Building a Responsibility Model to Foster Information Technology: Contributions from Social Sciences

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Abstract

The economic context advocates a better understanding of responsibilities and an enhancement of these responsibilities within a moral perspective. These arising requirements have oriented our research toward the elaboration of an innovative responsibility model. This paper aims at enriching our responsibility model on the basis of a further analysis of these concepts in human sciences literature.

1. Introduction

The current crisis has highlighted the necessity for a global rethinking of the economy. Industrial analyses as well as academic surveys have put forward the need for improving the management of IT in many areas such as transparency, commitment, accountability, control, procurement and alignment with the business. All of these domains are gathered under IT Corporate Governance umbrella and are progressively integrated in standards and norms such as ISO 38500:2008 [1] or COBIT 4.1 [2].

In parallel to these progressively formalized and newly arising requirements, companies are used to work with well-known experienced and approved management frameworks of their day-to-day operations, management or investments. These frameworks are for instance ITIL [3], COBIT, CIMOSA [4], or ISO 15504 [5]. Such frameworks mostly target a well-defined activity domain or a precise technology type, and address the above listed governance's requirements with a very specific approach and according to a precise context dependency understanding. All of these frameworks deal in one way or another with a responsibility concept. The consequence of this abundance of frameworks is the existence of an equal amount of responsibility models and interpretations.

Based on the assumption that all of those components are consistently used for the elicitation of corporate rules and policies, it is obvious through that grounding a convergence between them would quickly bring relevant benefits to the business. Moreover, assuming that these rules and polices most of the time formulate the behavior of a system [6] and of its stakeholders, we deduce that the stakeholders' responsibility represent a paramount significance to adequately govern a company.

Assuming the importance of the responsibility concept, the analysis of its representation through professional standards, norms and frameworks as well as the examination of scientific literature highlight, that, as yet, there does not exist a consensual and common understanding of its conceptual components.

Taking that into account, our research aspires to globally improve the IT governance mainly by advising a common responsibility model dedicated to the industrial and scientific usage. The elaboration of such a model is realized through a double activity. First, a theoretical model is constructed based on the analysis of its conceptual components issued from social, managerial, psychological and computer science literature's incomes. Secondly, the theoretical model is enhanced and validated by confrontation with industrial frameworks. Simultaneously, improvement proposals of these existing industrial frameworks are proposed by adjunction of conceptual components from the responsibility model they lack.

In this paper, we present the responsibility model and explain some of its most important components based on literature review and previous works.

2. The responsibility concept

There exists a plethora of responsibility definitions and this paper will not propose a new one but would rather synthesize a definition from existing ones. We may state that commonly accepted responsibility definitions encompass the idea of having the obligation to ensure that something will happens. Our previous works [7] [8] [27] [51] have reviewed the responsibility concept and have led to the development of a synthetic and pragmatic responsibility model (figure 1.) This model addresses three responsibility concepts' blocs that are the right to perform actions, the obligation to achieve results of actions and the assignment of stakeholders' responsibility. In this paper, the assignment process will be closely associated to the delegation mechanism [53]. Each of these concepts' blocs are explained in detail in the following sections.

Cholvy et al. [9] explains that responsibility is a concept with several facets corresponding to very different meanings. She provides three responsibility definitions, which implicitly encompass the three concept blocs relating to our model right, obligation and delegation. The first definition links the responsibility concept to something negative that has happened because of a person or could have prevented it from happening. This definition is mainly issued from the legal world and is closely related to a notion of causality. The second definition claims that responsibility is an obligation or a moral duty to report or explain the action or someone else's action to a given authority (answerability). This definition helps defining an obligation considered as a legal duty and introduced in parallel the moral duty, which

will be closely analyzed in the following sections. The third definition considers responsibility according to a position within an organization and explains that a person responsible for a task should be prepared to justify his actions and might be exposed to sanctions or rewards. This justification adds the accountability concept and consequently, nuances accountability versus answerability. These three definitions highlight important responsibility facets like obligation, moral duty, reporting or justification, and accountability or answerability. However, it is unclear how these concepts are linked together and how they interact, i.e. answerability vs. accountability vs. justification and obligation vs. moral duty. The following sections attempt to clarify this understanding.
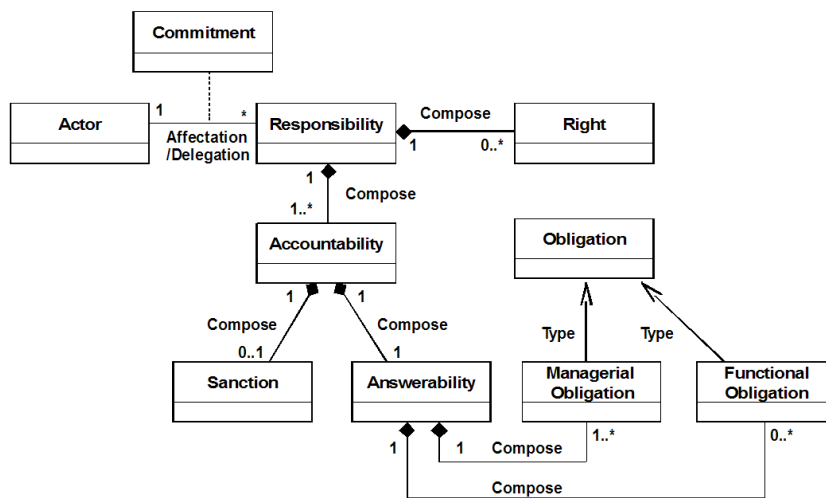

Figure 1. Responsibility Model Building Blocs UML Diagram

3. The obligation concept

The stakeholder responsible for specific action also has the obligation to achieve this action. Two main obligation types exist: functional and managerial obligation (figure 2.) Functional obligation is related to functional actions (direct production of goods) and managerial obligation concerns managerial actions (like i.e.: control, management, allocation of resources, etc.) At the organization's top layers, these kinds of obligations could be illustrated by recent laws like the Public Company Reform and Investor Protection Act of 2002 [10], known under Sarbanes-Oxley and the Basel II [11] requirements for financial institutions, which have highlighted the necessity of more engagements in the hands of employees and more precisely the CEO and CFO. This engagement may be translated into an obligation to be kept informed of the status of the accounts. In the field of ICT, obligation exists mainly in engineering methods like I* [12] and appears through the obligation to achieve a task or to

perform an action. The distinction of functional and managerial obligation is strengthened by Dobson [13] who defines functional obligation as what a role must do with respect to a state of affairs, whereas he defines a structural (managerial) obligation as what a role must do in order to fulfill a responsibility such as directing, supervising and monitoring, whenever an obligation or a right is delegated.

This concept of obligation is subject to more debate. For Bettini et al. [14], obligations are conditions or actions, which must be fulfilled either by users or a system after a decision. In [15], Sandhu et al. define obligations as requirements, which have to be fulfilled by the subject for allowing access. Crook et al. [16] extend the notion of obligation to obligation policy relating to actions which must be carried out on targets by subjects when a predefined event occurs and Haley et al. in [17] define it as what actions must be taken before access can be granted.

The obligation concept is strongly linked to a state of affairs, which must be achieved or avoided. This

concept doesn't exist in the realm of the access control model that rather tends to speak about the right or/and the obligation required to access information. E.g.: the right to read a document or the obligation to satisfy conditions before accessing it. By contrast, a task is a centrical concept in requirement engineering. E.g.: in Tropos, [18] a goal may be achieved by fulfilling a task.
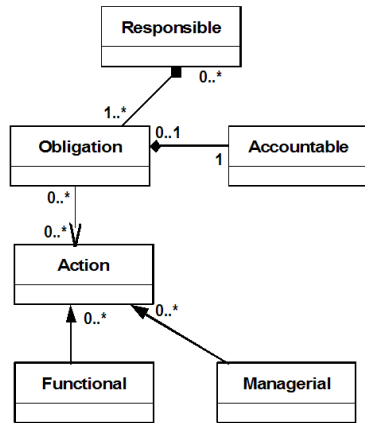

Figure 2. Obligation UML Diagram

Accountability (figure 3) is a concept existing in the fields of education [19], politics [20] and healthcare [21]. Accountability is a concept that exists for as long as the responsibility concept but this has been emphasized by the requirements for corporate governance. Accountability encompasses answerability and eventual sanctions or rewards. It is an important component of the obligation within which it justifies the achievement of an action and gives its evidence. This concept describes the state of being answerable regarding the achievement of a task. Behind the researches, which have introduced it, Fox [22] argues that accountability is generated from transparency. He explains that one person's transparency is another's surveillance and in the same way, one person's accountability is another's persecution. Fox defines accountability with the two following concepts: answerability and sanctions. For him, soft accountability is equivalent to answerability, whereas hard accountability is composed of answerability and sanctions. Stahl [23] confirms that responsibility and accountability are very closed concepts. He explains that accountability describes the structures, which have to be in place to facilitate responsibility and that responsibility is the ascription of an object to a subject rendering the subject answerable for the object. Stahl also focuses on the sanction as being of central importance for the responsibility. He nuances the sanction as positive or negative. His vision of responsibility is that it is constructed based on the three dimensions: object, subject and authority. For Stahl, authority is the entity that can determine and enforce the sanctions associated to the responsibility ascription (based and relying on a normative framework).

This approach presents de facto authority as a type of actor rather than as a particular capability representing the power to command and control others agents. We prefer the second approach.

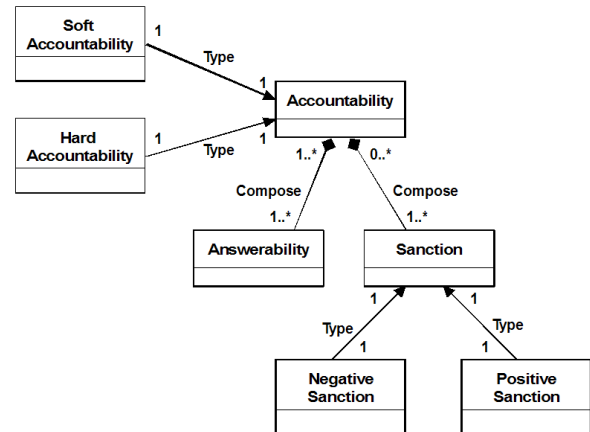Authority is also a concept used in CIMOSA [24]

Figure 3. Accountability UML Diagram

There exist others definitions of accountability. Laudon et al [26] express this concept by the following way: "Accountability is a feature of systems and social institutions: It means that mechanisms are in place to determine who took responsibility actions, who is responsible" with the following responsibility definition: "responsibility has to do with tracing the causes of actions and events, of finding out who is answerable in a given situation". Accountability is for Goodpaster et al. [54] a mechanisms' set allowing such tracing of causes, actions, and events whereas for Spinello [28], it is a necessary but not a sufficient responsibility condition.

4. The right concept

The right concept (figure. 4.) encompasses all the facilities required to perform the action the stakeholder is responsible for. These facilities could take on many forms like the capabilities', the authorities' or the delegation right.

Capability: describes the quality of having the requisite qualities, skills or resources to perform a task. Capability is a component that is part of all models and methods, and is most frequently declined through definitions of access rights, authorizations or permissions.

Authority: describes the power or right to give orders or makes decisions. This concept is introduced in Cimosa as the "power" to command and control others agents and to assign responsibilities. Cimosa [4] argues that responsible agents have rights over resource in the first and over process, activity and task in the second place. Cimosa distinguishes the resource and the capability: Resources are companies' assets required for carrying out processes whereas capabilities are technical abilities provided by a specific resource and are of four types (functional, object oriented, performance or operational).
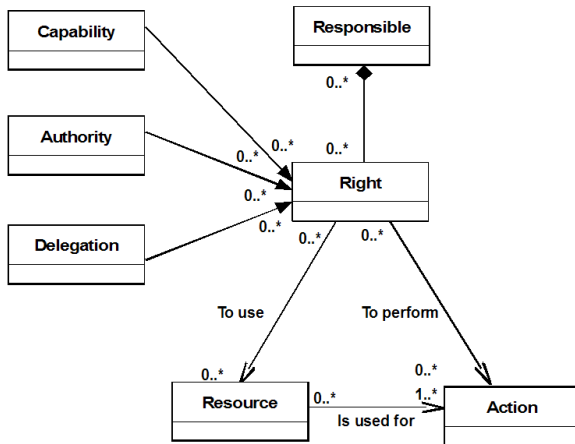

Figure 4. Right UML Diagram

Delegation: is a type of right to transfer some part of the responsibility to another actor. This transfer may concern the transfer of right or obligation or both. I.e. an actor may transfer the responsibility to achieve an activity to another actor. This obligation delegation may or not be accompanied by the delegation of right. This delegation of rights depends on the stakeholders' right of holding this responsibility This delegation may or not also includes the transfer of obligation as the obligation to be accountable [29].

5. Affectation / Delegation Process

Affectation / Delegation is the action of linking a stakeholder to a responsibility (figure 5). This affectation / delegation may take on different forms like: natural (the adult who plays the role of parent), legal or moral. In industry, the affectation is often resulting from a cascade of delegations or assimilated processes: the CEO is responsible of the global activity of the industry and may delegate the management of the production to the production manager, the management of the quality to the quality manager, the management of the marketing to the marketing

manager, etc. Thereafter, all these managers delegate some of their responsibilities to subalterns, which at the end constitutes a delegation chain.
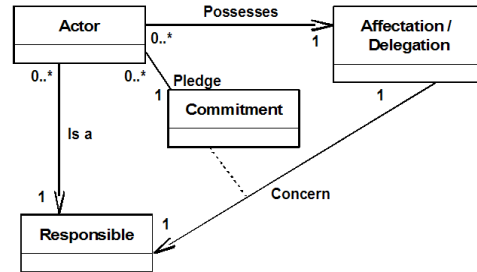

Figure 5. Delegation / Affectation UML Diagram

Actor (stakeholder) appears as a key component of the affectation / delegation action. It represents a person external or internal to an organization, a system or a software component. Stakeholder has to achieve a task he is responsible for. Number of synonyms of it exists like subject, employee, user or agent. For administration facilities, those stakeholders are often grouped together based on their profile. As previously explained in the literature overview, the most famous type of classification is the role but variations exist such as for example the team, the hierarchy, or geographical constraints.

Commitment is the moral engagement of a stakeholder to fulfill a task and the assurance that he will do it in respect of an ethical code. It appears that delegating or affecting responsibility to stakeholder only based on the concept or right and obligation misses to address an interesting topic that is the trust or the commitment. This domain plays an important role when policies deal with the human behavior and we make the statement that the more human behavior affects the process; the more this concept is meaningful. To fix the importance of it, let us imagine the situation of a manager requesting the help of a subaltern to conduct a meeting with an important customer. Two subalterns seem a priori able to perform this task due to their equal capabilities. However, the manager prefers to delegate the work to one employee rather that to the other. The manager makes this decision because this employee is more committed to the organization than the other. The manager trusts him more. This kind of situation, even if not formalized by ICT system, seems to appear rather frequently in reality

Commitment is the most infrequent concept in industrial and professional frameworks as well as in standards and norms. This moral engagement has already been invoked in section 3 where Stahl states that an individual involved in a process is ready to adhere to it.

Traditional policy model such as RBAC do not address it, however I* partly introduces it (e.g. when defining dependency as an "agreement" between two actors). For Yu [12], commitment provides an abstraction that allows workability to be judged without having to know about the routines used to achieve or the need to judge the workability of the individual elements that make up those routines. Commitment is the property that bridges the gap between ability and workability. Workability indicates that an agent believes that some routine would work even though it is incompletely specified or known.

Even if this concept rarely appears in professional literature, many states-of-the art have been produced in the scientific literature as for instance Shojiro Takao [30]. Scientists generally have agreed upon the idea that the commitment depicts the relationship between the individual and the organization. They have furnished many definition of it: Monday [31] explains that it can be seen as "the relative strength of an individual's identification with and individual's identification with an involvement in a particular organization", Stebbins [32] defines it as "the awareness of the impossibility of choosing a different social identity […] because of the immense penalties in making the switch". For Grusky [33], the commitment is "the nature of the relationship of the member to the system as a whole" and for Hrebiniak et al. [34]:"A structural phenomenon which occurs as a result of individual-organizational transactions and alterations in side-bets or investment over time".

Another interesting issue of Stahl's researches is that: "A responsibility ascription that is to be successful in improving social reality must be based on acceptable rules that the individuals involved are ready to adhere to". This obligation highlighted by Stahl strongly advocates the needs of actors' commitment.

All of these definitions tend to demonstrate that there exist different types of commitment. The two most recognized are affective commitment (also referred to as emotional, attitudinal or value-related) and continuance commitment (or calculative). See figure 6. Affective commitment is the one defined by Monday and which Porter [35] has depicted through the Organizational Commitment Questionnaire (OCQ) in terms of a strong belief in and acceptance of the organization's goals and values, a willingness to exert considerable effort on behalf of the organization and a strong desire to maintain their membership in the organization. Meyer et al. [36] have highlighted that employees with affective commitment tend to work harder for their companies than employees with other type of commitment.
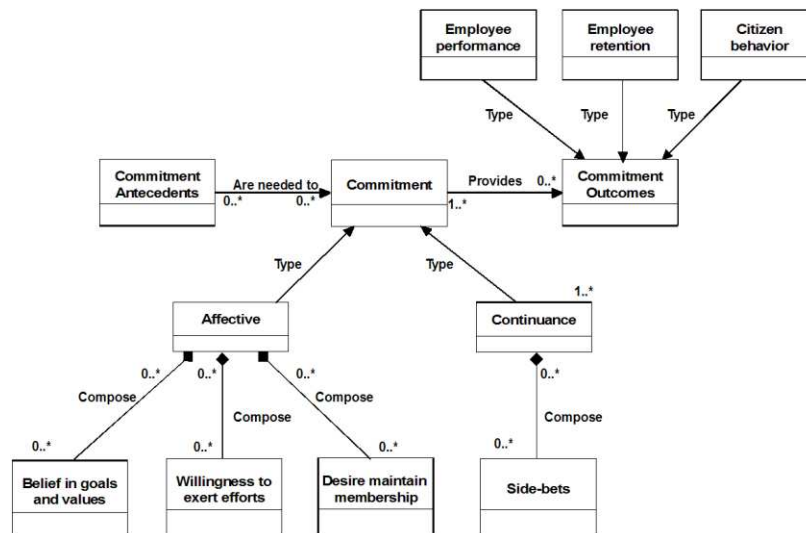
Figure. 6.: Commitment UML Diagram

Continuance commitment is the one defined by researchers such as Stebbins [32], Hrebiniak et al. [34]. This kind of commitment represents the fact that an employee doesn't want to leave the organization because of the loss of advantages gained by his seniority in the company and the alterations in side-bets. Many authors have proposed scales to measure continuance commitment: Mathieu et al. [37], Hackett et al. [38], Ritzer et al. [39], Meyer et al. [36], Hrebiniak et al. [34].

McGee et al. [40] have analyzed the continuance commitment from a psychological point of view and highlight the dichotomy of low alternative commitment when there exist few employment alternatives, and high

personal sacrifice when a decision has to made whether to leave or stay with a company.

Others commitments' perspectives exist like the normative commitment reflecting the employee's obligation feeling to remain in the organization [41], the internalization reflecting the value congruence between organization and employees [42] or the utilitarian component characterizing the give-and-take relationship between employee and the organization [30]. These types of commitment are not being represented in figure 6.

The analysis of the commitment is achieved based on the antecedents and on the outcomes as shown in figure 7.

Antecedents are the factors influencing the organizational commitment and upon which we can act or not to enhance this commitment. Antecedents may take many forms like the characteristics and experience that a person adds to the organization [31], the age of the employee and the period of the time he is with the organization [41] [43] [44]. The perception of the job security [45], the management culture and style [46], the employees' investments in time, money and effort [47].
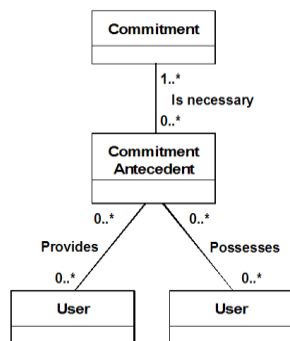
Figure 7.: Commitment Antecedents UML Diagram

2. Outcomes are the benefits resulting in the employee's commitment. Three main types of outcomes are distinguished from the existing surveys:

▪ The employees' performance [36]. Committed employees performed better because of their high expectations of their performance. Moreover, employees demonstrate a high level of performance when there are committed to both their organization and their profession.

▪ The retention of employee. Many studies have proved the link between the commitment and the employee turnover [48] [49] [36].

▪ The citizen behavior or extra-role behavior. The research over this outcome however remains inconclusive.
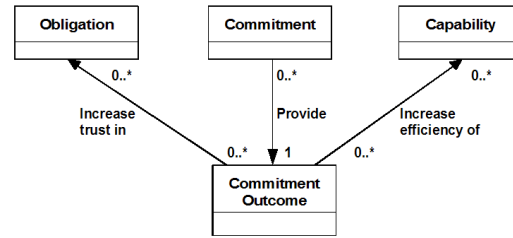
Figure 8. Commitment Outcome UML Diagram

As explained in figure 8, the outcomes of the commitment like the employees' performance could be associated as capabilities for others responsibility.

5. Conclusion

The current economic context and ongoing willingness to improve corporate and IT governance of companies advocate a strengthening of the definition and acceptation of rules governing a system's behavior. Simultaneously, we observe that the responsibility concept is central to these rules but remains poorly and in an unstructured way addressed within professional norms, standards and frameworks.

Consequently, this paper proposes an analysis of the mains concepts dealing with the notion of responsibility and defining an innovative responsibility model, which tends to integrate all of the meaningful analyzed concepts.

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