Paper submitted to Pre-ICIS 2010 SIGSVC Workshop on Services
December 12, 2010, 8:30-5 PM Hyatt, St Louis Arch, St Louis, MI, USA

On Electronic Process Guides for IT Service Management

Dr. Manuel Mora, Autonomous University of Aguascalientes, Mexico

Rory O'Connor, Dublin City University, Ireland

Dr. Ovsei Gelman, CCADET-UNAM, México

ABSTRACT

IT practitioners interested in implementing IT Service Management processes (like ISO/IEC 20000; CMMI-SVC, ITIL v2, or ITIL v3, or proprietary process models as ITUP® (IBM), MOF® 3.0/4.0 (Microsoft) are faced with the challenge to consult complex documents for learning and training purposes.. Such documents contain an inherent complexity by the number of schemes, categories, activities, roles, forms, techniques, concepts, attributes, and their interrelationships. Given this problem, a research stream (in Software Engineering discipline) has been focused on the design, implementation and evaluation of electronic process guides (EPGs). EPGs are digital documents which describe organizational processes for training and guiding real execution purposes, and which contains all required documents as well as sample of them. EPGs are not intended for enacting an organizational process (like a business process manager system) but for supporting their correct execution for human participants. We believe that EPGs can be useful for ITSM management. Thus, in this research in progress, we report: (i) a review of characteristics of EPGs, (ii) an EPG evaluation framework, and (iii) a conceptual evaluation of three open access EPGs. Two for IT Service Management (ITUP®, MOF® 4.0) and one for Software Engineering process (OpenUP). Our final research aim, is identifying enhancement opportunities for the design of EPGs by using ontology technology. Implications for ITSM are finally discussed.

1. INTRODUCTION

IT Service Management (ITSM) can be defined as a management system of organizational resources and capabilities for providing value to organizational customers through IT services (van Bon, 2007). IT Service Management has become a relevant organizational theme for IT areas in large and mid-sized organizations because it is expected that its utilization, jointly with other IT schemes of processes, deliver a more efficient and effective IT management, and ultimately a better organizational value (Salle, 2004; Johnson et al. 2007).

Sallé (2004, based on Venkatraman (1999)) indicates that IT management needs to evolve from a efficiency-focused management of IT infrastructure, to a real service management focus, until to arrive to a complete governed and strategically valued IT management. In the first case IT management is important for the enterprise but not still critical. In the two next cases, IT management becomes highly relevant and indispensable for supporting the enterprise. Johnson et al. (2007) identify the need of enterprises to rely more on IT-based supported business process and IT services as the vehicle for delivering such a support. From a research perspective, ITSM research themes have been encouraged to conduct (Demirkan & Goul, 2006; Gallup et al. 2009) and an ITSM curriculum to be deployed (Beachboard et al. 2007). Studies on ITSM impacts are still scarce (Hochstein et al. 2005; Cater-Steel et al. 2006; Potg et al. 2006) but of all them report positive impacts. In Hochstein et al. (2005) the findings of six cases conducted in large European companies (5) and a governmental setting (1) are reported. In all of them, the overall assessment is of positive impacts categorized as follows: *a better client/service orientation with positive impacts on the quality of IT services respectively, a better efficiency of IT processes, and a better visibility of IT processes (transparency and comparability documentary issues).* Cater-Steel et al. (2006) also reports positive impacts of ITSM (derived from 5 cases of Australian companies).

These are: *a more consistent and documented service management process (less negative surprises or omissions), less conflictive SLAs negotiations (smoother), more precise predictions of IT infrastructure warranty issues, and a better manager of incidents, changes and testing tasks*. Potg et al. (2006) from a single case also support the notion of ITSM implementation is associated to benefits.

However, IT practitioners interested in implementing IT Service Management processes (like ISO/IEC 20000; CMMI-SVC, ITIL v2, or ITIL v3, or proprietary process models as ITUP® (IBM), MOF® 3.0/4.0 (Microsoft)) are faced with the challenge to learn and consult complex documents. Given that successful ITSM implementations require adequate training and staff awareness (Pollard & Cater-Steel, 2009), besides another CSFs, we believe that ITSM implementers will demand a strong training support on ITSM processes. In related domains, like Software Engineering, such a problem has been already identified. For instance, the utilization of processes' standards and models (de facto and de jure) in such a domain such as CMMI-DEV (SEI, 2006) and ISO/IEC 12207 (ISO, 1995) has been associated with organizational benefits regarding to efficiency and efficacy of processes (references). However, it has been also reported their complex nature and knowledge structure, which avoids an easy implementation in organizations (Roedler, 2006; Mora 2008c). CMMI-DEV (SEI, 2006) for instance, is a document of 561 pages that describes 2 representations (continuous and staged), 5 maturity levels, 6 continuous capability levels, 22 key process areas, 5 generic goals, 17 generic practices with about 150 elaborations (specific recommendations for each one of the 22 areas for some of the 17 generic practices), 47 specific goals, 161 specific practices, and about 250 typical work products. For ITSM, several process frameworks have been reported: ITIL v.2, ISO 20000, ITIL v.3, and CMMI-SVC, and additionally particular representations from them have been realized

by companies (ITUP®, MOF® 3.0). Hence, such documents contains an inherent complexity by the number of schemes, categories, activities, roles, forms, techniques, concepts, attributes, and their interrelationships (Dougmore, 2006). Furthermore, current normal support for consulting official documents are usually implemented in HTML or PDF documents as Manual of Processes. Nevertheless, their current format and consulting capabilities, they are still considered difficult to use given their structural (poor organization, lack of guidance tools, lack of diagrams) and functional limitations (poor user interface, limited consulting capabilities). Consequently, ITSM implementers face a high cognitive complexity and practical problems for consulting them.

Given this problem, a research stream (in Software Engineering discipline) has been focused on the design, implementation and evaluation of electronic process guides (EPGs) (Kellner et al., 1998; Becker & Verlage, 1999). EPGs are digital documents which describe organizational processes for training and guiding real execution purposes, and which contains all required documents as well as sample of them. EPGs are not intended for enacting an organizational process (like a business process manager system) but for supporting their correct execution for human participants. Despite of the capabilities differences ; between EPG capability levels, all of them are useful for specific purposes: guiding an organizational process, testing an organizational process, or executing and controlling the organizational process from the digital document. Thus, in this research in progress, we report: (i) a review of characteristics of EPGs, (ii) an EPG evaluation framework, and (iii) a conceptual evaluation of three access-available EPGs. Two for IT Service Management (ITUP® of IBM, MOF® 3.0 of Microsoft) and one for Software Engineering process (OpenUP). Our final research aim is identifying enhancement

opportunities for the design of EPGs by using ontology technology (O'Leary, 1998; Chandrasekaran et al. 1998; Mora et al. 2008). Implications for ITSM are finally discussed.

2. ELECTRONIC PROCESS GUIDES (EPGs)

According to Kellner et al. (1998, p.11) an Electronic Process Guide is "*a reference document for an intended process, providing guidance to process participants in carrying it out*" (p. 11). An EPG is also delivered via computer technology. For other authors an EPG are: "*electronic document with graphical and textual representations of a process model which enable multiple views of such processes*" (Koolmanojwong et al. 2008); electronic documents which "*contain at least the information described in its printed counterpart, however, it is recommended to split process information into more manageable pieces that are easier to understand and digest for process participants*" (Scott et al. 2002); and well-structured and adv advanced electronic documents for "*guidance to the user, that is, it provides the Process Performer with information about the actual state, history, context, and future steps of the process to make informed decisions*" (Becker-Kornstaedt et al. 1999).

EPGs have been posed for both overcoming the natural limitations both printed-based Manual of Processes or their direct digital versions (without a specific EPG design), and generating new benefits. Between the main structural limitations of non EPGs are: lack of critical information (Kellner et al. 1998); complex linear-based documents (Becker-Kornstaedt, 2000); do not present the big picture of the process (Koolmanojwong et al. 2008). Regarding the functional limitations of non EPGs are: poor navigation (Kellner et al. 1998); version control and update problems (Becker-Kornstaedt, 2000), and poor utilization of diagrams and guidance charts (Koolmanojwong et al. 2008).Dingsøyr et al. (2004) visualizes non EPGs negative effects

as: few consulted, difficult reading, and just become "dust collectors". Research findings on EPGs has found benefits such as: improve training and process execution (Kellner et al. 1998); it permits a gradual tailoring of process (Becker-Kornstaedt, 2000); improve communication (Koolmanojwong et al. 2008). Additional identified benefits are: reuse, process conformance, and better management (Becker-Kornstaedt, 2000).

However, current state of the art of EPGs still have functional limitations. Main of them are the following: EPGs can be also complex and expensive systems to be deployed for small and mid-sized organizations (Kellner et al. 1998); EPGs can be isolated documents not linked with relevant process information (Becker-Kornstaedt, 2000); and EPGs can lack of supplementary tools (Koolmanojwong et al., 2008). Nevertheless of such limitations, it has been also reported that EPGs can be developed from a simple design and gradually evolve it, avoiding a "overdone" EPG (Dingsøyr et al., 2004).

While a standardized content of EPGs was not founded, from several sources it can be reported the following elements: ***overview, schemas, activities, roles, work products, and resources (i.e. guidelines, templates, concepts, examples, tools)***. An overview element is a textual and concise description of the process guidance. Schemes elements refer to texts and diagrams which describe the overall view of the process from an organized view. Activities elements describe the steps, inputs, outputs, control metrics, and tools and roles participating in them. Roles elements describe the types of human agents in the process. Work products elements describe the required and generated artifacts during the process. Finally, resources elements describe complementary material such as: guidelines, templates, concepts, examples, and tools. Similarly, there was not founded a standard scheme of EPGs functional capabilities. From same core studies, the following ones can be reported: to present an organized scheme of knowledge

chunks; to use a similar user interface in all documents; to provide flexibility; to present information in adequate language; to provide complementary tools.

Hence, the utilization of EPGs for ITSM has been not reported. However, at least two tools are available at present (for academic use): ITUP® (IBM, 2008) and MOF® 3.0 (Microsoft, 2008).

3. EVALUATION FRAMEWORK FOR EPGS

Some studies (Scott et al. 2001; Phongpaibul et al. 2007) have reported concepts for being used to evaluate EPGs. Most of them are intended for evaluating their generation capabilities as well as the structural-functional release of EPGs. In this research, we are focused on the second aim: evaluation of structural-functional attributes of three already EPGs. None well-accepted evaluation framework for EPGs was found in the literature. However, from core EPGs studies (Kellner et al. 1998; Becker-Kornstaedt, 2000; Dingsøyr et al., 2004; Koolmanojwong et al., 2008) and related studies on evaluation of IT (Moore and Benbasat, 1991; Kharanna et al. 1999; Lee et al., 2001) it is possible derive one. Table 1 reports our initial EPG evaluation framework (attributes and features).

For integrating an overall EPG evaluation, we also rely on the theory of decision-making models. A MADM (multi-attribute decision-making) model (Yoon & Hwang, 1985) was elaborated with such categories of concepts. MADM methods are widely used for ranking courses of action, which are assumed can be organized in a hierarchy of categories, delivering an overall score for each evaluated alternative (Dyer et al., 1992). In this research we use a SAW (simple additive weight) method. To use SAW is required to establish the weights of contribution of each attribute to the final score. It can be derived from pair-based comparisons

between all attributes. However, other variants for such assignment can be used. Figure 1 show the final the SAW model used in this research (it was elaborated with CDPlus tool demo version).

Table 1. Items for EPG Evaluation Framework

Category	Attribute	Description	Features
Structural (static)	S.1 CORE COMPLETENESS	the extent of the EPG includes descriptions for all core elements (schemes, activities, roles, work product, and resources (some of them)).	Existence of: overview, schemas, activities, roles, work products, and core resources (templates).
Structural (static)	S.2 STRUCTURENESS	the extent of the EPG exhibits logical coherence on the arrangement of knowledge units (elements).	Level of logical order, logical hierarchy of components, and adequate balance of textual and graphic content.
Structural (static)	S.3 AESTHETIC	the extent of the EPG is perceived by users as pleasant.	Existence of a pleasant GUI, readable fonts, and clear visualization of components.
Structural (static)	S.4 SUPPORT COMPLETNESS	the extent of the EPG includes descriptions for support elements (resources (guidances, templates, concepts, tools)).	Existence of support resources: guidelines, concepts, examples, and tools.
Functional (dynamic)	F.1 EASINESS OF USE	the extent of the EPG is perceived by users as not cognitive demanding.	Levels of easiness of learning, easiness of navigation, and not difficulty for locating some important element.
Functional (dynamic)	F.2 SOPHISTICATION	the extent of the EPG includes complementary tools (for recording, processing, and tracking process data).	Existence of advanced user support: access to external documents, record and tracking tools, expert advice.
Functional (dynamic)	F.3 PERFORMANCE	the extent of the EPG executes consulting tasks in adequate response times.	Response time, used computational resources for running it.
Functional (dynamic)	F.4 USEFULNESS	the extent of the EPG is perceived by users as a better alternative of current used documents for process guidance.	Fasten tasks, enhance effectiveness, improve overall quality of tasks.
Functional (dynamic)	F.5 VALUE	the extent of the EPG is perceived by users as a tool which delivers value (by increase of user performance and/or reduction of constrains).	Perceived value on time saving, perceived value on money saving, perceived value for information and knowledge delivered by tool.
Overall	O.1 STRUCTURAL VALUE	the extent of the EPG is perceived by users as a tool designed with quality of content and structure.	Weighed accumulated score from structural items.
Overall	O.2 FUNCTIONAL VALUE	the extent of the EPG is perceived by users as a tool operationally usable.	Weighed accumulated score from functional items.
Overall	O.3 OVERALL VALUE	the extent of the EPG is perceived by users as a tool which provides a sufficient value versus the effort and costs implied for its utilization.	Weighed accumulated score from accumulated structural and functional scores.

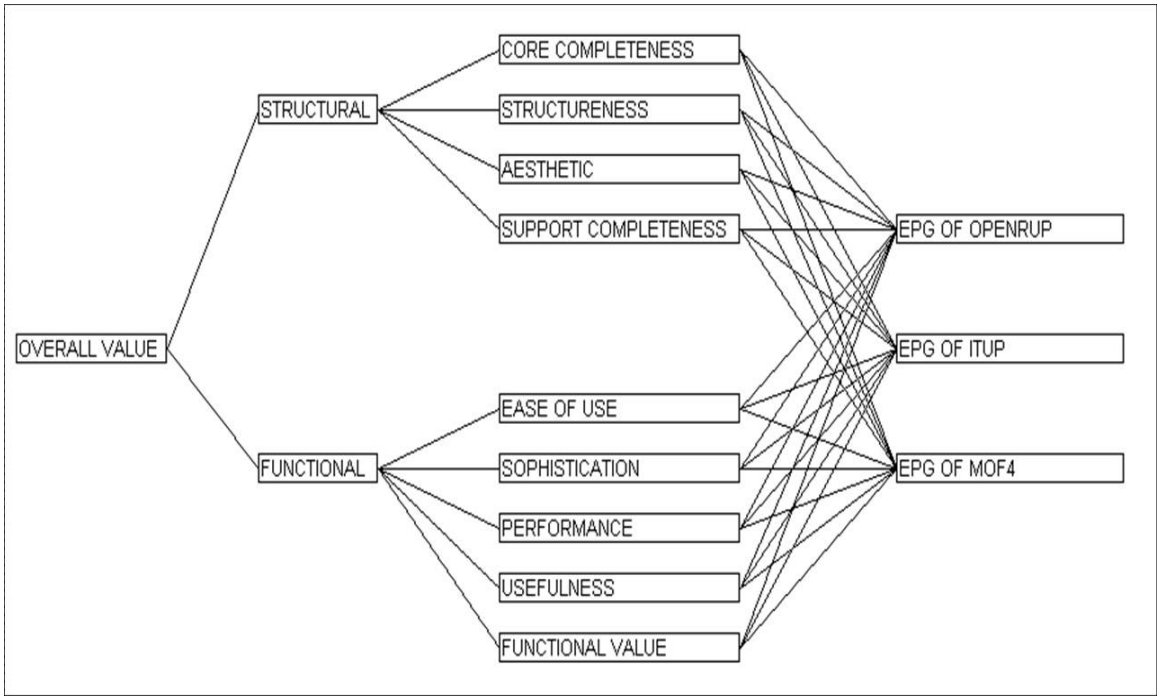

Fig. 1 SAW Model for Evaluation of EPGs

In this model, we use a numerical scale from 1.0 to 5.0 points for weights in the structure of attributes. Scale used was as follows: (5) critical attribute, (4) very important attribute, (3) important attribute, (2) not important, (1) trivial. In Figure 2 (generated with CDPlus demo), the weights (and their transformed priorities values) are reported.

Goal	Weights	Rating Set	Level 2	Weights	Rating Set
OVERALL VALUE	Important	STRUCTURAL	STRUCTURAL	Critical	CORE COMPLETENESS
	Important	FUNCTIONAL		Critical	STRUCTURENESS
				Important	AESTHETIC
				Important	SUPPORT COMPLETENESS
			FUNCTIONAL	Very Important	EASE OF USE
				Important	SOPHISTICATION
				Important	PERFORMANCE
				Critical	USEFULNESS
				Critical	FUNCTIONAL VALUE

Fig. 2 Matrix of Weights for Evaluation of EPGs

For rating the three possible alternatives a 5-point Likert scale was used as follows: (5) A very high fulfillment of expected features, (4) a high fulfillment of expected features, (3) a moderated fulfillment of expected features, (2) a low fulfillment of expected features, and (1) a very high or null fulfillment of expected features. Each item of the 9 attributes was evaluated for each one of the three EPG considering the list of features for each attribute (see Table 2).

4. EVALUATION OF EPGS (ITUP®, MOF®® 3.0, OpenUP)

EPG of OpenUP (Balduino, 2009) is realized in Eclipse Process Framework (Haumer, 2007a, 2007b), an open tool for designing electronic process guides. OpenUP is reported as an agile version of well-known unified process. OpenUP is organized in two dimensions: (i) methods (or disciplines) and (ii) process content. In Methods are defined: roles, tasks, artifacts, and guidance documents by separate. In Process content, previous elements are time-based (i.e. a workflow) organized. OpenUp design includes personal, team, and project increments (with their related documents). OpenUp defines 7 roles, 6 disciplines, 17 tasks, and 17 work products.

ITUP® (EMA, 2006) stands for IBM Tivoli Unified Process. ITUP® is the implementation of the IBM Process Reference Model for IT (PRM-IT). ITUP® is released through a access-free EPG. Its core architecture is based on 5 domains: scenarios, people (roles), technology (tools), information (work products), and the ITSM kernel of processes (as the integrator component). ITUP® includes more processes than ITIL V2 and V3. There are 41 processes grouped in 8 domains (Ganek & Kloeckner, 2007). ITIL V3 has 26 processes and 4 functions grouped in 5 domains (Cartlidge et al. 2007; van Bon et al. 2007). ITUP® includes a description of: process (workflows), roles, work products, specific guidances (for particular scenarios), directory of tools, glossary, related materials, and a glossary.

MOF® 4.0 (MOF4, 2008) is the implementation and enhancement of ITIL V3 processes from Microsoft. MOF® 4.0 consists of three components: (i) Team Model, (ii) Process Model, and (iii) Risk Management Model. Team Model has 7 clusters of roles. Process Model includes 16 service management functions grouped in 4 lifecycle categories (plan, deliver, operate, and manage), and 6 manage review tasks. Team and Process Models are related. Risk Management Model accounts for an independent risk management process to be applied during the IT service life cycle. It is important report that this MOF® 4.0 EPG was evaluated from the external website. While an EPG for MOF® 3.0 (MOF3, 2005) was available for downloading, for version 4.0 there a package but documents are not organized as an EPG. Model aligned with ITIL V3. However, an EPG was not located for being evaluated at present.

Because it is a research in progress, we decide conduct our own evaluations. Basic demographic data of both evaluators are: (i) 3 with doctoral degree; (ii) on 10 years in average teaching graduate courses on systems or IT engineering courses, (iii) previous experience on software process models (Mora et al. 2008) and service systems (Mora et al. 2009) research. Thus, our initial evaluation can be considered as realized by researchers involved in such topics.. In Table 2 it is reported the assigned scores for the 9 items (a detailed description of evaluations is reported in Appendix).

Figures 3 to 6 shows the scores assigned for these 3 EPGs. It is very important to remark that it was not evaluated the quality of the ITSM process, but the quality of the free and available electronic process guide. In Figure 3 it is reported the following scores: 0.958 for EPG of OpenUP, 0.775 for EPG of ITUP®, and 0.640 for EPG of MOF® 4.0. In Figure 4, it is reported the contributions for the final scores from the two main sub-criteria: structural and functional items. In the three cases the structural score contributes more than functional ones.

Table 2. Input scores assigned to EPGs

Category	Attribute	Input scores		
		OpenUP	**ITUP®®**	**MOF® 4.0**
Structural (static)	S.1 CORE COMPLETENESS	5	4	3.5
Structural (static)	S.2 STRUCTURENESS	5	4	3.5
Structural (static)	S.3 AESTHETIC	5	4	3.5
Structural (static)	S.4 SUPPORT COMPLETENESS	5	4	4
Functional (dynamic)	F.1 EASINESS OF USE	4	5	3
Functional (dynamic)	F.2 SOPHISTICATION	4	3	3
Functional (dynamic)	F.3 PERFORMANCE	5	5	3
Functional (dynamic)	F.4 USEFULNESS	5	4	4
Functional (dynamic)	F.5 VALUE	5	4	4

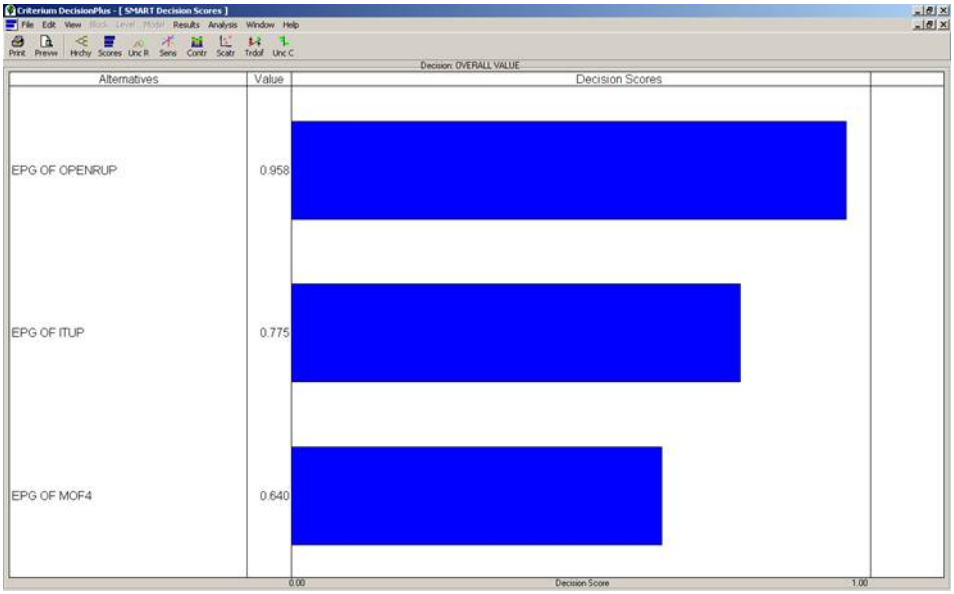

Fig. 3 Overall scores of Evaluated EPGs

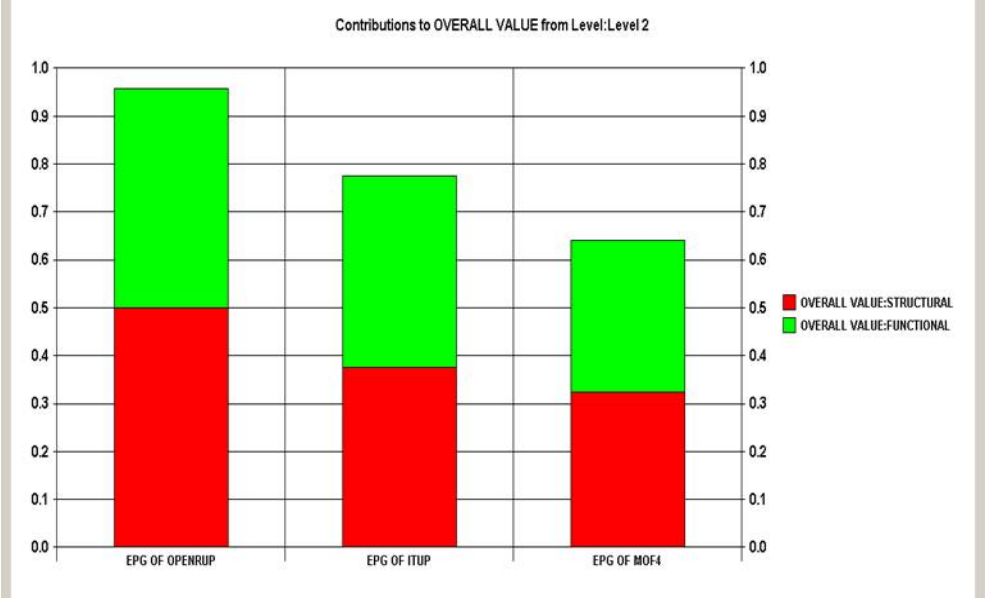

Fig. 4 Contributions of Structural and Functional Criteria to Overall Score

In Figure 5, it is reported the contributions to Structural item score from the four structural items. Structuredness and core completeness are the main contributors in the three EPGs.

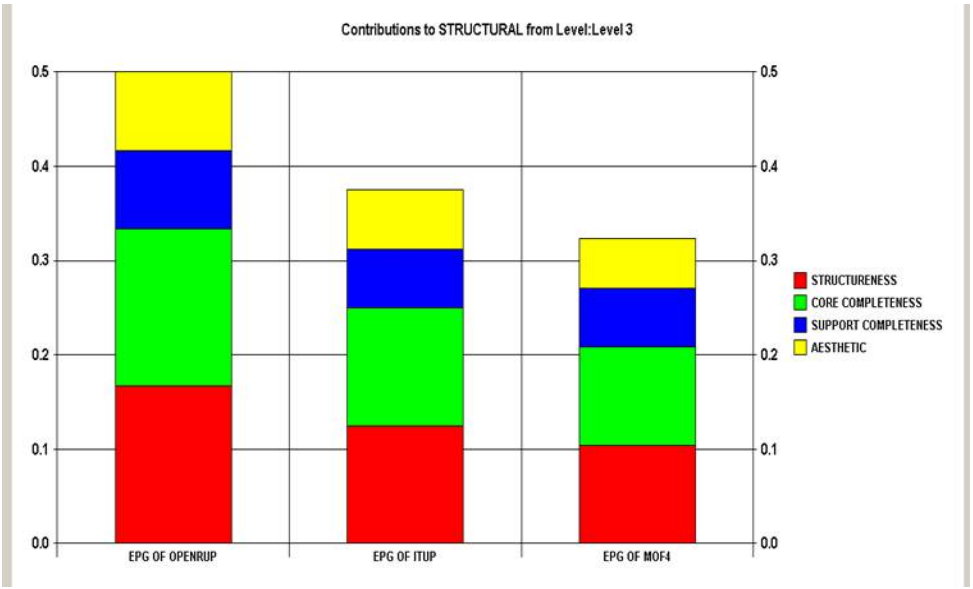

Fig. 5 Contributions of Structural Items to Structural Score

Finally, in Figure 6, it is reported the contributions to Functional item score from the five functional. Functional value and usefulness are the main contributors in the three EPGs.

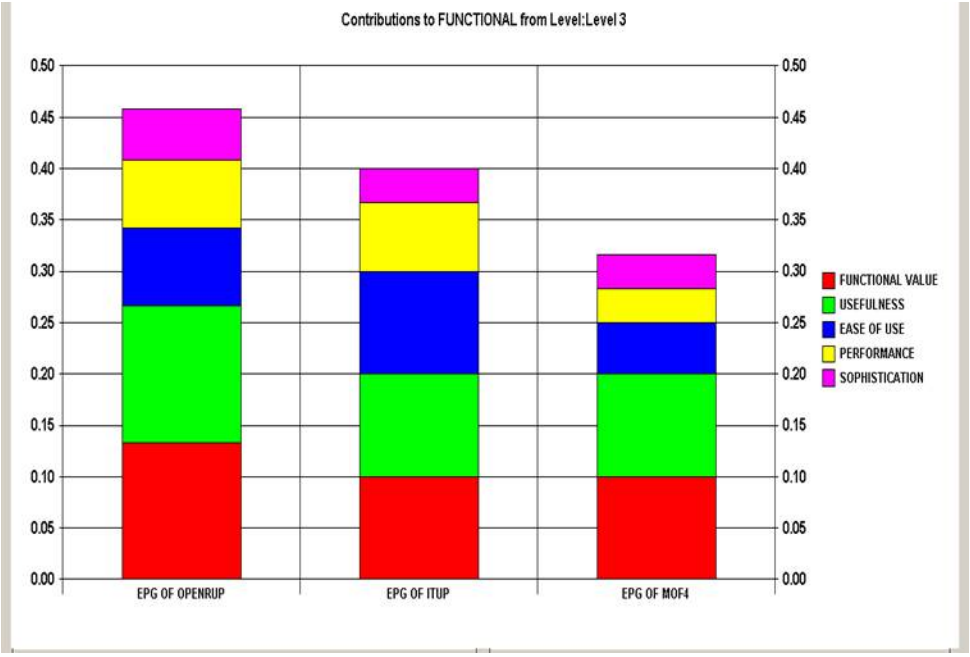

Fig. 6 Contributions of Structural Items to Structural Score

Hence, we have developed an evaluation framework for evaluating electronic process guides (EPG) in the context of ITSM. Because there are few of them available (i.e. with free academic access) we identify two (ITUP® and MOF® 4.0) and compare with an EPG from the software engineering discipline (OpenUP). A multi-criteria decision making model was developed for such an evaluation. Our main findings are the following: (i) EPGs are not well known and used in the information systems discipline, (ii) best available EPGs for ITSM are still uncompleted when these are compared with EPGs in the software engineering discipline, (iii) ITSM frameworks (ISO 20000, ITIL V2, ITIL V3, and proprietary process frameworks) while provide a variety of schemes, also add confusion for academic and practitioners on a more standardized ITSM scheme; (iv) EPGs in the software engineering discipline (used from the 80's end decade)

have more complete, well-designed, and used than ITSM EPGs. However, we consider that EPGs for ITSM are a interesting and relevant area of research and practical deployment opportunity.

5. CONCLUSIONS

IT academics and practitioners interested in teaching and implementing IT Service Management processes are faced with a variety of ITSM process schemes. In the discipline of software engineering, such schemes have been designed, taught, and used from the 80s decade. In contrast, in information system area, given the relevance of ITIL and derived schemes, it has emerged until 2000 decade. This has generated an advance on the acknowledgement of the need of process guidances in software engineering discipline, and it has caused the generation of tools like EPGs. In the case of information systems it is new. Thus, in this paper, we have raised the relevance of EPGs for guiding ITSM process and we have researched the structural and functional characteristics of two available EPGs for ITSM (ITUP® and MOF® 4.0) and compared with a more mature EPG from software engineering discipline (OPenUP). Main findings are: (i) EPGs are relevant for academic and practitioners, and (ii) we need to advance on such theme in information systems given the moderate scores reached for ITSM EPGs.

ACKNOWLEDGEMENTS

This research is supported by Autonomous University of Aguascalientes (grant PIINF-10-4) and partially by PROMEP RIGSTI research network grant.

REFERENCES

Balduino, R. (2007). Introduction to OpenUP (Open Unified Process). Internet document in www.eclipse.org (accessed in July 1, 2009).

Beachboard, J. et al. (2007). AMCIS 2007 Panel on IT Service Management: IT Service Management in the IS Curriculum. Communications of the AIS, 20(35), 555-566.

Becker-Kornstaedt, U. (2000). A Strategy for the Integration of Software Process Support Technology into Organizations.

Becker-Kornstaedt, U., Hamann, D., Kempkens, R., Rösch, P., Verlage, M., Webby, R., & Zettel, J. (1999). Support for the Process Engineer: The Spearmint Approach to Software Process Definition and Process Guidance. In: M. Jarke & A. Oberweis (Eds.): Advanced Information Systems Engineering, Proceedings of the 11th International Conference CAiSE'99, Lecture Notes in Computer Science, Vol. 1626, 119-133, Springer.

Becker, U. & Verlage, M. (1999). The V-Modell Guide. Experience with a web-based approach for process support. Software Technology and Engineering Practice, 1999. STEP'99, 1-8.

Cartlidge, A. et al. (2007). An Introductory Overview of ITIL® V3. itSMF.

Cater-Steel, A., Toleman, M., & Wui-Gee, T. (2006). Transforming IT Service Management – the ITIL Impact. 17th Australasian Conference on Information Systems, December 6-8, 2006, Adelaide, Australia, 1-11.

Chandrasekaran, B., Josephson, J. & Benjamins, R. (1999). What are Ontologies, and Why do We Need. IEEE Intelligent Systems, Jan-Feb, 20-25.

Demirkan, H. & Goul, M. (2006). AMCIS 2006 Panel Summary: Towards the Service Oriented Enterprise Vision: Bridging Industry and Academics. Communications of the AIS, 18(26), 546-556.

Dyer, J., et al. (1992). Multiple Criteria Decision Making, Multiattribute Utility Theory: the next Ten Years. Management Science, 38(5), 645-654.

Dingsøyr,T., Moe, N., Dybå, T., & Conradi, R. (2004). A Workshop-Oriented Approach for Defining Electronic Process Guides – A Case Study. In K. Rolland (Ed), Proceedings of the 11th Norwegian Conference on Information Systems, Stavanger, Norway, Nov 29-Dec 1,10-25.

Dougmore, J. (2006). Benchmarking provision of IT services. ISO Focus May, 48-51

EMA (2006). IBM Tivoli Unified Process (ITUP): Connecting the Dots. Business Report. Enterprise Management Associates (EMA), Boulder, CO.

Gallup, S., Dattero, R., Quan, J. & Conger, S. (2009). An Overview of IT Service Management. Communications of the ACM, 52(5), 124-127.

Ganek, A. & Kloeckner, K. (2007). An Overview of IBM Service Management. IBM Systems Journal, 46(3), 375-385.

Haumer, P. (2007a). Eclipse Process Framework Composer Part 1: Key Concepts. Internet document in www.eclipse.org (accessed in July 1, 2009).

Haumer, P. (2007b). Eclipse Process Framework Composer Part 2: Part 2: Authoring method content and processes. Internet document in www.eclipse.org (accessed in July 1, 2009).

Johnson, M., Hately, A., Miller, B. & Orr, R. (2007). Evolving standards for IT service Management. IBM Systems Journal, 46(3), 583-597.

Kellner, M., Becker-Kornstaedt, U., Riddle, W:, Tomal, J., & Verlage, M. (1998). Process Guides: Effective Guidance for Process Participants. Proc. 5th International Conference on the Process Software, Chicago, IL, USA, June, 11-25.

Koolmanojwong, S., Aroonvatanaporn, P., & Charoenthongtrakul, I. (2008). Incremental Commitment Model Process Guidelines for Software Engineering Class. USC CSSE Technical Report 2008-832, 1-12.

MOF3 (2005). MOF Executive Overview version 3.0. Document included in MOF 3.0 package.

MOF4 (2007). MOF Executive Overview version 4.0. Document included in MOF 4.0 package.

Mora, M., Cervantes, F., Macías-Luévano, J. (2008). Toward K-Onto-SDT: an Ontology-based Knowledge Management System for Description and Comparison of Standards of Process in the Domain of Information Systems. K. Engemann & G. Lasker (Eds), Proceedings of the Advances in Decision Technology and Intelligent Information Systems, Vol. IX, into the 20th. Int. Conf. on Systems Research, Informatics and Cybernetics, Baden-Baden, Germany, July 24-29, 93-97.

O'Leary, D. (1998). Using Ai in Knowledge Management: Knowledge Bases and Ontologies. IEEE Intelligent Systems, May-Jun, 34-49.

Phongpaibul, M., Koolmanojwong, S., Lam, A. & Boehm, B. (2007).Comparative Experiences with Software Process Modeling Tools for the Incremental Commitment Model. In ICSP 2007, LNCS 4470, 61–72.

Pollard, C. & Cater-Steel, A. (2009). Justifications, Strategies, and Critical Success Factors in Successful ITIL Implementations in U.S. and Australian Companies: An Exploratory Study. Information Systems Management, 26(2), 164-175.

Potgetier, B., Both7a, J., & Lew, C. (2006). Evidence that use of the ITIL framework is effective. Potgieter BC, Botha JH, Lew C (2005) 18th Annual Conference of the National Advisory Committee on Computing Qualifications, Tauranga, NZ , 160-167.

Sallé, M. (2004). IT Service Management and IT Governance: Review, Comparative Analysis and their Impact on Utility Computing. HP Technical Report HPL-2004-98, HP Laboratories, Palo Alto, CA, June 2, 1-26.

Scott, L., Carvalho, L., Jeffery, R. and D'Ambra, J. (2001).An Evaluation of the Spearmint Approach to Software Process Modelling. Proceeding of the European Workshop on Software Process Technology (EWSPT 2001), 77-89.

van Bon, J., Pieper, M. & van deer Veen, A. (2005). Foundations of IT Service Management based in ITIL. Van Haren Publishing.

van Bon, J. et al. (2007). Foundations of IT Service Management based on ITIL v3. Van Haren Publishing.

Venkatraman, N. (1999). Valuing the IS Contribution to the Business. Business Report. Computer Sciences Corporation.

Yoon, P. & Hwang, C. (1995). Multiple Attribute Decision Making: an Introduction. Sage, USA.

APPENDIX

Category	Attribute	Description	Features	EPG: OpenUP	
				Score	
Structural (static)	S.1 CORE COMPLETENESS	the extent of the EPG includes descriptions for all core elements (schemes, activities, roles, work product, and resources (some of them)).	Existence of: overview, schemas, activities, roles, work products, and core resources (templates).	**5**	All features are present and linked.
Structural (static)	S.2 STRUCTURENESS	the extent of the EPG exhibits logical coherence on the arrangement of knowledge units (elements).	Level of logical order, logical hierarchy of components, and adequate balance of textual and graphic content.	**5**	Very high logical order and links among core elements.
Structural (static)	S.3 AESTHETIC	the extent of the EPG is perceived by users as pleasant.	Existence of a pleasant GUI, readable fonts, and clear visualization of components.	**5**	Very high. Clear text, tables and diagrams
Structural (static)	S.4 SUPPORT COMPLETENESS	the extent of the EPG includes descriptions for support elements (resources (guidances, templates, concepts, tools)).	Existence of support resources: guidelines, concepts, examples, and tools.	**5**	Very high. Guidances, practices, tools, references, examples.
Functional (dynamic)	F.1 EASINESS OF USE	the extent of the EPG is perceived by users as not cognitive demanding.	Levels of easiness of learning, easiness of navigation, and not difficulty for locating some important element.	**4**	High. Some issues can be perceived as complex.
Functional (dynamic)	F.2 SOPHISTICATION	the extent of the EPG includes complementary tools (for recording, processing, and tracking process data).	Existence of advanced user support: access to external documents, record and tracking tools, expert advice.	**4**	High. Link to tracking tools are not reported.
Functional (dynamic)	F.3 PERFORMANCE	the extent of the EPG executes consulting tasks in adequate response times.	Response time, used computational resources for running it.	**5**	Very High.
Functional (dynamic)	F.4 USEFULNESS	the extent of the EPG is perceived by users as a better alternative of current used documents for process guidance.	Fasten tasks, enhance effectiveness, improve overall quality of tasks.	**5**	Very High. For academic and real projects.
Functional (dynamic)	F.5 VALUE	the extent of the EPG is perceived by users as a tool which delivers value (by increase of user performance and/or reduction of constrains).	Perceived value on time saving, perceived value on money saving, perceived value for information and knowledge delivered by tool.	**5**	Very High. Tool is free.

Category	Attribute	Description	Features	EPG: ITUP	
				Score	
Structural (static)	S.1 CORE COMPLETENESS	the extent of the EPG includes descriptions for all core elements (schemes, activities, roles, work product, and resources (some of them)).	Existence of: overview, schemas, activities, roles, work products, and core resources (templates).	**4**	All features are present. However, an organized lifecycle scheme is missing. Templates are provided partially.
Structural (static)	S.2 STRUCTURENESS	the extent of the EPG exhibits logical coherence on the arrangement of knowledge units (elements).	Level of logical order, logical hierarchy of components, and adequate balance of textual and graphic content.	**4**	High logical order and links among core elements. However, missing data (process, roles, products).
Structural (static)	S.3 AESTHETIC	the extent of the EPG is perceived by users as pleasant.	Existence of a pleasant GUI, readable fonts, and clear visualization of components.	**4**	High. Some texts are not clear by font sizes.
Structural (static)	S.4 SUPPORT COMPLETENESS	the extent of the EPG includes descriptions for support elements (resources (guidances, templates, concepts, tools)).	Existence of support resources: guidelines, concepts, examples, and tools.	**4**	High. Tools, references, glossary.
Functional (dynamic)	F.1 EASINESS OF USE	the extent of the EPG is perceived by users as not cognitive demanding.	Levels of easiness of learning, easiness of navigation, and not difficulty for locating some important element.	**5**	Very High.
Functional (dynamic)	F.2 SOPHISTICATION	the extent of the EPG includes complementary tools (for recording, processing, and tracking process data).	Existence of advanced user support: access to external documents, record and tracking tools, expert advice.	**3**	Moderate. No advanced features are reported.
Functional (dynamic)	F.3 PERFORMANCE	the extent of the EPG executes consulting tasks in adequate response times.	Response time, used computational resources for running it.	**5**	Very High.
Functional (dynamic)	F.4 USEFULNESS	the extent of the EPG is perceived by users as a better alternative of current used documents for process guidance.	Fasten tasks, enhance effectiveness, improve overall quality of tasks.	**4**	Very High. For academic projects. For real projects core information is missing.
Functional (dynamic)	F.5 VALUE	the extent of the EPG is perceived by users as a tool which delivers value (by increase of user performance and/or reduction of constrains).	Perceived value on time saving, perceived value on money saving, perceived value for information and knowledge delivered by tool.	**4**	High. Tool is free.

Category	Attribute	Description	Features	EPG: MOF 4.0	
				Score	
Structural (static)	S.1 CORE COMPLETENESS	the extent of the EPG includes descriptions for all core elements (schemes, activities, roles, work product, and resources (some of them)).	Existence of: overview, schemas, activities, roles, work products, and core resources (templates).	**3.5**	All features are present. However, roles are not linked to activities. Templates are also partially provided (and these are not related with I/O).
Structural (static)	S.2 STRUCTURENESS	the extent of the EPG exhibits logical coherence on the arrangement of knowledge units (elements).	Level of logical order, logical hierarchy of components, and adequate balance of textual and graphic content.	**3.5**	Moderate logical order. Roles and Templates are not well related to processes and activities.
Structural (static)	S.3 AESTHETIC	the extent of the EPG is perceived by users as pleasant.	Existence of a pleasant GUI, readable fonts, and clear visualization of components.	**3.5**	Moderate. Few diagrams.
Structural (static)	S.4 SUPPORT COMPLETENESS	the extent of the EPG includes descriptions for support elements (resources (guidances, templates, concepts, tools)).	Existence of support resources: guidelines, concepts, examples, and tools.	**4**	High. Tools, references.
Functional (dynamic)	F.1 EASINESS OF USE	the extent of the EPG is perceived by users as not cognitive demanding.	Levels of easiness of learning, easiness of navigation, and not difficulty for locating some important element.	**3**	Moderate. Some documents are linked but most of them are not.
Functional (dynamic)	F.2 SOPHISTICATION	the extent of the EPG includes complementary tools (for recording, processing, and tracking process data).	Existence of advanced user support: access to external documents, record and tracking tools, expert advice.	**3**	Moderate. No advanced features are reported.
Functional (dynamic)	F.3 PERFORMANCE	the extent of the EPG executes consulting tasks in adequate response times.	Response time, used computational resources for running it.	**3**	Moderate. It is needed to access the external website.
Functional (dynamic)	F.4 USEFULNESS	the extent of the EPG is perceived by users as a better alternative of current used documents for process guidance.	Fasten tasks, enhance effectiveness, improve overall quality of tasks.	**4**	High. However, core documents are missing.
Functional (dynamic)	F.5 VALUE	the extent of the EPG is perceived by users as a tool which delivers value (by increase of user performance and/or reduction of constrains).	Perceived value on time saving, perceived value on money saving, perceived value for information and knowledge delivered by tool.	**4**	High. Tool is free.