Personnel performance appraisal coverage in ITIL, COBIT and CMMi: a study from the perspective of People-CMM

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Abstract: Human capital is of paramount importance in the ICT industry. This paper analyses one of the elements which underlies effective management of human assets: performance assessment. This analysis is carried out using the development of a common standard based on the tasks and processes outlined in People CMM, the standard in human resource management designed by Software Engineering Institute. This framework is evaluated in different models related to IT Governance, such as COBIT, ITIL other related IT practices such as CMMI for Development, CMMI for Acquisition, and CMMi-SVC. The results indicate that COBIT is the only framework that presents reliable coverage in relation to personnel performance assessment.

Keywords: Performance Appraisal, People-CMM, COBIT, CMMi, ITIL.

1. Introduction

Human capital is key for the knowledge society. The advancement in techniques for personnel development has enabled the application of practices and processes which foster training and learning, improving the performance of individuals and groups. Studies of human capital (for example, Schultz, 1959; Becker, 1964; Mincer, 1974) indicate that this asset is sustained in knowledge, and that this element provides individuals with increases in their cognitive abilities, leading to more productive and efficient potential activity. Drucker (1998) stated that knowledge is the most significant economic resource of a post-capitalist society. Thus, according to Bakry and Alfantookh (2010), building the knowledge culture is of increasing importance, not only because of its role in providing sound knowledge management and effective knowledge-based economic development, but also because of its support to environment protection, intercultural harmony and human well-being.

In this scenario, Knowledge Intensive Organizations (KOI) are, according to Starbuck (1992), those organizations in which "knowledge plays a more important role than any other of the inputs to an organization". In this environment, KOI, in which IT-related organizations are included, according to Hurley & Green (2005) require effective measurement techniques for the development of their employees, both from the perspective of knowledge as well as competency elements (aptitudes, attitudes...). Human capital is particularly critical for competitiveness in high-tech sectors (Bartelsman et al., 2004). According to López-Fernández, Martín-Alcázar and Romero-Fernández (2010), IT human resources are gaining importance in an environment more and more competitive and changeable. This circumstance has obliged an increase in the

importance of human capital in general and its evaluation, in particular in different environments focused on the governing and management of ICT. In order to accurately analyze such elements, the current paper proposes a structured reflection of this research field, comparing the practices proposed in the state of the art with those models implemented in the ICT field. To include a more refined analysis, this paper outlines some recommendations for the inclusion of such practices in different models. Given that, according to Ruiz-Larrocha et al. (2011), IT standards (like ISO 27001, ITIL and COBIT) are available to assist organizations implement the appropriate programmes and controls to mitigate risks, knowing to what extent these standards covers performance appraisal could be helpful for managers and practitioners alike.

The remainder of the paper is organized as follows. The next section defines the state of the art about people assessment methods, as well as its components and principal implications. This is followed by the description evaluation framework. Subsequently, several ICT related initiatives are analyzed using the evaluation framework. Lastly, the paper presents the principal conclusions and future work of the study.

2. State of the art

IT workers professional practice must be continually revised and improved in order to adapt workers' competences to technical innovations and soft skills to evolving markets (Casado-Lumbreras et al., 2009). Thus, in all industries, but more in particular in IT, one of the leading activities for managers is to discover to what degree workers are competent. In this scenario, the performance appraisal of human resources has been explored both from a theoretical and applied viewpoint.

The use of rating scales in performance evaluations is deeply rooted in the history of personnel psychology (Landy & Farr, 1980). However, performance appraisal is a delicate issue (Myloni, Harzing, Mirza, 2004). Cole (2001, p. 798) defines performance appraisal as a formalized, systematic assessment and discussion of an employee's performance and his/her potential and desire for development and training. In plain words, according to Chilton & Hardgrave (2004) performance is a term that is often used to refer to the degree to which an employee has executed his or her assigned duties. Appraisal practices often include formal review and feedback sessions, and may include procedures for establishing work objectives, conducting self-appraisals, and setting performance goals (Thurston & McNall, 2010). There are three approaches a manager can take in evaluating an individual employee: (1) effectiveness and productivity; (2) evaluation of traits; and (3) evaluation of behaviors (Latham & Wexley, 1977).

According to Curtis, Hefley & Miller (2009), the role of performance appraisal as a part of performance management is primarily to record the results of performance for use as input to decisions about adjustments to compensation, personal development planning, staffing, promotion, and other workforce activities. In this way, performance appraisal is the central point for the collection of data which underlie decisions regarding the competency of human assets in their activities, requiring, on the one hand, the definition of the elements for comparison with established performance standards, and on the other hand, mechanisms put into place for the storage and exploitation of performance information.

On the other hand, poor management of human factors can hinder the use and effectiveness of technology and Information Systems (Ives & Olsen, 1984; Willcocks & Mason, 1988). Examining this aspect even further, performance management has been cited as a common cause of IS failure (Eastman, 1991; Legge, 1989; Seilheimer, 1987). According to Ball and Harris (1982) Information Systems personnel evaluation is the second most critical issue of IS management. Perhaps for this reason, the literature has discussed the difficulty of developing software systems and evaluating IT personnel in the organization for more than 40 years (Boyd et

al., 2007). The different goals of the stakeholders lead to different courses of action and conflicting perspectives of this personnel performance (Linberg, 1999), the differences between the perception of the success of IT staff and the success of the standard user being one of the principal sources of disagreement, as exhibited by the evaluation (Jiang et al., 2001).

In this study domain, in one of the earliest studies of IT personnel performance, Arvey and Hoyle (1974) developed a behavioral expectation scale to measure the performance of systems analysts and programmers. Subsequent to this work, contributions by many other authors were made for the construction of a method of performance management (for example, Igbaria & Wormley (1992); Jiang, Sobol & Klein 2000; Chilton & Hardgrave, 2004). The applications of the performance measures proposed are focused on distinct objectives, such as the comparison of performance between contract versus permanent workers (Ang & Slauter, 2001), fit between individual characteristics and job characteristics (Ketler and Smith, 1993), assignment of personnel in software projects (Acuña & Juristo, 2004; Acuña et al., 2006), to cite some of the most significant cases. Concerning the elements which have been examined in order to achieve an effective evaluation, intensive debates have also emerged among the scientific community regarding the elements for performance evaluation. In a recent significant contribution, based upon a literature review, Boyd et al. (2007) found seven important performance dimensions for IT Professionals: (1) work quality, (2) project work, (3) general tasks, (4) interpersonal quality, (5) dependability, (6) teamwork and leadership, and (7) career related training.

Independently of the evaluation method and the items evaluated, due to the importance of performance appraisal, the authors considered it interesting to determine the level of support which is given to this management tool in the various ICT maturity and governance initiatives. The sections which follow provide a response to this research question.

3. Elements for the analysis.

Prior to realizing the analysis of the evaluation of performance of different frameworks, a reference standard for the management of human capital and a diagnostic element which permits the analysis of the distinct models from a common perspective should be established.

The reference standard in the management of human capital selected was the People Capability Maturity Model (P-CMM). P-CMM is a model of maturity and capacities based on 17 key process areas for the management of human capital in software development organizations, however, it can also be applied to organizations in other industry sectors (Curtis et al. 2009).The model is divided into 5 maturity levels (from level 1 to level 5, which represents a rather restricted view of the management of human capital), each of which represents a change in the culture of the organization. Traversing the levels, each level improves the attraction, deployment, organization, motivation and retention of human capital. Each of the 17 process areas corresponds to one of the four operating levels of the model, and is divided into the following sections: purpose, description, objectives, compromises, skills, practices, measures, verifications. From the perspective of performance management, P-CMM offers an evolution according to level with four phases; at level 2, performance is measured at individual level and is reported to the managers; at level 3, performance is measured at team level, and is reported to the management, together with performance at individual level. At level 4, performance is measured quantitatively; and at level 5, performance is aligned between the teams of the organization. Taking into account the characteristics of this model, for the present research, the model has been analyzed selecting exclusively the process areas which focus on performance management: Performance Management (level 2), Quantitative Performance Management (level 4), Organizational Performance Alignment (level 5); together with the objectives and practices of other process areas linked to this management. As a diagnostic, a checklist for the evaluation of the performance of

human capital has been created. For the preparation of this checklist, the P-CMM model has been analyzed examining process areas, activities, and objectives, which cover the elements necessary to evaluate human capital performance. The evaluation, viewed as a process, has been divided into three sub-processes; establishment of measures, measurement, and evaluation of performance. Within each sub-process, generalized practices which are based on at least one P-CMM practice have been included. Each sub-process contains a series of activities with an identifier, a level (individual or group or both), a short description together with the P-CMM practices to which it is related. These practices are defined using the initials of the process area which they pertain to, and the practice number. The table below demonstrates the checklist.

Table 1 – Checklist extracted from People-CMM

Process	Subprocess	ID	Activity	Mode
Human Capital Performance Assessment	Establishment of measures (EST)	EST1	Individual. (PM: P4, P5) (QPM: P3) (C-BP: P7)	I
		EST2	Unit (PM: P1, P2) (QPM: P2) (C-BP: P6) (WP: P6)	G
		EST3	Group (QPM: P3) (WD: P3)	G
	Performance measurement (MED)	MED1	Individual Level (PM: P7) (QPM: P5, P6) (CCI: P2)	G
		MED2	Unit Level (PM: P3) (WP: P11)	I
		MED3	Group Level (QPM: P5, P6) (WD: P13)	G
		MED4	Almacenamiento de las mediciones de rendimiento (QPM: P8)	A
	Evaluation of performance (EVA)	EVA1	Individual Level (PM: P9) (C-BP: P8, P9) (CCI: P3)	I
		EVA2	Group Level (EW: P11) (CCI: P6)	G

I= Individual; G= Group; B= Both

The section which follows presents the analysis of the evaluation of performance using various ICT models, employing as analysis tool the checklist just described. The use of the checklist may be split into three levels. At the activity level, an activity is considered covered when at least one element of the model under analysis has the same objective as the activity in the P-CMM model. At the sub-process level, three categories have been considered: performance

appraisal at individual level, when the model covers individual employee activities (I); covered at group level, when the model applies measurement and evaluation at group level (G); and covered at both levels, when the model covers all activities of the P-CMM model together with those which pertain to both categories, individual and group (A), or "joint".

4. Analysis of the models in relation to human capital evaluation practices

The models selected for the analysis are focused on the following principal areas: ICT management, project development, and outsourcing. For the selection of the models, their relevance and level of use has been taken into account, both in academic and organizational environments. Employing the diagnostic element formulated in the previous section, the results of the analysis for the following models will be presented and discussed: ITIL, COBIT, CMMi-DEV, CMMi-ACQ y CMMi-SVC. For each model, the following aspects are included: a brief description of the model, the checklist as applied to the model, and a summary of the analysis together with the considerations taken into account for performing the analysis. Upon completion of the analysis of the models, the section includes a diagram which summarizes the conclusions of the findings.

4.1. Information Technology Infrastructure Library (ITIL)

Information Technology Infraestructura Library (ITIL) is a standard of best practices whose objective is to manage ICT infrastructure efficiently, with the objective of guaranteeing the levels of service agreed upon by the ICT organization and its clients (OGC, 2009). ITIL in version 3 consists of a set of five books published by the Office of Government Commerce (OGC), which empowers an ICT organization to improve the service it offers to its clients. Each of the books covers a specific area: Service Strategy, Service Design, Service Transition, Service Operation, Continual Service Improvement; this set has been entitled ITIL Core. For each area, ITIL defines objectives, activities, and the inputs and outputs of the processes of the ICT organization. Using these elements as a basis, it is possible to realize an analysis of the evaluation of the performance of human capital from the ITIL perspective.

The elements of ITIL utilized for the analysis of this model are processes, together with sub-processes, and their associated activities. Based on these elements, and using the checklist, the following results are obtained:

Table 2 – ITIL personnel assessment coverage

Activity (ID)	Related Elements	Covered (Yes/No)
EST1	Service Design: Roles & Responsibilities	Y
	Service Transition: Roles & Responsibilities	
	Service Operation: Roles & Responsibilities	
	Continual Service Improvement: Roles & Responsibilities	
EST2		N

EST3	Service Design: 4.2 Service Level Management	Y
MED1		N
MED2	Service Transition: 4.4 Release and Deployment Management	Y
MED3	Service Design: 4.2 Service Level Management, 4.3 Capacity Management Service Transition: 4.1 Transition Planning and Support, 4.2 Change Management, 4.4 Release and Deployment Management Service Operation: 5.1 Monitoring and Control Continual Service Improvement: 4.3 Service Measurement	Y
MED4	Service Design: 4.3 Capacity Management, 4.6 Information Security Management Service Transition: 4.7 Knowledge Management	Y
EVA1		N
EVA2	Service Design: 4.2 Service Level Management, 4.7 Supplier Management Service Transition: 4.4 Release and Deployment Management, 4.6 Evaluation Service Operation: 5.1 Monitoring and Control	Y

Taking into account the results displayed in the previous table, it can be deduced that ITIL does not cover the entire process of human capital performance evaluation, the model lacks elements for measuring and evaluating at individual level (MED1, EVA1), however, it defines roles and responsibilities for the entire service provision life cycle (EST1). At joint level, ITIL does not cover performance measurement (MED2). To carry out the current analysis, ITIL has been considered in the context of services; with the outcome that the practices for human capital performance evaluation for groups are considered uniquely for services in the context of this framework or model.

4.2. Control Objectives for Information and related Technology (COBIT)

COBIT is a set of recommended practices for the governance of Technologies and Information Systems (TIS), created by the Information Systems Audit and Control Association (ISACA), and IT Governance Institute (ITGI) (ISACA, 1996). COBIT 4.1 is organized into 34 high level control objectives for TIS processes, which are grouped into 4 activity domains for the governance of TIS: Plan and Organize (PO), Acquire and Implement (AI), Deliver and Support (DS), Monitor and Evaluate (ME).For each of the 34 objectives, COBIT provides detailed control objectives, 215 objectives in total. All of the objectives, both those at high level (34), as well as the detailed objectives (215), are correctly structured and contain explanations of their purposes and reach (ITGI, 2007). COBIT defines the relation between an ICT organization and its goals, as a set of

clearly defined processes which use the skills of the employees, and the infrastructure, to use automatic business applications, adding value to the information of the organization.

The elements of COBIT used for the analysis are the detailed objectives, based on which, and using the checklist, the following results are obtained:

Table 3 – COBIT personnel assessment coverage

Activity (ID)	Related Elements	Covered (Yes/No)
EST1	PO4.12 , PO7.3, P010.8	Y
EST2	PO10.7 (at project level)	Y
EST3	DS1.3, DS1.4 (at service level)	Y
MED1	PO7.3, DS3.5	Y
MED2	PO10.13 (at project level), DS3.5	Y
MED3	DS1.5 (at service level), DS3.5	Y
MED4	ME 1.2	Y
EVA1	PO7.7, DS3.2	Y
EVA2	DS3.2 (at service level)	Y

Taking into account the results of the previous table, it can be said that COBIT covers the entire performance evaluation process of human capital, which includes its sub-processes and activities. In order to realize the analysis, the researchers considered the characterization of COBIT focusing on services and projects; this has been subsequently formulated as the conclusion that the performance appraisal of human capital practices for individual employees are considered in this model for projects only, and group evaluation for services.

4.3. Capability Maturity Model Integration for Development (CMMi-DEV)

CMMi-DEV (CMMI, 2006) provides a comprehensive integrated solution for development and maintenance activities applied to products and services. This model forms part of a set of models whose objective is to cover the necessities of specific areas. CMMi-DEV follows the structure CMMi Model Foundation, which defines, among others, the following elements: objectives, roles, measurements, and verifications. Taking into account these elements, it is possible to analyze human capital performance evaluation from the perspective of this model.

The elements of CMMi-DEV used for the analysis are the practices, both generic and specific, based on which and using the checklist, the following results are obtained:

Table 4 – CMMi-DEV personnel assessment coverage

Activity (ID)	Related Elements	Covered (Yes/No)
EST1	GP 2.3, 2.4, 4.1;	Y (Low coverage)
EST2	MA: SP 1.1, SP 1.2	Y (Low

		coverage)
EST3	SAM: SP 1.3 (Supplier)	Y
MED1	IPM: SP 1.4; QPM: SP 1.1, 2.1(Project);	Y (Low coverage)
MED2	(IPM) + IPPD: SP 3.3 (Team)	Y (Low coverage)
MED3	GP 2.8, 4.2;	Y
MED4	MA: SP 2.1	Y
EVA1	SAM: SP 2.2 (Supplier)	Y (Low Coverage)
EVA2	IPM: SP 1.5; PMC: SP 1.1; QPM: SP 1.4, 2.3 (Project);	Y

Examining the results obtained, it can be concluded that CMMi-DEV covers the entire performance appraisal process. It should be mentioned that the coverage of the practices at individual and joint level is low, given that CMMi-DEV does not include practices exclusively dedicated to evaluate performance at these two levels. To realize the analysis, the researchers considered the characterization of CMMi-DEV as focused on the development of projects; this has led to the conclusion that evaluation performance practices for groups are considered for projects in this model, and individual employees for suppliers.

4.4. Capability Maturity Model Integration for Acquisition (CMMi-ACQ)

CMMi-ACQ (CMMI, 2007) is a maturity model evolution of CMMi-DEV model focused on the acquisition process of acquirer organizations. This model follows the structure of the CMMi Model Foundation, making it possible to utilize its elements to analyze the evaluation of the performance of human capital from the perspective of this model.

The elements of CMMi-ACQ used for the analysis are the practices, both generic and specific, based on which, and using the checklist, the following results are obtained:

Table 5 – CMMi-ACQ personnel assessment coverage

Activity (ID)	Related Elements	Covered (Yes/No)
EST1	GP 2.3, 2.4, 4.1;	Y (Low coverage)
EST2	MA: SP 1.1, 1.2	N
EST3		Y
MED1	IPM: SP 1.4; PP: SP 2.1; QPM: SP 1.1, 2.1 (Project);	Y (Low coverage)
MED2	IPM: SP1.6 (Team)	N
MED3	GP 2.8, 4.2;	Y
MED4	MA: SP 2.1	Y

EVA1		Y (Low coverage)
EVA2	PMC: SP 1.1, 1.2; QPM: SP 1.4, 2.3 (Project)	Y

Examining the results obtained, it can be concluded that CMMi-ACQ does not completely cover the human capital evaluation process. The model does not cover the evaluation of performance at joint level, and its coverage at individual level is scarce. The conclusion in this case is that this model exclusively covers evaluation of performance for the group framework; teams, projects, services. To realize the analysis, the characterization of CMMi-ACQ has been considered focused on the acquisition of projects; this has been translated into the conclusion that only performance evaluation practices for groups are considered in this model, as well as for work teams, projects and services.

4.5. Capability Maturity Model Integration for Services (CMMi-SVC)

CMMi-SVC is a maturity model which covers the activities necessary to manage, establish and deliver services (CMMI, 2009). Similarly to CMMi-ACQ, it is a model based on CMMi to adapt itself to the requirements of organizations which provide services. Given that its structure is based on the CMMi Model Foundation, it is possible to analyze performance evaluation of human assets in this model in the same way as in the two previous models. CMMi-ACQ contains elements in common with CMMi-DEV and CMMi-ACQ, and adds objectives and practices specific to the provision of services.

The elements of CMMi-SVC used for the analysis are practices, both generic and specific, based on which and using the checklist, the following results are obtained:

Table 5 – CMMi-SVC personnel assessment coverage

Activity (ID)	Related Elements	Covered (Yes/No)
EST1	GP 2.3, 2.4, 4.1;	Y (Low coverage)
EST2	MA: SP 1.1, 1.2;	Y (Low coverage)
EST3	SSD: SP 2.2	Y
MED1	SAM: SP 1.3 (Supplier)	Y (Low coverage)
MED2	IPM: SP 1.4; QPM: SP 1.1, 2.1 (Project);	Y (Low coverage)
MED3	IPM: SP1.6 (Team);	Y
MED4	CAM: SP 1.2; SD: SP 1.2 (Service)	Y
EVA1	GP 2.8, 4.2;	Y (Low coverage)
EVA2	MA: SP 2.1;	Y

Taking into account the results obtained, it can be concluded that the CMMi-SVC model covers the entire human capital performance evaluation process. The model lightly covers the evaluation of performance at joint and individual level. Therefore, the conclusion is that the model covers performance evaluation for the group model; teams, projects, and services. To realize this analysis, the characterization of CMMi-SVC has been as being centered on service provision projects; thus performance evaluation from a group perspective is considered for this model, as well as work teams, projects and services, and units for suppliers. To finalize, Figure 1 includes a graphical vision of the coverage of the elements of Personnel performance assessment in the models analyzed.

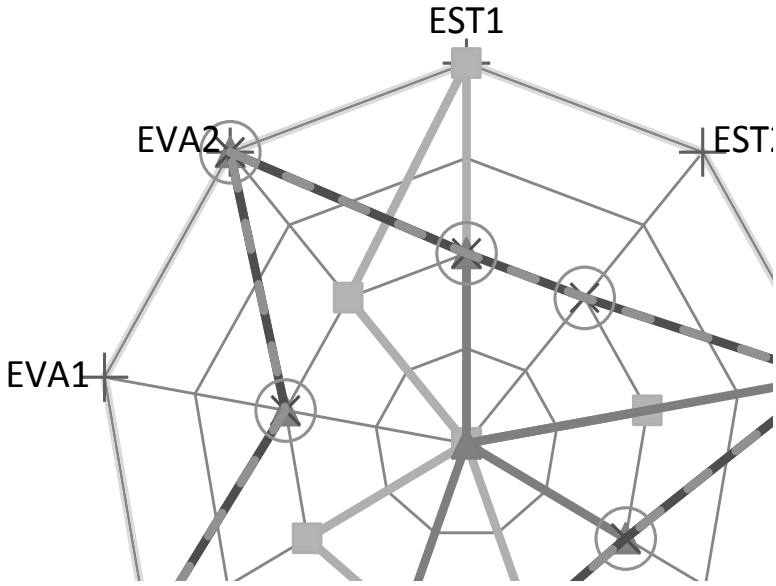

Figure 1 – Results of the analysis

5. Conclusions and future work.

This paper presents a study carried out with the aim of finding out the coverage of diverse models related to IT management with respect of personnel performance. Results show dissimilarities with regard to coverage of the global process. COBIT is the only model that covers the entire evaluation process exhaustively, while the CMMi-ACQ and CMMi-DEV models cover personnel performance, but presents weaknesses with regard to individual and joint levels, and lastly, ITIL does not cover the process satisfactorily. However, results, in spite of the overall differences, present certain similarities. Thus, all models cover the establishment of measures for individuals (EST1), the storage of the performance measures (MED4) and the evaluation of performance at group level (EVA2). Regarding the differences, not all of the models cover the establishment of measures for units (EST2) and groups (EST3), some lack elements for the measurement of performance in the three categories (MED1, MED2, MED3) and only COBIT covers the evaluation of performance at individual level (EVA1).

As future research lines, three different study areas are proposed. In the first place, it is proposed to extend the work to other models which are considered of relevant application in the ICT field, and in particular, applicable to Chief Information Officer, such as COSO, for the case of risk management, PMBoK and PRINCE2 in project management and ISO 20000, eTOM and BPM for IT services, operations and infrastructure. In the second place, a study is proposed which covers the personnel competencies cycle in the context of evaluation, focusing on fields such as compensation and the management of competencies for the alignment of the performance and job position. Lastly, and as principal future research line, the development of a standard which includes recommendations for the integrated inclusion of management measures in the context of management tools for ICT is proposed.

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