. We have been working on nailing down the transparency concept within the organizational context. As such, we have created a conceptual model of transparency, focusing on its relationships with other qualities (accessibility, ease of use, understandability, informativeness and auditability). Departing from this conceptualization of Transparency we are building a normative guide to measure the level of transparency of an organization. Similar to the Nolan stage model for Information Systems adoption, we are proposing five maturity stages to gauge the advancements of the organizations towards Transparency maturity. Within the scope of Simon’s bounded rationality our conceptual model has ways to judge how far or close an organization may be with respect to certain expected Transparency practices. Our work aims to establish a way of attributing, in a transparent way, stars to organizations, according to how they “satisfice” our conceptual model. As such a five star system, could better inform the organization itself as well as the market how mature they are with respect to Transparency. Each level (opaque, disclosed, comprehended, reliable, participative) has to “satisfice” some criteria in our conceptual model, which are translated to real practices being performed within an organization. Our work is defining such practices, and how they can be observed by the organization, that is which work products are necessary for sustaining the practices or which are produced by the practices. We are also drawing from the work done by the ISO organization and by the CMU - SEI (Software Engineering Institute) on their models to evaluate software quality. In particular, the SEI model, CMMI (Capability Maturity Model Integration) is also organized in a five level scale. The goal of our paper is to present the results so far and discuss this line of normative policies towards increasing the level of transparency in organizations.

1 Introduction

Transparency is a fuzzy concept that has been used in a wide range of contexts, such as social, economic and political. Recently, this concept has been explored by means of a quality driven conceptual model (Chung 2000). Cappelli (Cappelli 2009) and Leite
2010) reported on the work of the Requirements Engineering Group at PUC-Rio towards the construction of a Transparency conceptual model. The resulted model comprises a network of 33 qualities that contributes to the achievement of Transparency.

1.1 Transparency Graph

This graph uses the NFR Framework (Chung 2000) as its description language, which has a proper syntax and semantics geared to Non Functional Requirements (NFR) or Softgoals (the clouds in Figure 1) or qualities. Intrinsic to the language semantics is the notion that Softgoals are satisfied and not satisfied, and as such, does not have a clear cut criteria for satisfaction and relies on the shoulders of Herbet Simon (Simon 1969) who coined the term “satisfice” to denote an outcome of a bounded rationality process.

We believe that bounded rationality was a proper realm to deal with the fuzzy concept of Transparency, but trying, at the same time to find ways of clarifying it from the perspective of quality relationships. As such, using the NFR language (Chung 2000) (Chung 2009) we posit that Transparency can be seen as a network of qualities that “help” Transparency. The Figure below presents this network.

![Figure 1: Transparency SIG (Cappelli 2009)](image)

How should we “read” this graph? Take for instance the left part of the graph: there we can see that the quality accessibility “help” Transparency, which means the more accessible something is, the more transparent that something will be. However, the quality of being accessible (Figure 2), from the point of view of Transparency, is helped by portability, availability and publicity; so, the more portable something is, more accessible it will be; the more available something is the more accessible that something will be; the more publicity something has the more accessible that something will be.
The same reading can be done to any of the other qualities that help Transparency. Taken for instance, auditability (Figure 3), if something is more auditable, then it will be more transparent. If something is more accountable, then it will be more auditable, and so on.

The chain of help depicted in Figure 1 broadcasts qualities towards Transparency. It is important to understand that this does not say that Transparency is composed of (mereology) 33 qualities; it says that these 33 qualities contribute positively towards Transparency. This is an important part of thinking in terms of bounded rationality, since having less of one of any of these qualities does not equate as not having Transparency, but on having Transparency on a different, lesser, degree.

Figures 4, 5 and 6 detail the other qualities that help Transparency.
Another important aspect within the realm of bounded rationality is that the judgment of qualities is always on the eye of the beholder; so different viewpoints (Leite 1991) will perceive differently the degree to which a quality can be inferred.

Regarding the term “something”, it is a placeholder for an object to which the quality of Transparency is being applied. Usually, Transparency is applied to “something” of the type information, that is “something” of type information is more or less transparent; and this is the case when transparency is related to disclosure of information or freedom of information in the context of citizenry. However, we understand that Transparency should also be applied to processes as well, that is, cases in which “something” is of type process. Although most of the literature focuses on information transparency, at least Weber (2008) deals with process transparency. We believe that an understanding of Transparency applied to both information and processes allows for a better characterization of the concept.

As such, Figure 1 has the aim of being general, as a quality, but we understand that it will be instantiated differently according to each “something” it is being applied. So, we can think of an organization being transparent, or a law being transparent, or a document being transparent, or a software being transparent, or pedagogy being transparent. That is, the general quality of Transparency may be applied to different objects, in which the information about the object should be transparent or in the case in which the process object may be transparent.

For instance, if we watch a soccer game live, we watch the process as it happens, in a transparent way, but we may read about it later, and in that case the information about the game should be transparent. In some situations it is desired that the process itself be transparent and not just the information about it. Nonetheless this distinction is not just framed by the notion of time, but it is also a dependent on other qualities such as completeness.
1.2 Knowledge Acquisition

How did we produce the model presented in Figure 1? We have used a set of requirements elicitation strategies (Gougen 1993) to acquire an understanding of Transparency. It is interesting to note, that coming from a Computer Science background we had an interesting but confusing obstacle. In computing the word “transparent” has been used with a total opposite semantics! Texts in computing use the word as to mean that something is hidden from the user with the intuition of making things easier, that it the user should not worry about that something (Wikipedia 2013).

Since the meaning of Transparency we were looking for was of openness, clarity, we have aimed social science literature to find the semantics of Transparency. Several information sources, like laws and regulation related to freedom of information and data protection, were used to gain knowledge on Transparency, but four books did stand up in building our understanding.

Holzner and Holzner (Holzner and Holzner 2006) provide an in-depth study from the social and historical perspectives on what they see as a movement to open government, in which transparency is key towards more open and democratic societies. Henriques (Henriques 2006) examines different constituents of transparency as a concept and frames them in the context of organizations, claiming that transparency will be essential for successful organizations. Lord (Lord 2006) provides arguments showing that increasing levels of transparency do not imply in more democracy and peace, as such insights lies on the limits of transparency. Fung et al (Fung et al. 2007) use the concept of target transparency as a way for organizations to reduce specific risks or performance problems through selective disclosure and does this by providing a careful analysis of the constituents of transparency.

1.3 Knowledge Validation

The model presented in Section 1.1 (Figure 1) was the result of a series of previous versions. These versions resulted of a construction process based on collaboration. The process was carried out by a team of a dozen researchers that using the elicited knowledge proposed a network of qualities linked by the help label. Each member proposal of adding, grouping or splitting qualities was discussed in meetings. Each meeting would usually take two hours and sometimes a whole meeting was to discuss the role of a given quality in the model, which in a forwarding meeting could be discussed again, sometimes retracting to a previous meeting.

The meetings discussions were an important aspect of your building process, for three main reasons: a) it was a consensus driven decision, b) it provided constant feedback, and c) validation, even partial, was achieved by using the different viewpoints of each researcher.

Notwithstanding, we have also submitted our model to two external panels with experience on conceptual modeling (Mylopoulos 1994) and on goal oriented conceptual modeling (Yu 1993) asking the panel to validated our model.

The Transparency model (Figure 1) has been used as an anchor in our work on Organizational Transparency, in special with regards to process transparency (Cappelli 2007). This model has also been used to study the Brazilian Access Law (Presidência da República 2011) with respect to the understandability characteristic (Engiel 2012). This background led
us to start work on the proposal of a Transparency Maturity Model (TMM) to gauge the state of affairs of chosen subjects with respect to Transparency.

2 Maturity Models

Maturity model is a self-explanatory term. It is a model to gauge the maturity of something. In the area of Information Systems the Nolan’s Stage Model can be seen as an early prototype of contemporary maturity models. Nolan (Nolan 1979) listed 6 stages to which an organization would evolve with respect to the use of computing in organizations. The model was driven basically by computing budgets, but with different characteristics at each stage. The following stages were devised by Nolan: I) Initiation, II) Contagion, III) Control, IV) Integration, V) Data Administration, and VI) Maturity. This model evolved from an early four stages to the six stages, in which the high point was maturity where the organization would have implemented its basic portfolio and would be exploring the advantages of computing beyond the basic stages. This model was influential and according to critics (King 1984), despite its imprecision, it was important to characterize the evolution of computing in organizations.

Maturity Models become popular with the creation of the Capability Maturity Model (CMM) (Humphrey 1988) by the Software Engineering Institute at Carnegie Mellon University. The Institute was funded by the Department of Defense with the objective of improving the quality of software production in DoD contractors. The CMM was very effective and started to be applied not only to software but also in integrated systems dealing with software. The model is built around the concept of key process areas, cluster of processes, in which each process has goals, features and practices.

Different versions of CMM were developed over the years, and the model turned to be called Capability Maturity Model Integration (CMMI) (CMM, 2010). Recently, Carnegie Mellon moved CMM-CMMI out of the Software Engineering Institute to the CMMI Institute (CMMI 2013), where it says: “CMMI is a proven approach to performance management with decades of results showing it works. Organizations using CMMI have predictable cost, schedule, and quality—business results that serve as discriminators among their competitors. CMMI is built with practices and goals seen in thousands of real organizations worldwide. Use these practices and goals to evaluate your own performance and decide what to improve for your own business reasons.”

The SEI model had different spin offs, one of them in Brazil (Montoni 2009). The Brazilian software process model was developed to be: “…a feasible pathway for organizations to achieve benefits from implementing software process improvement at reasonable costs, especially small and medium-size enterprises.” (Montoni 2009). The official site for the MPS.br model (MPS 2013) informs that there are already 488 organizations that were evaluated according to the MPS.br model, which has 7 levels, being A the high maturity one (Optimizing). Each level has a set of processes and each process may be subject to a set of process attributes that defines a particular aspect of process capability.
Maturity models are models conceived in the context of quality standardization, where, ISO (International Standardization Organization) is a major player. Moved by globalization, organizations would need to trust partners far away from their usual environment. Quality seals were effective in improving the relationship of organizations in the overall global market. ISO itself did work with standards for software quality and influenced and was influenced by the CMM model, in particular the series IEC of ISO standards.

The major benefit of such models is to set standards. They also provide an evolution path for organizations towards higher maturity levels, which are understood as a higher quality production processes. Of course that central to their success is the robustness of its embodied knowledge. In order to be relevant, maturity models have to be built on solid ground of domain knowledge, but also must present a well-formed evaluation framework as to be sustained. The general idea of ISO standards is by concentrating on processes and using them as the major way of evaluation.

3 A Transparency Maturity Model

We understand that a key point in any maturity model is how well it captures the domain knowledge it aims to gauge. Examples from the software engineering realm show us that although standards models are reported as providing good results, there is also reports (Turner 2002) (Zhou 2005) that point out to failures of the models to capture the context of agile development or open source software. On a survey on building maturity models (von Wangenheim 2010) it is reported that several models are developed in an ad-hoc manner.

Although Maturity Models are quality models, the ones seen in Section 2 are based on a set of processes that, if present, will lead to an overall quality of key areas (like in CMM). These models are general in the sense that they try to capture overall knowledge on a given field assuming that if this knowledge is used, by means of processes, the overall result will be better, if more key areas are covered, so as more processes are implemented more quality is achieved.

In our case the proposed maturity model relies on a validated model of the quality Transparency, so it is much more focused, since it targets one specific quality and does not cover a field of knowledge. Notwithstanding, as seen in the introduction, the quality Transparency may be applied to different topics, or objects (something). So, if the conceptual model is sound, the Maturity Model derived from this conceptual model should be sound. In a way it relies on the qualities that contribute to Transparency and processes are used as a way of satisficing a given quality. More important, different processes may be used to satisfice a given quality.

The major challenge of our model is then to measure the level of achievement of a given quality for a given object by means of a process. Note that the object may be either information or a process. That is, we will have processes to operationalize the transparency of a process.
3.1 **The Process for Building the Transparency Maturity Model**

Literature on maturity model building (Pöppelbub, 2011) (Steenbergen 2010) provided a basis for the process we are following in the case of the Transparency Maturity Model. The process steps (Figure 7) are: scope identification, model specification, instrumentation, pilot, application, and evolution.

![Figure 7: Transparency Maturity Model – Construction Process Steps](image)

First an elicitation strategy is used to gather information on the scope, on the information sources, and on goals to be achieved. Based on this elicitation, some choices can be made that will characterize the model. Choices refer to: a) objective of the model and to which subject (object) it is applied, b) if the model is process driven and/or technology driven, c) the public it will be targeted, and d) if the model is descriptive or prescriptive.

In our case we will have a descriptive model that is targeted to citizens, that is both process and technology driven and in which the objective is that transparency be achieved and the object is the organization.

The model specification includes the definition of the maturity levels, the meta-model to be used and the descriptive content of each level. Central to this step is the meta-model, that defines the descriptive contents by means of the GQO (goal, question, operationalization) process (Serrano 2011), similar to the GQM (goal question, metric) strategy (Basili 1994).

The third step is instrumentation. This step includes the development of an assessment strategy based on the specification. This step is grounded on the meta-model and on the operationalizations for the questions posed to each goal. This step is closely linked with the construction of an evaluation transparency method (Benjamin, 2013). It is in the instrumentation where metrics would have to be defined to gauge to which degree the operationalizations satisfice the goal. The metrics should be sharp enough to minimize different evaluations by different evaluators.

The realization of pilots is an approach to cover missing parts, and as such helps the analysis of the model, by providing an early validation. The pilots are also a step where verifications by the design team do occur in a ways to make the model more consistent.

The next step is to apply the model, which is planning how the model and instruments will be applied, train the participants, apply the model and instruments in a real organization scenario, communicating the results and perform corrective actions.

Last, but orthogonally, the model evolves, making possible the analysis of identified improvements, building a base of lessons learned, keeping different versions of the models with the required changes.
3.2 The Meta Model for the Transparency Model

![Diagram of the Transparency Maturity Meta Model](image)

**Figure 8: Transparency Maturity Meta Model**

Using a Conceptual Model Language (Mylopoulos 1994), we built a meta model for our Transparency model. In this language the rectangles represent the entity being modeled, the links represent the relationship between two entities, and the numbers in each end of a link represent the cardinality of that relationship. So, reading our model, it says: a number of \( n \) maturity levels are applied to a number of \( n \) objects. An object can be parts, sectors, processes, systems of an organization. One maturity level is composed of a number of \( n \) characteristics (softgoals). A maturity level has a number of \( n \) purposes. A purpose may be unfolded in a number of \( n \) purposes. A characteristic may be target of a number of \( n \) purposes. A characteristic may be implemented by a number of \( n \) practices, and a practice may be implementing a number of \( n \) characteristics. A practice may be composed by a number of \( n \) practices. A practice may generate a number of \( n \) work products.

The mapping is done once we have selected the “something” to which the Transparency Meta Model will be applied for the public to be targeted. This “something” will be the entity object. The maturity levels are the levels we have selected for the model (see next Section), together with its purposes. The characteristic entity is mapped from our SIG (Figure 1). The characteristic defines the quality that contributes to achieving the maturity level. As such, we have to choose which characteristics (softgoal – quality) applies to each level, and then define through the use of our operationalizations strategy (GQO), which practices (an entity) and workproducts (an entity) will be sufficient to operationanalize the characteristic.

3.3 The Levels of Maturity

The Transparency Maturity Model (TMM), the instantiation of the above meta model applied to organizations, defines an evolving path to the deployment of transparency in organizations. It describes 5 levels to classify organizational transparency, as depicted in Figure 4.
Participative: The organization allows the dialogue with the external environment about the information provided.

Reliable: The organization allows the auditability of the information provided.

Comprehended: The organization provides and allows access to understandable information to the external environment.

Disclosed: The organization provides and allows information access to the external environment.

Opaque: The organization provides information to the external environment in a non-systematic fashion.

Figure 9 – Transparency Maturity Levels

Each maturity level gathers characteristics that, when applied to the object (information that the organization wants to make transparent), makes it possible to know what level the organization has achieved. The assembly of the levels was built around three major principles: 1) an ad-hoc perception of a ladder of characteristics (accessibility, usability, informativeness, understandability, auditability), 2) a deeper understanding that each of the five main characteristics, may, as well, be achieved in different levels, and 3) using the Brazilian Access Law (Presidência da República 2011) as milestone for Level 2 (Disclosed)

So, each level will have a series of characteristics that will be satisficed to attain that level. Using the three main principles and the GQO (Goal, Question, Operationalization) a set of key practices to be deployed in the organization in order to comply with the transparency characteristics described at each level are defined. The description of practices helps organizations to establish what must be applied in their internal procedures to be aligned with the expected transparency characteristics. The deployment of each practice may prescribe the elaboration of specific work products or artifacts, also suggested by TMM.

3.4 Operationalization (getting to practices and work products)

In order to explain how practices and work products are identified, we present a partial view of the TMM details for level 2.

First we have elected, following the major principles as in Section 3.3, the ten characteristics of level 2: publicity, availability, portability, operability, clarity, current, integrity, verifiability, traceability, and accuracy. It is important to understand that each of these characteristics will have operationalizations (practices and work products) that will satisfice the given characteristic to the expected level of maturity. For instance, see Table I for some examples.

Each practice and work product listed for each level has a description of its activities and attributes thus forming a general guide (a standard) for categorizing each maturity level.
Once all levels are established together with their practices and products, there is a need for an evaluation model, which is the basis for how appraisers (assessor) will certify that a given organization fits the standards, the TMM.

### 3.5 The Evaluation Model

The deployment of maturity models requires an evaluation model linked to it, given the need to assess the implementation of the practices defined in the model. This is the norm with well established maturity models such as the Mps.Br (Evaluation Guide (Softex 2011)) and the CMMI (Standard CMMI Appraisal Method for Process Improvement (SEI , 2011)). In both cases, the maturity model provides a reference for the evaluation process for defining requirements that define each of the elements that make up the maturity levels of these models.

The evaluation method is applicable to any level of maturity and consists of the process model and its evaluation documents, the definition of requirements for assessment, the requirements for evaluators training and the construction of an evaluation guide. The evaluation process model is already built, and has five macro processes as shown in Figure 10.

#### Figure 10 – Organizational Transparency Evaluation Process (Benjamim 2013)
The process "Collect Organizational Information" aims to obtain information that provides an overview of the organization. The process starts with the receipt of the evaluation contract. The coordinator of the appraiser designates the lead assessor of the assessment. The lead assessor sends the identification profiling to collect information. The organization fills this document and sends it to the lead assessor. The completeness of this document is verified. If the process is completed the next process is started, otherwise further information is requested through the organization. The process concludes with the correctly identification of the organization.

The process "Prepare Evaluation" aims to organize information and allow people to conduct the evaluation. The process starts with document Organization Profile filled out correctly. The lead assessor determines the scope of the assessment. Then identify the members of the evaluation team with the appropriate profile. It asked the local coordinator of the evaluation, to send a list of members of the organization which will participate in the evaluation. Based on all the previous information, the lead assessor develops an evaluation plan. Then, requests the approval of the plan by the sponsor of the evaluation. Adjustments are made if necessary. If there is no need to adapted, the evaluation team will be trained to conduct the evaluation. The process ends with the assessment team trained.

The process "Conduct Review" aims to conduct evidence collection and generate report with the evaluation result. The process begins with the assessment team trained. The lead assessor performs an opening meeting. Each member of the evaluation team collects necessary evidence to determine the implementation of the practices. Then it will be checked if the evidence collected is sufficient to prove the implementation of practices. Then the practices are scored. The lead assessor will conduct meeting with all staff to obtain a consensus on the evaluation result, if necessary new evidence can be collected. Subsequently the evaluation team will determine the maturity level of the organizational unit. The lead assessor prepares the presentation of the results of the evaluation and conducts it. The process concludes with the evaluation report preparation.

The process "Perform Audit Process Assessment" aims to determine whether the evaluation was performed according to the method of evaluation. The process starts with the receipt of the evaluation report by the coordinator of the evaluators group. The coordinator assigns an auditor and gives the evaluation report to the auditor. The auditor audits the report. If this is approved, it generates the audit report. Otherwise, the lead assessor will be asked to perform adjustments. Once adjustments are made, the lead assessor sends audit report for the auditor and the coordinator of the evaluation. The process ends with the approval of the audit report.

The process "Display Results" aims to report the evaluation results. The process starts with the audit report reception. The lead assessor records the lessons learned during the evaluation. The final report is generated. Upon receipt the evaluation document, it will be archived. The process concludes with evaluation results presentation.

In addition to the processes we also designed some documents models: the document profile ID of the organization, the evaluation plan, and the lessons learned records, audit report and evaluation report.
Managing Transparency

The preceding Sections did report on the overall design of TMM, which is still in development. As of now, we are working with a team of 16 participants from two institutions, UNIRIO and PUC-Rio and are making a series of efforts to publicize our work with the goal of broadening the collaboration with other institutions. As an example, we have helped to organize the first WTransS – J Workshop em Transparência em Sistemas (WtranS 2013) and have been in a public audience in the Brazilian House of Representatives (WebCâmara 2013).

We posit that, in a similar fashion to the efforts in improving software quality, by means of standards, the TMM may achieve similar results as promoting an awareness about transparency and providing a next step is to apply the model, which is planning how the model and instruments will be applied, train the participants, apply the model and instruments in a real organization scenario, communicating the results and perform corrective actions.

Our work aims to establish a way of attributing, in a transparent way, stars to organizations, according to how they “satisfice” our conceptual model. As such a five star system (TMM levels), could better inform the organization itself as well as the market how mature they are with respect to Transparency. Each level (opaque, disclosed, comprehended, reliable, participative) has to “satisfice” some criteria in our conceptual model, which are translated to real practices being performed within an organization together with its related work products.

As mentioned in Section 3.5 an evaluation process in an organization is the main instrument for a feedback loop within an organization. An assessment process not only may lead to a desired seal, but also is a organized way of an organization seek improvement over its policies and practices regarding transparency.

Of course that a model is just a reference, without commitment from the managers or without legal norms, or market pressure transparency will not be pursued. What we have noted from the Brazilian experience is that organisations that want to be prepared to obey the Brazilian Access Law lack an organized guide as how to do it. One of our first targets with the TMM is to provide a set of organized practices and work products for Level 2 which we believe fulfills the requirements of the law.

Conclusion

Measuring quality is well known to be a problem, and that is why we recur to the ideas of bounded rationality and did use a conceptual model, that contrary to most of others do take in consideration that sometimes is just ok to have something satisficed, that is attending the requirements not completely, but to a certain degree.

Indicators of information transparency have been proposed, as for instance for the evaluation of sites (Ballotpedia 2013), but most of this work is dealing with the object of transparency and not with transparency as a quality. In several cases, it is clear that having access is not enough, so what is the gain in having information in such a volume that is impossible to parse it, or if the information is not current, or if the information is written in a obfuscated way, as for instance when lots of acronyms he next step is to apply the model, which is planning how the model and instruments will be applied, train the participants, apply
the model and instruments in a real organization scenario, communicating the results and
perform corrective actions.

Last, but orthogonally, the model evolves, making possible the analysis of identified
improvements, building a base of lessons learned, keeping different versions of the models
with the required changes.

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