# A FRAMEWORK FOR ANALYSING IT GOVERNANCE APPROACHES

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Abstract: Information systems (IS) have a role of information processing and service providing for business activities. Moreover, the latter take place in an evolving environment and it becomes more and more crucial to measure the effectiveness and the efficiency of the IS as a support of the enterprise activities and strategies. The purpose of the corporate governance and the information technology governance (ITG) is to ensure that enterprise strategy is properly implemented. The ITG can thus facilitate the anticipation of the required evolutions of the IS. In this paper, we propose a framework for analysing and positioning ITG approaches often referenced in the literature.

## 1 INTRODUCTION

The *corporate governance* is a mechanism which controls that the company strategy is well applied to the ground. By distributing the decisional rights and by defining objectives of control, it directs also the decisions of the managers. That results mainly in the implementation of vertical flows of information (or decisional flows). This type of governance is oriented by external actors like shareholders.

*ITG* must achieve goals resulting from corporate governance. Support activities are organised into an iterative process which aims at defining the objectives of IT activities, making the decisions, scheduling IT activities, controlling and measuring the implication of the decisions and the activities on objectives achievement. A general definition for IT governance is given in (Van Grembergen, 2002): "IT Governance is the organisational capacity exercised by the Board, Executive Management and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT".

In this paper we propose a framework for analysing some well known ITG approaches. This paper is organised as follow. Section 2 presents some approaches related to IT governance. In section 3, we propose a framework for analysing and comparing the presented approaches.

## 2 RELATED WORKS

This section briefly presents some approaches and tools which aim to support ITG. We identified five IT related domains impacted by these approaches: (i) IT management, (ii) process improvement, (iii) controlling and measuring IT services, (iv) change and flexibility, and (v) maturity of development processes.

### 2.1 IT Management

From manager's point of view, the governance is about decision making support. Balanced Scorecard (BSC) (Kaplan and Norton, 1996) is a methodology helping managers to formalise their scorecard. It suggests building a scorecard using four analysing axes: (i) the financial perspective, (ii) the customer perspective, (iii) the business process perspective and (iv) the learning and growth perspective. Each axe allows to the manager to identify the appropriate indicators. We can add other axes to structure specific scorecard for ITG (AFAI and CIGREF, 2006).

The synthesis of governance practices in companies, provided in (Weill, 2004), allowed us to identify some decisions that IT managers have to take. This work identifies taxonomy of governance and exposes a typology of decisions. In this context, decision-making is an intellectual activity performed



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by a human agent, or a group of human agents. It consists of identifying a problem in a particular context generally in order to face a changing situation and to find a solution by selecting among several choices.

(Kaplan and Norton, 1996) and (Weill, 2004) provide a support for IT management activities by describing the decisional context and by proposing a method to formalise scoreboards.

## 2.2 Process Improvement

Process improvement was a main goal for industry in the 80' in order to decrease waste or product defects. Motorola used for the first time Six Sigma in the 80' when American companies where under competition from Japanese industry. Today, Six Sigma (Biehl, 2004) approach is more and more applied for IS engineering.

Six Sigma is a statically based technique which is focalised on satisfying customer needs. It is process oriented and allows a leadership based on metrics. Processes are considered as supports to the customer satisfaction. In order to attain this goal, Six Sigma proposes five steps: "Define", "Measure", "Analyse", "Improve" and "Control" (DMAIC). It is an iterative and continuous process of improvement which leads engineers to manage quality projects, to measure and to improve the process performance.

The main effect of process improvement is to increase the process capability.

## 2.3 Measuring IT Services

A scope for ITG is to control if the decisions related to the IT management are linked to a strategic goal of the enterprise. Moreover, the degree of completeness for IT strategic objectives must be measured and, the implications of IT activities on the enterprise strategies should be analysed. COBIT (Control Objectives for Business and Related Technology) (AFAI and ITGI, 2002) and ITIL (IT Infrastructure Library) (Violino, 2005) make explicitly the link between enterprise objectives and IT process performance measures.

ITIL provides a set of best practices on IT processes. It deals with quality of services and describes bases for the standardisation of IT processes in companies. ITIL describes the context of service providing: what are the support or hardware, the tools and software used and the documentation linked to them? The limitation of ITIL is raised on the fact that it does not provide a framework for the improvement of the quality of services (Niessink and Van Vliet, 1998).

CoBIT is more focalised on the control of activities and more dedicated to business managers: it allows them to define control objectives and indicators in conformity of a three-dimensional perception including (i) quality of data, (ii) processes, and (iii) IT resources. CoBIT can help an organisation to align the use of IT with its business goals (Ridley et al., 2004) and to decrease IT risks to an acceptable level. CoBIT organises processes into four domains: planning and organisation, acquisition and implementation, delivery and support, and monitoring.

ITIL and COBIT can be considered as complementary frameworks. Recent works establish links between IT frameworks: (Santana Tapia, 2006) argues for using COBIT maturity model to evaluate the maturity of processes deployed in the context of ITIL.

## 2.4 Change and Flexibility

ITG is a set of organised activities to control if decisions related to IT are properly applied. Effects of the decisions should be measured in order to evaluate their applicativeness and appropriativeness in the implementation of the change. The "Enterprise Knowledge Development: Change Management Method" (EKD-CMM) (Barrios and Nurcan, 2004) provides (i) an intention driven IS engineering model allowing to describe the company strategy; (ii) a linkage between business processes and strategic objectives through out top-down, bottom-up or mixed approaches. The main advantage resides, in fact, in the capability of the method to support an enterprise context of change and to keep IT support aligned with business objectives.

(Hammami-Abid and Elidrissi, 2004) identifies implications of IT governance in the way of aligning IT with business objectives and argues for context anticipation by ensuring BP flexibility. Authors identify four ideas associated with ITG: (i) knowledge anticipation, (ii) leadership or the capacity to take IT decisions, (iii) reaction based on a set of indicators and measurements, and (iv) BPs as support for value creation.

These two approaches allow enterprises to handle change. EKD-CMM supports the change process by using specific models (Nurcan et al., 1999) and, through documentation, allows anticipation (Hammami-Abid and Elidrissi, 2004).

## 2.5 Maturity of Development Processes

Development processes are crucial because their products are the architectures of the enterprise information systems. The maturity of the development process can be measured. In this way, a set of metrics describing the IT context is a

prerequisite. Capability Maturity Model Integration (CMMI) is a model developed by the Software Engineering Institute (SEI) in order to evaluate the maturity level of the software development processes. CMMI is composed of a set of models for various activities in the company. CMMI for system engineering and software engineering (SEI, 2001) proposes a set of development processes organised by key sectors which are representative for a business activity. Each key sector has its own specific goals and generic goals. For each goal, a set of best practices is provided. CMMI proposes two models for software engineering processes evaluation: the continuous evaluation and the stage evaluation. The first is mainly dedicated to small or medium organisations which can easily identify their key sectors and the second is more appropriate for wild structures like international groups.

CMMI allows analysing four types of processes decomposed by 24 processes which are evaluated through levels of maturity depending on the selected type of evaluation.

# 3 A FRAMEWORK FOR IT GOVERNANCE AND ANALYSIS

This section presents the framework we built for analysing IT engineering/management approaches on particular pertinent aspects linked with ITG. We use this framework to compare eight approaches.

## 3.1 The "Four-worlds" Framework

The four-worlds framework was proposed for understanding several IT related engineering disciplines: information systems engineering (Jarke et al., 1992), requirements engineering (Jarke and Pohl, 1993), process engineering (Rolland, 1998) and change engineering (Nurcan and Rolland, 2003). Let us remind that for each discipline, facets and attributes of the framework should be contextually defined. We believe that this framework can also help in understanding the field of ITG. This comprehension is a prerequisite for providing IS engineering methods aiming to anticipate ITG.

### 3.1.1 General Overview

The framework provides four analysis views called also worlds. The subject world contains the reality of ITG and is an answer to the question '*what* is ITG?'. The usage world is linked with users objectives and justifies '*why* using ITG?'. The development world contains engineering processes allowing to develop an IS which is able to support ITG. The objective of the development world is to describe the way to deploy ITG and it is led by the question '*how* to deploy ITG?'. The system world describes the content of the IS, the elements used to represent the subject world: '*through which*' support to communicate about ITG?'.

Each world is described using facets. A facet is representative of a particular aspect of ITG. We use valuable attributes to characterise a facet. Thus a world is composed by a set of facets. An attribute is defined on a domain of value. A domain can be of several types: a predefined type (integer, real, boolean...), an enumerated type (ENUM {a, b, c}), or a set (SET (a; b; c)). In this section we represent "facets" with quotes, ATTRIBUTES are in capital letters and *values* are in italic. In the following when the facet has a unique attribute, the latter is considered having the same name than the facet and is not reminded explicitly.

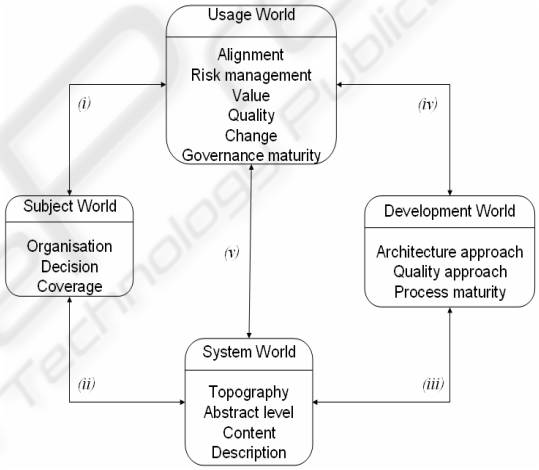


Figure 1: Framework overview.

The four worlds are interlinked in a particular way as shown in Figure 1: (*i*) the subject world generates some objectives for the usage world, (*ii*) the system world is a way to represent the reality or the subject world, (*iii*) the system world is built by the engineering processes described in the development world, (*iv*) the development world is a way to attain objectives for the usage world, finally (*v*) the system world is used to support the stakeholders objectives specified in the usage world.

### 3.1.2 Subject World

The subject world is described through three facets. (Weill, 2004) allowed us to identify the "decision" and "organisation" facets. IT managers have to make decisions in various domains: *IT architecture*, *IT infrastructure*, *requirements*, *finance* and *project scheduling*. These decisions are mainly focalised on

a financial aspect. IT decisions, when they are made, have to be accepted by all stakeholders. "Organisation" facet represents the enterprise context for decision-making and delegation (*centralised*, *decentralised* or *hybrid*). The "coverage" facet is representative of the main enterprise objective in deploying ITG. *Internal* ITG is seen as a way to manage IT to ensure a support for business processes. *External* ITG is a support to ensure shareholders and the directorate that IT decisions are in conformity with their own objectives.

### 3.1.3 Usage World

The usage world is composed of six facets representing main goals in using IS. IT managers have to keep IT "aligned" with enterprise objectives (Henderson and Venkatraman, 1993) in a particular "risk management" context. Alignment can be performed by *strategic integration* or *functional integration*. Risks can be *transferred* to an external entity, *accepted* or *refused*. Decisions are taken to ensure that IT creates "values" through services provided to the *organisation* or to *external actors* (e.g.: customers, shareholders, providers). The "Quality" facet is representative of the *IT usability*, *efficiency*, *efficacy* and *degree of goal completion* (Tricot and Tricot, 2000). The 'Change' facet characterises ORIENTATION and CYCLE of change (Rolland, 1998). ORIENTATION can be *horizontal* or *vertical* and the CYCLE of change can be *radical* or *continuous*. The "maturity of IT governance" can be also an essential goal for managers (AFAI and CIGREF, 2006). Maturity is performed by instantiating a maturity model describing LEVEL (integer) and associated OBJECTIVES which is an enumeration of enterprise *objectives*.

### 3.1.4 Development World

The development world is composed of three facets. The "architecture approach" is representative of the way of modelling the enterprise knowledge using *strategic modelling*, *cartography* or being guided by the target *IS* (Longépé, 2004). Here, the "quality approach" facet is not linked with information system characteristics but with the quality management methodology in use. We identified two types of quality approaches: (i) *continuous* improvement where goal definition and measures creation anticipate the future states of the enterprise and goal redefinition, (ii) the *factual* approach where data analysis is required for decision-making. Enterprises are more and more concerned by "development process maturity": they use maturity models like CMMI which presents the maturity LEVEL (integer) and their associated OBJECTIVES (list of *objectives*).

### 3.1.5 System World

The system world is composed of four facets. The "topography" facet is used to characterise the IT deployment in the organisation. The topography can be *centralised*, *distributed* or *hybrid* depending on the "organisation" of the decision process (§ 3.1.2). The "abstract level" is based on the plan theory in the way that a plan can generate other more 'specific' ones (Rolland, 1998). We can suppose the existence of infinity of levels but we limit them, in this framework, to three: *meta-model*, *model* and *instance*. The "content" facet describes concepts that the system offers in order to support ITG: *goal*, *process*, *service*, *decision* and *indicator*. The "description" facet is representative of the way to represent concepts and is related to the attributes FORM and NOTATION used to describe them. The notation can be *formal*, *semi-formal* or *informal*. Concepts can be represented through *diagrams*, *text* or *ontology*.

## 3.2 Discussion and Analysis

We have chosen to formalise a framework to analyse the implication of ITG approaches on the IT engineering methods because, in our knowledge, the literature does not provide this kind of study does not exist. We built our framework by defining ITG related properties. Improvements can be made for scaling this framework to literature analysis for other research questions related to ITG. We measured the pertinence of each approach on a particular aspect of ITG (i.e. facets we defined for this purpose). Here, we evaluate this pertinence for each world on a scale of ten points (see Formula 1 and Table 1). Marks ($N$) are proportional to the number of facets used to evaluate an approach ($f_n$) in comparison to the number of facets on the concerned world ($f_w$). A high mark on a specific world, for a given approach, indicates that this approach can be significantly analysed and compared to other approaches through the facets of this world. EKD-CMM which is an 'enterprise architecture and IS' engineering approach, is less perceived by the framework than the others. This shows us that EKD-CMM, as enterprise knowledge and IS engineering approach, does not integrate well IT governance concepts. Our research aims to improve IS engineering methods in order to deal with the ITG requirements. In this context, the evaluation can help us in selecting the ITG approaches which will be used to improve IT engineering methods.

$$N = 10 . \frac{f_n}{f_w} \quad (1)$$

Table 1: Evaluation of approaches.

| | Subject | Usage | Develop-ment | System |
|---|---|---|---|---|
| **(Weill, 2004)** | 10.00 | 5.00 | 3.33 | 10.00 |
| **BSC** | 6.67 | 8.33 | 6.67 | 7.50 |
| **Six Sigma** | 10.00 | 6.67 | 6.67 | 10.00 |
| **ITIL** | 6.67 | 8.33 | 6.67 | 7.50 |
| **COBIT** | 6.67 | 10.00 | 10.00 | 10.00 |
| **EKD-CMM** | 6.67 | 5.00 | 3.33 | 10.00 |
| **(Hammami-Abid, 2004)** | 6.67 | 6.67 | 3.33 | 7.50 |
| **CMMI** | 6.67 | 8.33 | 10.00 | 10.00 |

# 4 CONCLUSIONS

Our study considers, and situates the contributions of IT governance approaches. This work provides a step in the comprehension and in the appropriation of IT governance requirements. The comprehension of these contributions anticipates our research whose objective is to work out an engineering method allowing us to build "governable" information systems.

We aim (i) to improve our knowledge and experience on method engineering in order to develop ITG related method chunks which could be integrated in existing IS engineering methods and (ii) as a first case study, to extend EKD-CMM in order to anticipate the ITG requirements for an IS under development.

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