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ABSTRACT

The ongoing financial markets debacle and the global economic context advocate enhancing the governance of the companies and, de facto, improving the elaboration and the understanding of employees' responsibilities. Furthermore, the moral aspects of the business and the employees' commitment have appeared as becoming increasingly unavoidable to face emerging ethical challenges. These arising requirements have oriented our research toward the elaboration of an innovative responsibility model built on the concepts of obligation/accountability, right and commitment. This paper aims to present, validate and improve the responsibility model on the basis of a comparison to related concepts from the COBIT framework. In parallel to this improvement, proposals of conceptual modification of the COBIT framework are made and illustrated based on the RACI chart.

Categories and Subject Descriptors

K.6.1 [**Management of Computing and Information Systems**]: Project and People Management – *Staffing, Strategic information systems planning, Systems analysis and design, System development.*

General Terms

Management, Reliability, Security, Human Factors, Theory.

Keywords

Responsibility Model, IT Governance, IT Management, COBIT, RACI Chart, Business Ethic, Employee Commitment.

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 governance of Information Technology (IT) such as the control, the procurement of and the alignment with the business and the employees' engagement in more ethics, transparency, accountability and commitment. All of these domains are gathered under the Corporate Governance umbrella and are progressively integrated in standards and norms such as ISO/IEC 38500:2008 [1] that provides principles for the corporate governance of IT, SOX [2] that describes requirements and specific mandates for financial reporting or Basel II [3] that defines rigorous risk and capital management requirements for the banking sector.

In parallel to these newly arising and progressively formalized requirements for improving the *governance* of IT, companies are used to work with well-known experienced and approved *management* frameworks for their day-to-day operations, IT follow-up activities or investments. These frameworks mostly target a well-defined activity domain or a precise technology, and address the above listed governance's requirements through a very specific approach and well-defined areas, i.e. COBIT [4], a framework that enables the development of clear policies and good practice for IT control throughout enterprises, IT Infrastructure Library (ITIL) [5], a public library that focuses on IT services management for high-quality service provision, CIMOSA [6], an enterprise architecture model to define industrial computer system architecture or the international standard ISO/IEC 15504 [7] a framework for the assessment of software processes. All of them deal in one way or another with responsibility elements and 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 these models are consistently used for the elicitation of corporate rules and policies, it is obvious that defining a common responsibility model among them would quickly bring relevant benefits for the business. Moreover, assuming that these rules and polices most of the time formulate the behavior of a system [8] and of its employees, we deduce that having these responsibility suitably defined represents a paramount significance for the governance of companies.

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, a consensual and common understanding of its conceptual components does not exist.

Taking that into account, our research aspires to globally improve the IT governance mainly by advising a common responsibility model dedicated to industrial and scientific usage. This model of

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responsibility may later be used to refine the elicitation of pragmatic IT policies such as the access control one.

In this paper, we present the responsibility model and explain some of its most important components in section 2. The research method used to develop this model is a two steps approach. In step 1, we depict the scientific literature in the field of responsibility to identify its main conceptual components. In step 2, we elaborate a UML responsibility model based on the component found in step 1 and we operate successive refinements by comparing it with existing professional management framework.

Afterward, we introduce in section 3 the COBIT's responsibility elements through a synthetic UML diagram. Then we compare the responsibility model elaborated in section 2 with the responsibility constructs encompassed in that diagram and we advise on some COBIT enhancements according to the most significant responsibility concepts of our responsibility model in section 4.

Finally, in section 5 we illustrate the improvement by analyzing the COBIT' *Identify system owners' action of PO4 "Define the IT Processes, Organisation and Relationships*".

2. THE RESPONSIBILITY CONCEPT

The responsibility model (Figure 1) was elaborated through a double activity. First, the theoretical model was constructed based on the analysis of the responsibility conceptual components issued from social [19], managerial [8,16,19,22], psychological [18,24,26,27] and computer science [11,30,31] literature's incomes. Secondly, this theoretical model was enhanced and validated by confrontation with industrial frameworks. Simultaneously, improvements of these existing industrial frameworks were proposed by adjunction of conceptual components from the responsibility model they lack. I.e. [9,10,12].

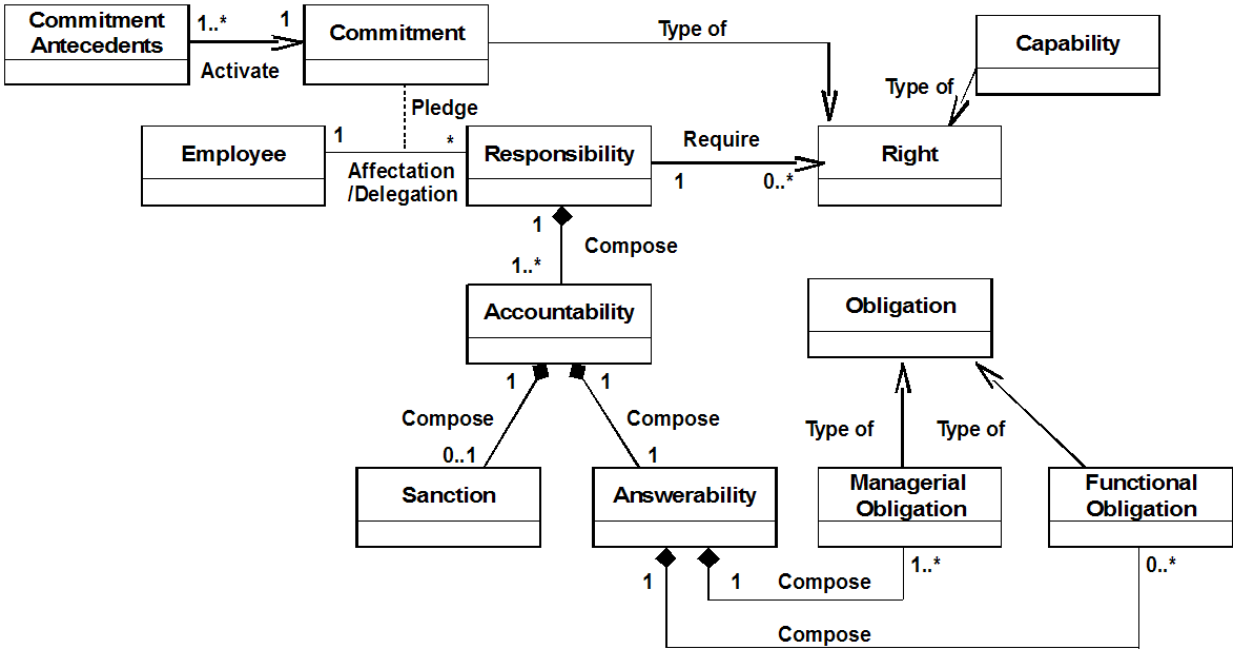

Figure 1. Responsibility Model UML Diagram.

The analysis of the responsibility concept [11,12] highlights that there is a plethora of definitions of it. We may however state that commonly accepted definitions of responsibility encompass the idea of having the obligation to ensure that something happens.

2.1 Concept of Obligation/Accountability

Obligation is the most frequent concept that appears in literature as well as in industrial and professional frameworks. Two types of obligation have been defined by Dobson [13]: functional obligation as what a role must do with respect to a state of affairs (e.g. execute an activity) and 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.

Accountability and *answerability* are closed concepts that are composed of one or several obligation(s) to report the achievement, maintenance or avoidance of some given state [36] to an authority. The difference between both concepts is that one accountability is composed of one answerability and zero or one sanction [13]. Stahl [14] argues 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 responsibility. He nuances the sanction as positive or negative. The *answerability* is defined by Cholvy as "an obligation or a moral

duty to report or explain the action or someone else's action to a given authority" [11]. There are other definitions of accountability. Laudon and Laudon [33] define this concept in the following way: "*Accountability is a feature of systems and social institutions: It means that mechanisms are in place to determine who took responsibility of actions"* with the following definition: "*responsibility has to do with tracing the causes of actions and events, of finding out who is answerable in a given situation*". For Goodpaster and Matthews [34] accountability is a mechanism' set allowing such tracing of causes, actions, and events whereas for Spinello [35], it is a necessary but not a sufficient responsibility condition.

2.2 Concept of right

The concept of *right* is common but is not systematically embedded in the frameworks. It encompasses facilities required by an employee to fulfil his accountabilities. These facilities could include, amongst others capabilities, authorities or the right to delegate.

Capability describes the possession of requisite qualities, skills or resources to perform an action. Capability is a component that is part of all models and methods [6,36,37], and is most frequently declined through definitions of access rights, authorizations or permissions [38,39].

Authority describes the power or right to give orders or makes decisions. This concept is introduced in CIMOSA [6] as the "power" to command and control other employees and to assign responsibilities. CIMOSA argues that responsible employees have rights over resource in the first place and over process, action and task in the second place. CIMOSA distinguishes resources from their capabilities: 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, performance, object oriented or operational).

Delegation right is a type of right to transfer some part of the responsibility to another employee that pledges commitment for it (Cf. section 2.3). This transfer may concern the transfer of right or of accountability or both. The delegation of an obligation may or may not be accompanied by the delegation of right to further delegate this same obligation [36]. This delegation of rights depends on the right's type (access to information, money, time…) and on the employee's status, function or position. This delegation may or may also include not the transfer of obligation as the obligation to be accountable [32].

2.3 Assignment/delegation process

Assignment is the action of linking an employee to a responsibility and *delegation process* is the transfer of an employee's responsibility assignment to another employee.

The *commitment* pledged by the employee related to that assignment or delegation process represents his moral engagement to fulfill the action and the assurance that he does it in respect of an ethical code. The commitment remains a virtual concept, difficult to define as well as to integrate in a strictly formalized framework. In [16], Meyer and Allen acknowledge that *"commitment should be conceptualized as a psychological state concerned with how people feel about their organizational engagements*". To bypass the integration difficulty, we propose to integrate in the model the components that enforce the commitment as an alternative solution. These components traditionally called "Commitment's antecedent" in the literature correspond to more pragmatic variables [17].

The antecedents may take many forms depending of the type of commitment. These forms are i.e. the characteristics and the experiences that a person brings to the organization [18], age of the employee and the time he is part of the organization [19,20,21], the perception of job security [22], management culture and style [23], the employee's investments in time, money and effort [24]. A scientific survey of the commitment also highlights that "Commitment outcomes" may really influence the quality and efficiency of the action achieved. Pfeffer in [25] explains that "*Employee commitment is argued to be critical to contemporary organizational success*". Following list summarized commitment outcomes:

- The employee performance [26]. Committed employees performed better because of their high expectations of their performance. Moreover, employees have a high level of performance when there are committed to both their organization and their profession.
- The retention of the employee. Many studies demonstrate the link between the commitment and the employee's turnover [24,26,27].
- The citizen behavior or extra-role behavior. The research over these outcomes remain however inconclusive [28].

Based upon the commitment outcomes and antecedent definition, we may assumed that being committed to the responsibility of an action means for an employee on the one hand an increasing of trust in the achievement of the obligation or in the accountability attached to the responsibility, and on the other hand more efficiency (and consequently more capabilities) for this employee to perform the action.

3. COBIT AND THE RESPONSIBILITY CONCEPT

COBIT Executive Overview [4] describes COBIT as follows:

> *COBIT is a framework and supporting tool set that allow managers to bridge the gap with respect to control requirements, technical issues and business risks, and communicate that level of control to employees. COBIT enables the development of clear policies and good practice for IT control throughout enterprises. COBIT is continuously kept up to date and harmonized with other standards and guidance. Hence, COBIT has become the integrator for IT good practices and the umbrella framework for IT governance that helps in understanding and managing the risks and benefits associated with IT. The process structure of COBIT and its high-level, business-oriented approach provide an end-to-end view of IT and the decisions to be made about IT*

COBIT addresses the responsibility of all roles played by employees involved in IT governance actions. The COBIT responsibility model is formalized through a RACI chart matrix attached to all 34 COBIT processes. RACI stands for Responsible, Accountable, Consulted and Informed and explains what the responsibilities of all employees are regarding the key activities performance. This COBIT responsibility model differs from the

responsibility model introduced in section 2. To make the difference between both clearer and to discuss it, we introduce a summarized representation of the COBIT responsibility model including its RACI chart on an UML diagram in Figure 2.

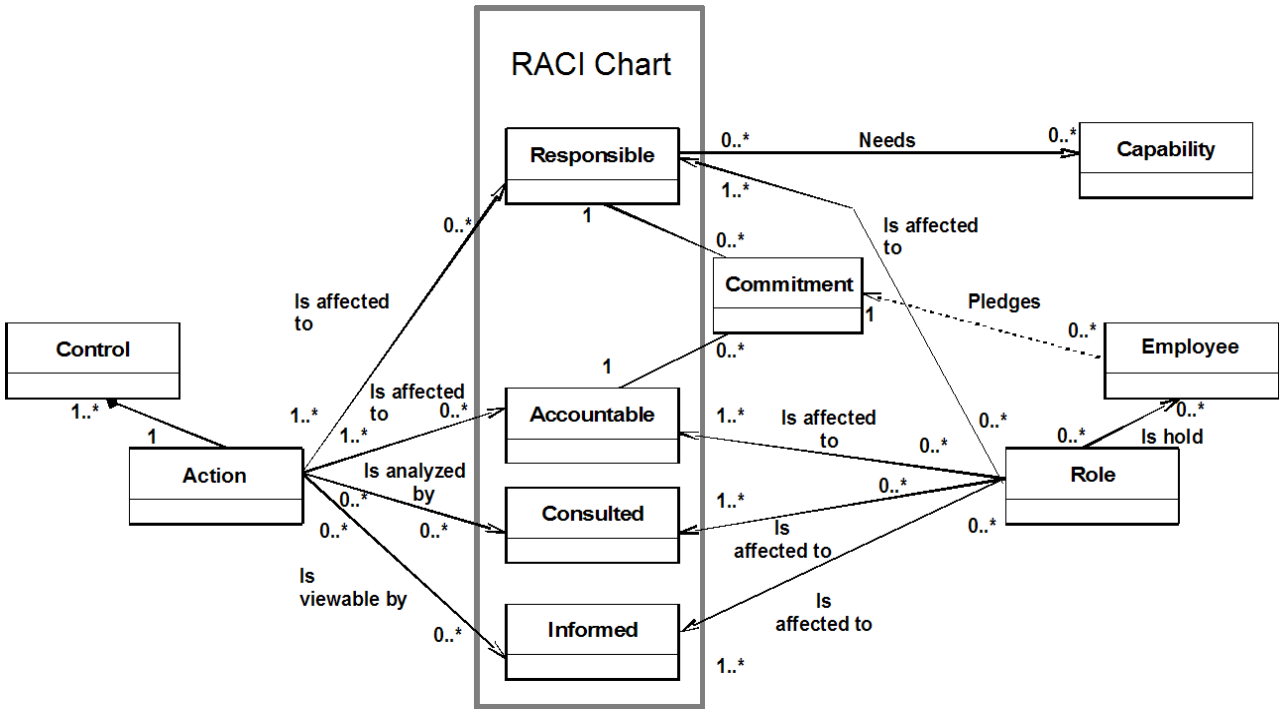

Figure 2. COBIT Responsibity UML Diagram

3.1 COBIT's Concept of Obligation/ Accountability

COBIT introduces the *obligation* of employees related to their responsibilities. I.e.: AI6 *Acquire and Implement Manage Changes requests the employee to "Set up formal change management procedures"* or DS11 *Deliver and Support Manage Data requests the implementation of physical security measures.* The meaning of the Cobit obligation is the same as the meaning of the obligation introduced in section 2

COBIT also addresses the *accountability*. Accountability and responsibility are both at the same conceptual level part of the RACI chart and consequently, represent both a type of obligation assignment/delegation process to an employee. COBIT defines the accountable as the employee who provides direction and authorizes an action whereas the responsible is the employee who gets the action done. COBIT definitions of responsibility and accountability are closed to the one provided in section 2 and 2.1. However, in our responsibility model, accountability is not at the same level as the responsibility but is a concept that composes the responsibility.

Moreover, it is also possible to understand some other differences and nuances between both concepts by analyzing how they are used in the framework:

- 1st input is the sentence that defines level 2 of the COBIT maturity model: "*An individual assumes his/her responsibility and is usually held accountable*". This sentence means that it is possible or not to be responsible and accountable at the same time.
- 2nd input is "*IT management has the resources and accountability needed to meet service level targets*" from DS1, Define and Manage Service level (Maturity Model level 5). This sentence means that accountability is also something that is possessed and as consequence, may be seen as rather a capability (or a right) than an accountability (or an obligation). As it appears this sentence presents the accountability as an authority [25] more than a duty to give account regarding an obligation.

As Fox [14] acknowledges, accountability is partially issued from transparency. By analyzing transparency concept in COBIT, it appears that it is an IT or process goal for about 11 of the COBIT controls. Transparency is however often attached to the understanding of IT costs and to the necessity of IT governance rather than to the individual responsibility.

The concepts of sanction and answerability do not appear in COBIT.

3.2 COBIT's Concept of right

Our responsibility model is composed of different types of *rights* like authority, capability or delegation. In COBIT, the concept of right does not really exist but capability, authority and delegation are addressed. Right only appears in the sense of access right like in DS5.3 "*Identity Management*" or in the sense of rights and obligations linked to a contractual engagement like i.e. in AI5.4 "*IT Resources Acquisition*".

The *capability* concept is defined in the framework as: "*Having the needed attributes to perform or accomplish* […]". Globally,

capability is an important concept integrated in COBIT and is related to a process or to an employees' responsibility.

From the process perspective, the performance of a process is measured based on what the process has to deliver (process outcomes), on how it delivers it (process capability) and on how much it is applied (its coverage). The understanding of this process capability is different from the capability addressed in our responsibility model. The COBIT maturity model is derived from CMMI [29] and is interpreted for IT management processes. For instance: "*To respond to the business requirements for IT, the enterprise needs to invest in the resources required to create an adequate technical capability (e.g., an enterprise resource planning [ERP] system) to support a business capability (e.g., implementing a supply chain) resulting in the desired outcome (e.g., increased sales and financial benefits).*"

From the employee perspective, COBIT addresses the capability like it appears in the responsibility model introduced in section 2: capability is linked to an employee and is necessary for him to perform an action. I.e.:

1. ME1.5 Board and Executive Reporting: "Provide management reports for senior management's review of the organization's progress toward identified goals, […]." In this case the management report is one capability necessary for the senior management's review.

2. AI4.2 Knowledge Transfer to Business Management: "Transfer knowledge to business management to allow them to take ownership of the system and data and exercise responsibility for service delivery and quality, internal control, and application administration processes[…]" In this case the knowledge is one capability necessary for the business management.

Authority is not explicitly defined in COBIT but some sentences say that this concept may be perceived as a type of capability. I.e. in the COBIT glossary, the accountability refers to the person or group who has the authority to approve or accept the execution of an action. It may consequently be seen as a type of right to approved or accept an action. Moreover, authority is something provided to the person that is responsible. I.e. the action « Assigning sufficient authority to the problem manager" in DS10 "Deliver and Support"

Delegation exists in COBIT and this concept is presented in next section.

3.3 COBIT's Assignment/delegation process

Assignment as it appears on Figure 1 exists punctually and in COBIT it is named allocation of responsibility. Due to the miss of definition of allocation in the framework, this concept refers indifferently to many meanings like i.e. in the attribute of the level 1 of the maturity model of PO5 "*Manage the IT Investment*" where it corresponds to a type of capability necessary to perform the management of IT actions rather than an assignment of responsibility to an employee. Others types of allocations exist like i.e. the allocation of resources addressed in some section like in DS3.4 IT Resources Availability of DS3 "*Manage Performance and Capacity*" or the allocation of capability that exists punctually like i.e. the budget allocation attribute of level 4 of the maturity model of DS12 "*Manage the Physical Environment*".

Delegation process exists in COBIT but it is not clear how different it is from allocation. According to what as been found in COBIT, delegation concerned the delegation of responsibility like in level 4 attribute of the maturity model of PO6 "*Communicate Management Aims and Direction*" or the delegation of authority like in PO1.6 "*IT Portfolio Management*".

As highlighted in the responsibility model, *commitment* is an important concept related to the delegation/assignment process. Commitment appears in a number of controls of COBIT but it is not dully defined. I.e.:

- In ME3, the responsibility requirement for being at level 4 is that employees are mindful of their compliance obligations and that their responsibilities are clearly understood. This information is interesting in that it adds a new contribution to the responsibility model that is the understanding of the obligation. This contribution could be associated to a commitment antecedent that contributes to foster the definition of the responsibility and consequently improves the job description and the employee's commitment antecedents.
- In PO6 *Communicate Management Aims and Direction:* The sentence "*A positive, proactive information control environment, including a commitment to quality and IT security awareness, is established*" defines the characteristics of level 4 of the maturity model of this control.
- In PO10 *Manage Project*, the PO10.4 Control Objective is "*Employee Commitment: "Obtain commitment and participation from the affected employees in the definition and execution of the project within the context of the overall IT-enabled investment programme*". Obtaining commitment according to section 2 could be interpreted by "activating" commitment antecedents for the employees involved in that control. The issue of that activation is a set of commitment outcomes necessary for the project management.
- As explained in section 3, "*responsibility and accountability are defined and accepted*" from level 3 and 4 of the Maturity Model. This notion of acceptance is interesting because it introduces a commitment of employees regarding their assignment

Although the commitment concept exists in the framework, it appears selective and is explicitly required only for project management control where it is necessary that employees affected in the definition and execution of the project were committed.

4. ENHANCEMENT OF THE COBIT RACI CHART

As explained in previous sections, the current representation of responsibility in the COBIT framework may be enhanced regarding the 3 elements that composed the responsibility model introduced in section 2:

1. The right is an important concept in order to achieve an action or a COBIT control but it is not automatically dully expressed and it is often linked to the global control (like i.e. the process input) rather than to responsibility of a precise action itself.

2. The obligation is spread over all the responsibilities and the accountability is in the RACI chart at the same conceptual level as responsibility. This lack of differentiation between the concepts could lead to misinterpretation such as: "you could be responsible without being accountable". That means whatever you do, there are no consequences for you. At the opposite: "you could be accountable without being responsible". In this sense, it means you might be accountable of something that you are not responsible for.

3. The commitment appears sporadically for some controls and in a global way regarding the engagement of some specific employees. However, it is not adapted specifically for each action. This issue suggests that the commitment is perceived as an organizational commitment rather than as a personal commitment that has to exist for each "action – employee" assignment/delegation process.

Based upon these statements, the RACI responsibility model could be improved by the following way (Figure 3):

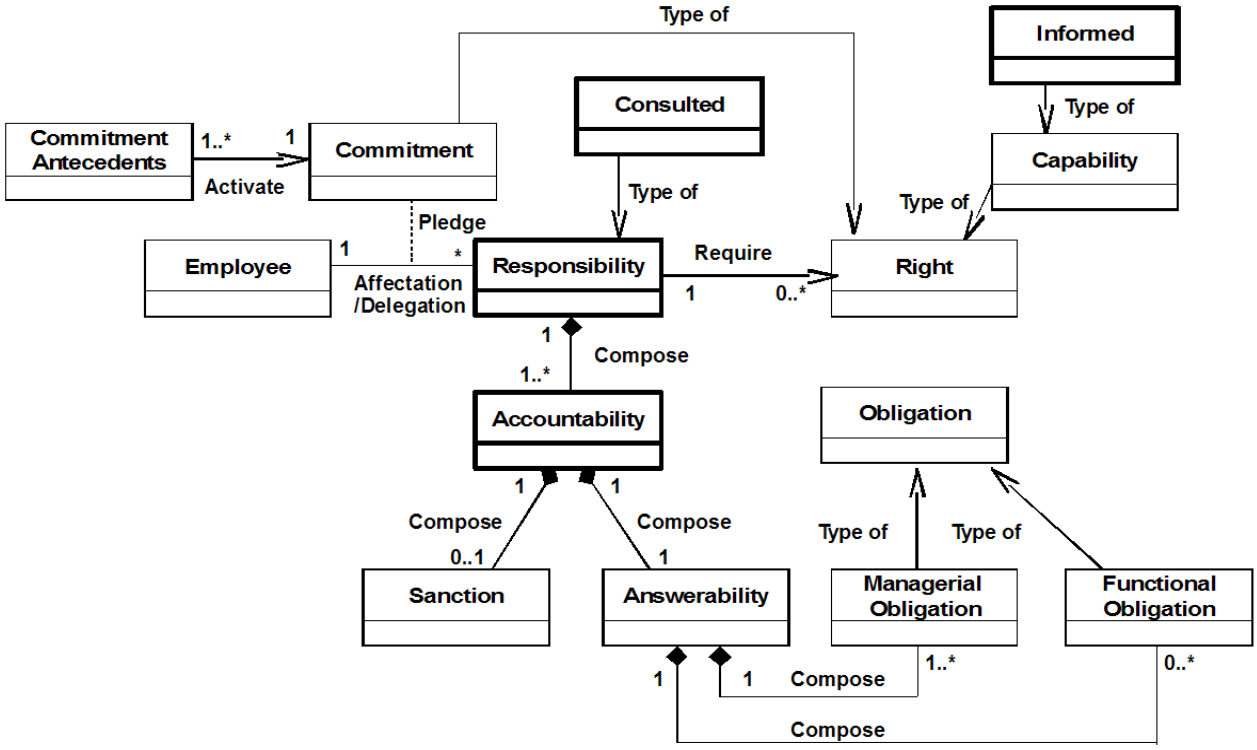

Figure 3. Enhanced COBIT Responsibity Model

- The obligation, right, capability and commitment are systematically integrated as components of responsibility.
- The accountability is no more perceived as an attribute that links an employee to an action and that is on the same level as the responsibility but as a component that composes this responsibility.
- The informed component of the RACI chart is no more perceived as a type of allocation/assignment of "role – action" but as a type of right for responsibility.
- The consulted component of the RACI chart is no more seen as a type of allocation/delegation of "role – action" but as a type of responsibility.

5. COBIT RACI CHART CASE STUDY

To illustrate the proposed improvement of the COBIT responsibility model, the *Identify system owner's action* of PO4 *"Define the IT Processes, Organisation and Relationships*" is analyzed. The RACI chart that concerns this action is represented in Table 1.

Table 1: COBIT RACI Chart of Identity system owners

Activity ↓ Function →	CFO	Business Executive	CIO	Business Process Owner	Head Operation	Chief Architect	Head Development	Head It Administration	PMO	Compliance, Audit, Risk and Security
Identify System Owners	**C**	**C**	**A**	**C**	**R**	**I**	**I**	**I**	**I**	**I**

Following that RACI chart: The Head Operation (HO) is responsible; he gets the action done whereas he is not accountable for it. The CIO is accountable; based on the explanation of the accountability in section 3.1, he is answerable to the action and is sanctioned according to the result. In parallel, the HO is responsible but does not have to justify the achievement of the action.

Based on our model, the function of the CIO and of the HO could be clarified: the CIO could have managerial obligations like provisioning the HO with the necessary right to achieve the action, controlling the work of the HO, delegating this action if requested, etc. The HO has Functional Obligations like collecting information on the system, understanding how it is used and affecting responsibilities to subalterns. Based upon the identification of this dual responsibility, we may clarify the concept of accountability: CIO is accountable for i.e. having provided the rights to the HO and the HO is accountable for i.e. having affected responsibilities to subalterns.

The RACI Chart highlights that CFO, Business Executive and Business Process Owner are consulted. According to our model, Consult is a type of responsibility and consequently may be defined based on the corresponding concepts that are right/capability, obligation/accountability and commitment. Indeed, to provide the required information, the employee who is consulted needs to have some rights like: access to some information or the right to provide information if it is confidential information. He also has the obligation to provide clear and accurate data and is accountable for that. This last point means that he is answerable and is subject to sanction if the information that he has provided following the consultation is wrong. Moreover, when an employee is affected as a consulted employee, he has to be committed to this responsibility and must consequently have commitment antecedents activated.

Finally, RACI Chart designs five peoples informed of the action. Being informed may not be associated to a responsibility in that it is impossible to be accountable or committed to that. Inform or getting information on the achievement of an action is rather to be considered as a type of right for responsibility. Indeed, in the following case study the employee responsible for the Compliance, Audit, Risk and Security needs to be informed of the output of the action to performed others actions he is responsible for like i.e. preparing the list of auditable employees for assessing system performance.

Additionally, right is formulated for the control in a whole rather than to a particular action or for a particular responsibility. That means in our case study that, if we consider the *control input* of the PO4 control as rights necessary to achieve the actions of the control, these rights are automatically provided to every employees engaged in the control without distinguishing the action they perform. I.e.: The 10 functions identified in the RACI chart of the Action « *Identify system owners* » have indifferent access to all inputs of the control. These rules are in opposition to other security rules like the minimum privilege [30] and separation of duties [31].

Concerning the action *Identify system owners* again, ten people at least are involved but only one could be held accountable for the results. Our model proposed a solution to dispatch the accountability to all employees who assume responsibilities.

We finally propose to manage the commitment of all employees when responsibilities are affected or delegated.

6. CONCLUSIONS

Current economic context and ongoing willingness to improve corporate and IT governance of enterprise advocate a strengthening of the definition and acceptation of rules that govern the behavior of a system. Simultaneously, we observe that the responsibility concept is central to these rules but remains whatever moderately and in an unstructured way addressed to professional norms, standards and frameworks.

Consequently, this paper proposes an analysis of the main concepts that compose the concept of responsibility and defines an innovative responsibility model that tends to integrate all of the meaningful analyzed concepts.

The responsibility model is afterwards validated by comparison with the COBIT RACI chart and some improvements are proposed and justified to enhanced the perception of responsibility in this framework: Systematic integration of *obligation*, *right* and *commitment* as responsibility components, *accountability* is a component related to obligation and *informed* a type of right, *consulted* is a type of responsibility and inherits of its properties.

Finally, the *Identify system owners action* of PO4 "*Define the IT Processes, Organisation and Relationships*" is analyzed to illustrate the added value of our proposition in a real context.

7. ACKNOWLEDGMENTS

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