8-6-2011

Towards a Design for IT Performance Management

Kaveh Mohajeri
Virginia Commonwealth University, mohajerik@vcu.edu

Towards a Design for IT Performance Management

Kaveh Mohajeri
School of Business
Virginia Commonwealth University
mohajerik@vcu.edu

ABSTRACT

This paper provides a report on the first iteration of a design-driven research project for delivering an IT performance management (ITPM) solution. This research is situated in the context of existing IT performance related studies. Design science research (DSR) is the underpinning research approach for crafting the ensuing ITPM solution. Three challenges in the ITPM area are identified and a design to meet the challenges is proposed. This is followed with a recapitulation of what the research covered in order to develop and evaluate the design. The evaluation results show that the totality of the design is acceptable. Contrary to the mainstream IS literature, this research takes a design approach to create a solution which goes beyond only the technical and which is based on commonly neglected stakeholder-oriented theories in ITPM. Implications of taking the design approach are discussed.

Keywords

Design science research, IT stakeholders, IT governance, Iran

INTRODUCTION

This paper recounts a one-year research project which was done in the IT governance (ITG) domain in general and ITPM area in particular. The research project involves the first iteration of a design-driven inquiry aimed at answering this question: "What would be a good design for a new ITPM solution which could be considered an improvement to the existing ITPM approaches?" For a better understanding of this question, it would be a good to situate the research reported in this paper among existing IT performance related studies.

Although IT performance related inquiries address demonstrating and enhancing the values received from exploiting information and communication technologies in business settings, there are several equally insightful research streams which try to demonstrate and enhance those values through different viewpoints (Brown and Grant, 2005; Seddon, Graeser and Willcocks, 2002; Wilkin and Chenhall, 2010). One major stream is about evaluation of IT performance and – following the "Mismeasurement" problem cited by Brynjolfsson (1993) – tries to propose new sorts of measures and metrics (i.e. shift from the measurement of tangibles to the measurement of intangibles) for the sake of justifying the ever-increasing magnitude of IT investments (e.g., Irani, 2010; Irani and Love, 2008; and Willcocks and Lester, 1999). Another stream focuses on IT performance related decision-making and management structures and – also following the "Mismanagement" problem cited by Brynjolfsson (1993) – comes up with some emergent concepts and frameworks, one of the most important of which is ITG (e.g., Huang, Zmud and Price, 2010; Van Grembergen and De Haes, 2009; and Weill, 2004). Another more practical stream can be distinguished in which ITG is being considered a meta-managerial framework which considers IT performance measurement (ITPm) as one of its focus areas (e.g., ITGI, 2003; Wilkin and Chenhall, 2010).

Among all of the aforementioned research streams, the last is the closest to the adopted position presented in this manuscript. However, there are two important distinctions between the last stream and the position adopted in this paper. First, the proposed design in this article is for ITPM, rather than just for ITPm. In fact, the proposed design affects some important aspects such as IT performance goals, IT strategies, and IT projects and capabilities; hence the ITPM concept can better reflect its nature. This consideration can strongly be supported by speculating on the IT balanced scorecard (ITBSC) which is the dominant framework for providing performance management capabilities of which measurement is a part (Van Grembergen, Saull and De Haes, 2003; Wilkin and Chenhall, 2010). Second, while most of the past studies in all of the three research streams are concerned with creating value just for business and or users/customers (Brown and Grant, 2005; Seddon et al., 2002; Wilkin and Chenhall, 2010), the design proposed in this article aims to view the goodness of IT performance outcomes based on a more balanced approach which also involves other actual IT performance stakeholders -- namely, those who are impacted by or should contribute to IT performance.

In the rest of this paper, I first concentrate on the term "design" and discuss the underlying inquiry method for responding to the aforementioned research question. Next I proceed from the inventory of past approaches already taken toward ITPM, and

come up with some challenges. Then, I focus on providing a response to the research question by proposing an ITPM solution which addresses the diagnosed challenges. In the following part, the developmental activities of the solution will be presented in terms of two distinct sub steps: theoretical validation and practical realization. Evaluation of the proposed solution will be another part. I conclude with a discussion of some gained results and experiences.

METHODOLOGY: DESIGNING A WORKING SOLUTION

Compatible with what Gregor (2006) identifies as "theory for design and action," the central goal of this piece of research is to *prescribe* a solution for managing the IT performance in organizations. Influenced by the abovementioned type of theory, the underpinning epistemological approach taken in this study is DSR (Hevner and Chatterjee, 2010; Hevner, March, Park and Ram, 2004). I have followed the steps of Vaishnavi and Kuechler's (2004) general methodology of DSR (see Figure 1) to identify the problem, to suggest a solution, and to develop and evaluate that solution. Furthermore, in accordance with what is shown in Figure 1 as the knowledge flows (i.e. the first column), I gained invaluable knowledge through conducting the inquiry. While some parts of this knowledge (i.e. academic experts' comments) helped me in revising the proposed design during the theoretical validation sub step, other parts (e.g., lessons learned in the practical realization sub step and results of the evaluation step) will be used in the next iteration of the inquiry.

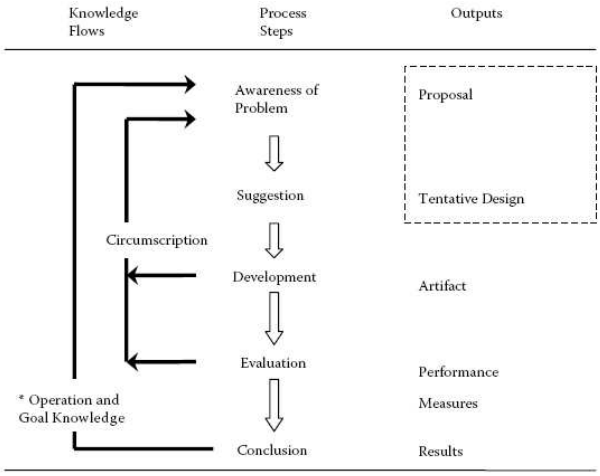

Figure 1. The General Methodology of DSR (Vaishnavi and Kuechler, 2004)

Additionally, according to the third column in Figure 1, another major aspect is the outputs. In addition to the *proposal*, the *performance measures* and the *results*, this study also provides the ITPM design in terms of the *tentative design* and the *artifact*. While the *tentative design* just includes proposed theoretical components (i.e. *concepts*, *conceptual model*, *algorithm*, and *ITPM maturity model*), the *artifact* refers to the two following items (see Hevner et al., 2004; Lee, 2007; Vaishnavi and Kuechler, 2004):

(1) *Theoretical artifact*: validated *concepts*, *conceptual model*, *algorithm*, and *ITPM maturity model*;

(2) *Practical artifact*: *instantiation* which, in this paper, means realization *action* in an organizational setting.

AWARENESS OF PROBLEM: CHALLENGES IN THE ITPM AREA

Based on a comprehensive literature review surveying those parts of the literature mentioned in the introduction as well as some other publications (such as Bardhan, Demirkan, Kannan, Kauffman and Sougstad, 2010; Graeser, Willcocks and Pisanias, 1998; Hallikainen, Hu, Frisk, Päivärinta, Eikebrokk and Nurmi, 2006; Hitt and Brynjolfsson, 1996; Kang and Bradley, 2002; Parker, Benson and Trainor, 1988; and Van Grembergen and Van Bruggen, 1997), I distinguished four varied approaches. Each of these approaches has its own assumptions, strengths and weaknesses. The most important aspects of the approaches are summarized in Table 1.

Approaches	Assumptions	Strengths	Weaknesses
Financial Mostly can be mapped to the "IT as a cost center" viewpoint by Venkatraman (1997)	• All of the IT benefits are tangible and quantifiable and can be stated quantitatively	• Ability to quantify the tangible costs and benefits of IT in an effective and accurate way • Well-founded theoretical support	• Unable to address the intangible costs and benefits • Does not solve the "productivity paradox of IT"
IT – Business – Value Management Mostly can be mapped to the "IT as an investment center" viewpoint by Venkatraman (1997)	• IT is like a merchandise • The value for "business" (i.e. benefits divided by investments) should be maximized	• Ability to make IT impacts more vivid for businesses • Involving some intangible criteria	• In terms of stakeholders, it mostly has a business-centric view • Mainly, the focus is on the forward-looking activities (i.e. new projects or capabilities)
IT Service Management Mostly can be mapped to the "IT as a service center" viewpoint by Venkatraman (1997)	• The heavy focus should be on the "users" • IT should be conceived as a service, hence the quality of service is the critical factor	• Significant role in considering IT a service-oriented supporting body for businesses	• In terms of stakeholders, it mostly has a user/customer-centric view • Mainly, the focus is on the current activities (i.e. functions or processes)
ITBSC Originally based on Van Grembergen and Van Bruggen (1997), and Graeser et al. (1998)	• IT performance should be viewed in terms of four perspectives • All of IT performance objectives and criteria should be originated from strategies	• Balanced view toward IT performance that is not just based on financial criteria • Addressing both scopes of IT performance	• In terms of stakeholders, it mostly addresses a combination of business-centric and user/customer-centric views • Presumes a fixed framework toward IT performance management

Table 1. The Four Major Approaches to ITPM

For assessing the suitability of taking the above approaches in ITPM practices, I decided to examine whether each of these approaches has a balanced view toward IT performance. This balanced view can be examined in each of the approaches through at least three critical questions which are based on some pre-existing notions and classifications (see Chan, 2000; Seddon et al., 2002; Venkatraman, 1997; Wilkin and Chenhall, 2010):

- Which types of IT performance criteria are taken into consideration?
- Which IT performance scopes are taken into consideration?
- Which groups of IT performance stakeholders are taken into consideration?

While all of the four approaches, at their core, involve gauging and enhancing the values of exploiting IT in business settings, their weaknesses, which are listed in Table 1, can be categorized into the following three challenges. These are challenges with which the four approaches are confronted as they try to response to the above three questions:

(1) Except the ITBSC approach, other approaches do not address the complete spectrum of performance measure types (i.e. from efficiency to effectiveness and then, readiness for the future);

(2) Except the ITBSC approach, other approaches are just focused on one performance scope (i.e. IT functions or IT projects);

(3) Each of the approaches only addresses limited groups of stakeholders as receivers of the values of exploiting IT in organizations.

Therefore, the *proposal* – as the output of this step (see Figure 1) – would be an ITPM design that (1) considers both quantitative and qualitative measures, (2) pays attention to both IT functions and IT projects as the two fundamental IT performance scopes, and (3) includes all stakeholders who are impacted by or should contribute to IT performance. In fact, this ITPM design should not take any pre-established, biased attitude toward one or two specific group(s) of stakeholders;

instead, it should let CIOs conduct stakeholder analysis steps to find out what stakeholder groups are more important in any given organization and at any time. In this way, the designed solution seems to be more dynamic and responsive to environmental changes which would be reflected in the consequent, contingent performance measures. Moreover, taking this stakeholder-oriented approach can be a significant step toward shaping IT as a true "value center" as described by Venkatraman (1997).

PROPOSED DESIGN FOR MEETING THE CHALLENGES

Companies in general, and IT departments in particular, operate in socio-economic environments in which expectations and contributions of actual stakeholders are a key factor in effective managerial and decision making procedures (Bryson, 2004; Korac-Kakabadse and Kakabadse, 2001). Following this sense of stakeholder orientation, a new generation of organizational performance management solutions has emerged in the past few years. In this new generation, there are, at least, two common beliefs: (1) for setting performance objectives, the focus should be on the stakeholders' needs and contributions, rather than the preset corporate strategies, and (2) there should not be any fixed, pre-established set of performance criteria, but instead, they should be specified during the performance management action based upon the revealed conditions and needs (Green and Jack, 2004; Jack, 2002; Neely, Adams and Crowe, 2001).

Bringing the above notions into the realm of ITPM, I was mindful of two new generation performance management solutions (i.e. "Performance Prism" by Neely et al., 2001, and "Value Mapping" by Jack, 2002) for crafting an ITPM solution. Moreover, I speculated on the "Stakeholder Typology" model proposed by Mitchell, Agle and Wood (1997) to conceptualize and operationalize the stakeholder analysis aspects of the solution. Consequently, I came up with a *tentative design* of the solution – as the output of the *suggestion* step (see Figure 1) – that includes:

(1) The *conceptual model* which represents the relationships between 19 *concepts* (see Figure 2). This model shows the complete story that is running in the background of the solution. For example, the relationships between the first three concepts can be narrated as: "Potential Stakeholders" should be casted into "Ranked Stakeholders," and on that basis, "Ranked Actual Stakeholders" should be determined. Considering the provided guide box in Figure 2, we can extract the other narrations in the same way.

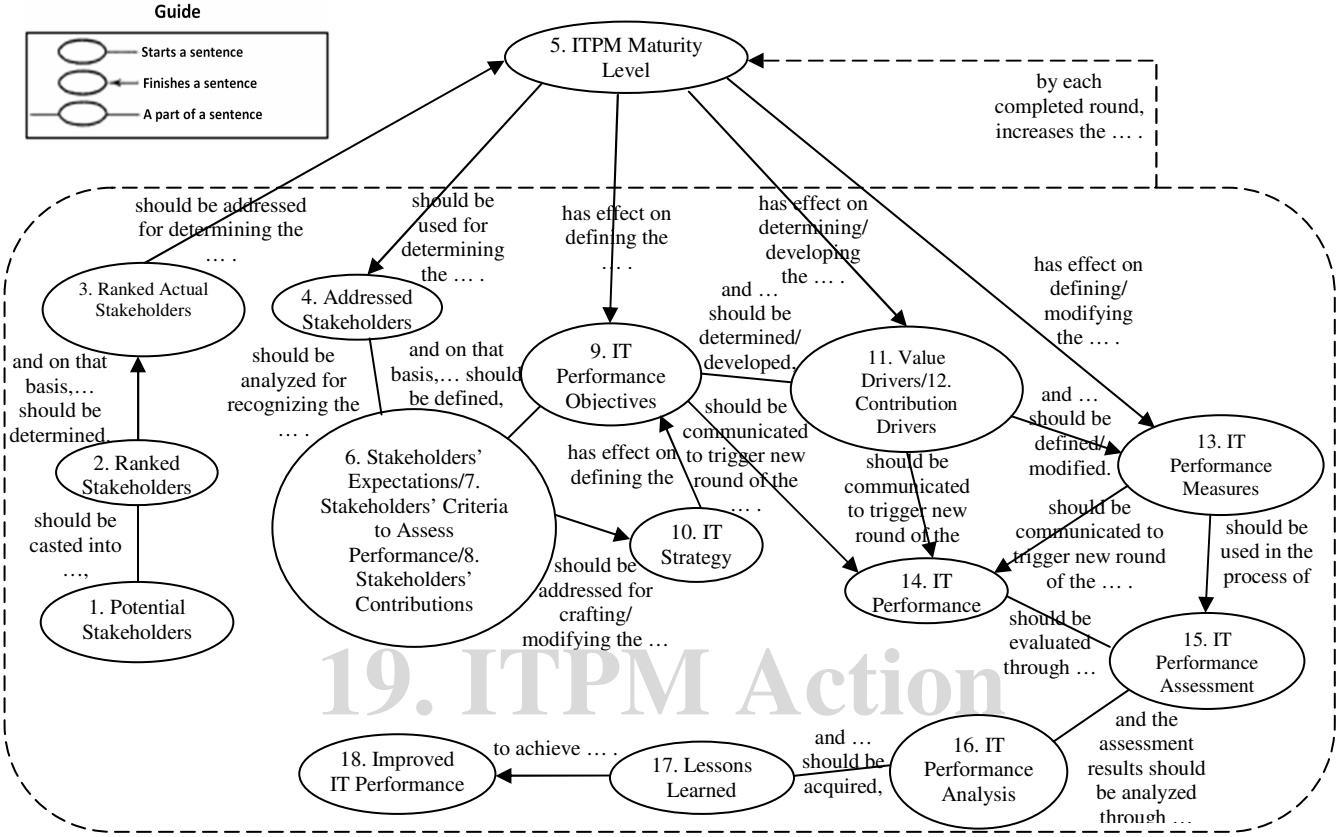

Figure 2. The Conceptual Model in the Tentative Design (Its Theme is Adapted from Checkland's (1999) "Formal System Model")

(2) The *algorithm* which shows performing the ITPM action in 12 steps (see Figure 3).

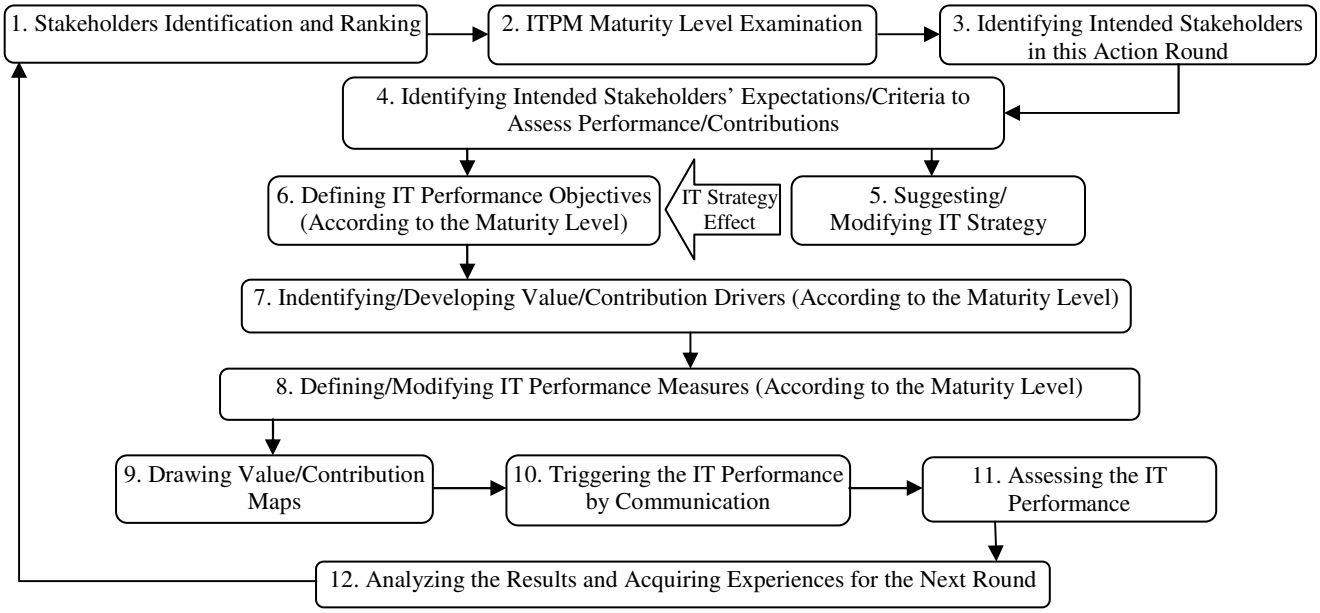

Figure 3. The Algorithm in the Tentative Design

(3) The *ITPM maturity model* which is designed to specifically reflect the fifth concept (i.e. ITPM Maturity Level) (see Figure 4). In fact, the asserted need for such a maturity model by some authors (e.g., Gomolski, 2004) led to crafting this model from scratch. Having six levels of maturity, this 3D model can provide a balanced guidance for IT managers in the way of ITPM action. The model suggests that any given ITPM action should become mature in terms of three dimensions: stakeholder groups, performance criteria, and performance scope. Among the stakeholder groups, first class stakeholders are those few, most important ones. In the other dimension, the highest maturation level for performance criteria is based on what is characterized as "balanced view toward performance" by the balanced scorecard (BSC) approach. So, this highest level covers three aspects of performance: efficiency, effectiveness, and future readiness. Hence, in summary, this model can lead any ITPM action to proceed from the first level – a cube with three aspects of IT projects, first class stakeholders and efficiency criteria – and to continue in an accumulative manner to reach the full matured status (i.e. the sixth level) – a cube with three aspects of IT projects and IT functions, third class of stakeholders, and BSC level performance criteria.

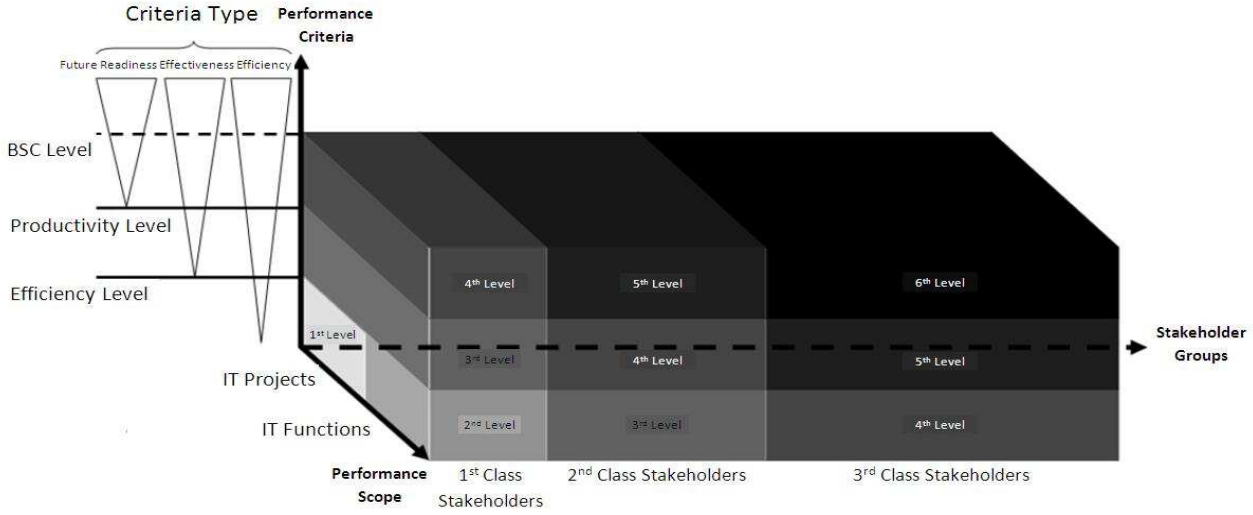

Figure 4. The ITPM Maturity Model in the Tentative Design

DEVELOPMENT: VALIDATION AND REALIZATION OF THE PROPOSED DESIGN

Theoretical Development: Validation of the Proposed Design

The *theoretical artifact* in this research was achieved through conducting a construct validation survey. Viewpoints of 14 academic experts were gathered through an elaborate questionnaire[1] which covers all aspects of the *tentative design* and includes both structured (i.e. based on the five-point Likert scale) and open questions. Statistical analysis of responses to the structured questions showed that the totality of the solution is approved (see Figure 5). However, content analysis of responses to the open questions revealed that, from the experts' points of view, there are some partial bugs. There were seven bugs, four of which received high weights (see Table 3) based on using the "Shannon Entropy" method (see Shannon, 1948).

		Category	N	Observed Prop.	Test Prop.	Exact Sig. (1-tailed)
C	Group 1	<= 3	0	.0	.6	.000[a]
	Group 2	> 3	14	1.0		
	Total		14	1.0		
CM	Group 1	<= 3	0	.0	.6	.000[a]
	Group 2	> 3	14	1.0		
	Total		14	1.0		
AL	Group 1	<= 3	0	.0	.6	.000[a]
	Group 2	> 3	14	1.0		
	Total		14	1.0		
MM	Group 1	<= 3	3	.2	.6	.004[a]
	Group 2	> 3	11	.8		
	Total		14	1.0		
WHOLE	Group 1	<= 3	0	.0	.6	.000[a]
	Group 2	> 3	14	1.0		
	Total		14	1.0		

Figure 5. The Output of Non-parametric Binomial Test (C: Concepts, CM: Conceptual Model, AL: Algorithm, and MM: Maturity Model)

What the Bug Affects	Description of the Bug
The Concepts The Conceptual Model	Implementation of "Lessons Learned" is a necessity for achieving "Improved IT Performance."
The Conceptual Model	The "ITPM Action" does not necessarily increase the "ITPM Maturity Level" per round; instead, multiple rounds may be needed.
The Conceptual Model	The seventh concept (i.e. Stakeholders' Criteria to Assess Performance) should be separated from the two other concepts (i.e. Stakeholders' Expectations and Stakeholders' Contributions) since its direct effect on "IT Performance Measures" should be addressed.
The Algorithm	The feedback arrow can also point to the other steps, not just the first one. This means that the next round can also be started from the steps 4, 6, 7 and or 8.

Table 3. The High-weighted Bugs

These four bugs led to an increase in the number of *concepts* to 20 (i.e. by adding the "Implementation of Lessons Learned" concept). Additionally, the *conceptual model* and the *algorithm* were revised (see Figures 6 and 7) while the *ITPM maturity model* remained unchanged.

[1]. The questionnaire's reliability was assessed through calculating the Cronbach's Alpha (0.941). Moreover, its validity was examined and approved by five academic experts.

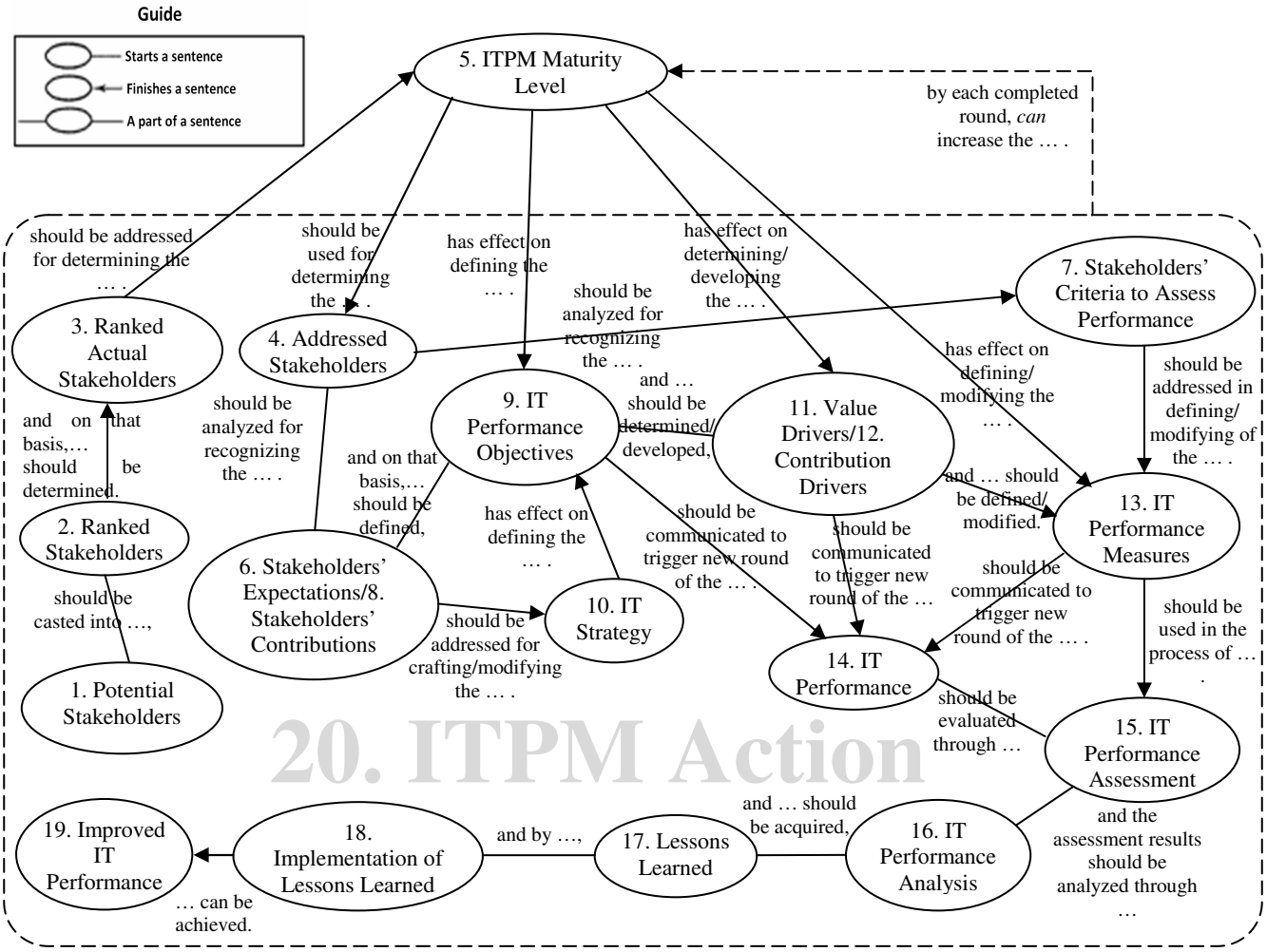

Figure 6. The Conceptual Model in the Theoretical Artifact

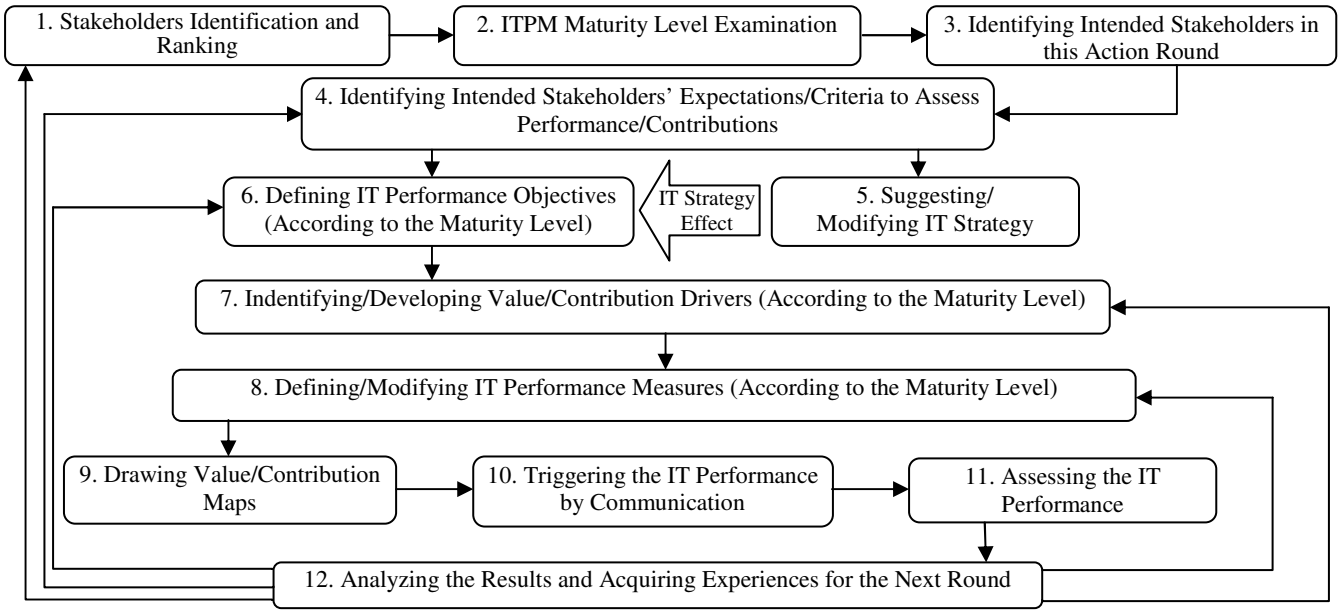

Figure 7. The Algorithm in the Theoretical Artifact

Practical Development: Realization of the Proposed Design

For the purpose of *instantiation*, I selected an Iranian organization which acts as an industrial policy maker and implementer. The ITPM solution was realized in the "Statistics and Information Management" (SIM) department of this organization. This department consists of six employees and provides the whole organization with IT services (i.e. software and hardware), among others. The as-is status of the department showed a serious need for revising ITPM practices. So, we (i.e. I along with SIM's employees) started the realization of the ITPM solution by identifying and ranking the stakeholders. Then, we came up with the maturity as being at the 2nd level. On that basis, we identified those stakeholders who should be addressed in that specific ITPM action round (i.e. higher level managers and Ministry of Industry) and gathered their expected values and contributions through some designed forms. Based on the extracted values and contributions, we defined performance objectives and made suggestions for modifying SIM's strategy. After that, we defined "value drivers" and performance measures. However, this realization endeavor was stopped by the 9th step of the *algorithm* (i.e. "Drawing Value/Contribution Maps") due to some organizational constraints. Figure 8 shows one of the drawn "value maps" which act as visual communication tools in ITPM actions (see Green and Jack, 2004, for some good definitions of "value drivers" and "value maps").

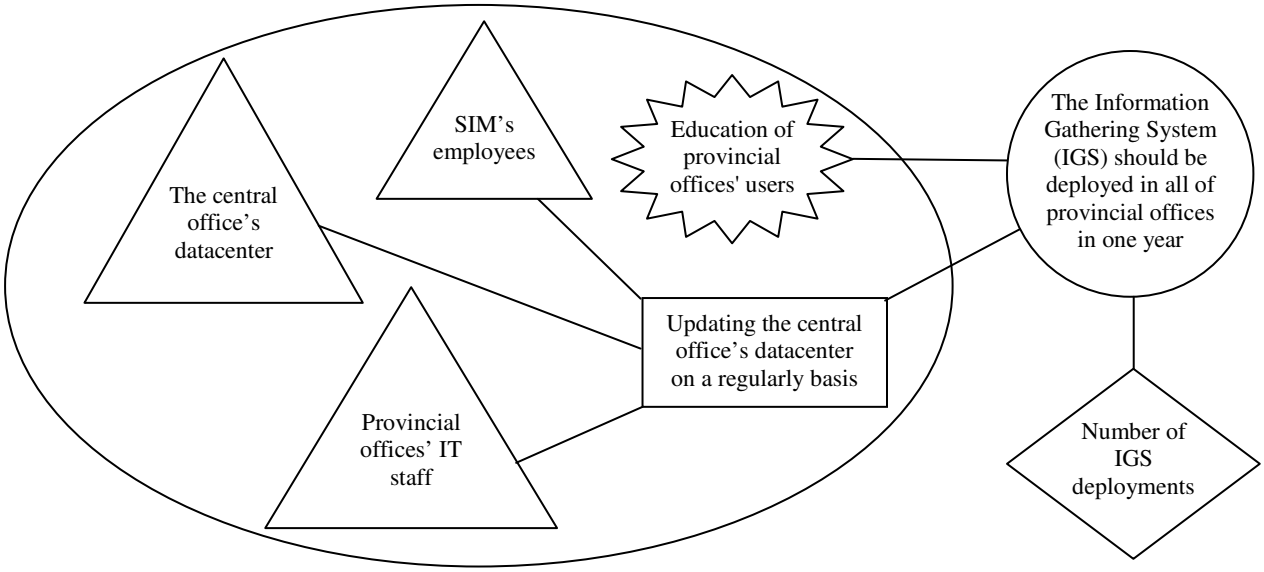

Figure 8. A Drawn Value Map (Circle: Objective, Diamond: Performance Measure, Oval covers all of Value Drivers, Star: Project, Rectangle: Function, Triangle: Capability)

In spite of the fact that the *instantiation* was incomplete, I learned some important lessons which can be reflected by the following items:

- It seems a good idea to define some criteria for assessing the stakeholders' contribution to IT performance. These criteria should be defined by stakeholders and used as another basis for defining performance objectives and drivers.
- The "IT Strategy Effect" arrow in the *algorithm* should be removed because the "Suggesting/Modifying IT Strategy" activity has no effect on the "Defining IT Performance Objectives" activity. Instead, it is the existing IT strategy that has effect on the "Defining IT Performance Objectives" activity.
- Benchmarking from other parts of organization or other companies should be taken into consideration, especially during the "Defining/Modifying IT Performance Measures" activity.
- During the realization endeavor, some previously unknown procedures were developed, and including them in the next version of the solution's *algorithm* should be perused.

EVALUATION OF THE PROPOSED DESIGN

The proposed ITPM design was evaluated through the *observational* approach and by the *case study* method (Hevner et al., 2004, p. 86). This evaluation was done by conducting structured interviews with four SIM employees (i.e. SIM's manager plus three other employees) that were engaged in the *practical development* step. These interviews were based on key success factors of performance management solutions that were extracted from some parts of the literature such as Neely, Mills,

Platts, Richards, Gregory, Bourne and Kennerley (2000) and Najmi, Rigas and Fan (2005). The success factors were expressed in 13 sentences. Then, comments of the four employees, as practical experts (PEs), were gathered and finally reflected on the 5-point Likert scale (see Table 4).

Measures	PE 1	PE 2	PE 3	PE 4	Average
1. Taking stakeholders' expectations into account	4	2	5	4	3.75
2. Structured and systematic process for defining objectives, drivers and measures	5	1	3	2	2.75
3. Feasibility of defining objective performance goals	4	4	4	4	4
4. Feasibility of revising the performance objectives due to environmental changes	5	4	4	4	4.25
5. Nonfinancial measures are foreseen	4	4	3	4	3.75
6. Feasibility of revising the performance measures due to environmental changes	5	4	4	3	4
7. Facility for realizing the relationships between objectives, drivers and measures	4	5	3	5	4.25
8. Providing quick feedback	3	1	2	3	2.25
9. Providing continuous improvement of the performance	4	5	1	4	3.5
10. Sensitiveness to changes in external and internal environments	5	4	3	5	4.25
11. Performance assessment from several aspects	4	1	3	5	3.25
12. Reliability	5	1	3	3	3
13. Easiness of application	2	5	3	1	2.75
Average	4.15	3.15	3.15	3.61	**3.52**

Table 4. The Practical Experts' Scores

As it is shown in Table 4, the totality of the ITPM solution received an acceptable score (i.e. 3.52). However, average scores for the 2nd, 8th, and 13th sentences showed the possibility of the presence of some problems. In this way, there can be three possible reasons: (1) defects in the design of the solution, (2) weak presentation and communication of the solution's aspects and functionalities, and (3) incomplete realization of the solution. In terms of the first reason, it seems that the main problem, in the first place, is rooted in the algorithmic aspect rather than the conceptual side. Hence, some remedial speculations should be made regarding the *algorithm* in terms of its general procedure, feedback mechanisms, and application ease. The second reason can be treated by conducting in-depth interviews – containing open-ended questions – with PEs for better interpreting their understanding of what constitutes a good ITPM solution. Using this interpretive/hermeneutical approach, one can get good ideas about what factors should be considered during the presentation and communication phase. Finally, the third reason can be addressed by fully accomplishing the *practical development* step with the aim of giving a more complete picture of the solution to the PEs as well as impacting a broader range of stakeholders whose feedback about the ITPM solution can be beneficial.

DISCUSSION AND CONCLUSION

While the current IS literature consists of mostly technical design-driven studies, in this research effort, I have taken the design approach for creating a solution that goes beyond the technical. Along these lines, this paper has reported an IS inquiry with good levels of relevance in so far as it proposes a solution which can be productive in solving, improving, or at least managing a specific real world problem. Meanwhile, in this inquiry, I have also tried to deliver rigor, for example, by involving survey and content analysis methods. Moreover, as one of the few instances of stakeholder-oriented ITPM studies, the work in this paper introduced some novel adaptations of existing stakeholder-oriented theories and solutions for dealing with the ITPM area's challenges. On the other hand, by taking the design approach, this research can be viewed as a step toward what Lee (2010) refers to as the prospect of IS research in the next 25 years "in which research in IS no longer models itself on the research disciplines found in the natural and social sciences, but instead … [it models] itself on the research disciplines found in the professions" (p. 338).

Along with its contributions, the research presented in this paper has its limitations. For instance, the surveyed academic experts did not completely understand the *ITPM maturity model*, so I could not obtain useful feedback about this component. Hence, in the next iteration of the inquiry in the future, I need to find out what else I can do to improve and validate this model. Furthermore, it should be noted that organizational settings, as environments for the *development* and *evaluation* of

designs, should be selected carefully. We should ask ourselves whether a specific organizational setting is sufficient for covering and realizing all aspects of any proposed design. Moreover, it seems that for designing soft (or social) artifacts, which addresses "wicked problems" in organizational settings, we need a more dynamic, human-based design procedure. In this case, the design process itself should be designed. Hence, the matter of "how" may, at least, be as important as the matter of "what" when we design organizational artifacts. A possible way to address the matter of "how" would be to direct or redirect our attention to complementary ways of doing research – adding a range of perspectives, such as interpretive and positivist, to the design-driven inquiries.

REFERENCES

1. Bardhan, I. R., Demirkan, H., Kannan, P. K., Kauffman, R. J., and Sougstad, R. (2010) An interdisciplinary perspective on IT services management and service science, *Journal of Management Information Systems*, 26, 4, 13–64.
2. Brown, A. E. and Grant, G. G. (2005) Framing the Frameworks: A Review of IT Governance Research, *Communications of the Association for Information Systems*, 15, 696-712.
3. Brynjolfsson, E. (1993) The productivity paradox of information technology, *Communications of the ACM*, 36, 12, 67-77.
4. Bryson, J. M. (2004) What to do when stakeholders matter, *Public Management Review*, 6, 1, 21-53.
5. Chan, Y. E. (2000) IT Value: The great divide between qualitative and quantitative and individual and organizational measures, *Journal of Management Information Systems*, 16, 4, 225-261.
6. Checkland, P. (1999) Systems Thinking, Systems Practice: Includes a 30-Year Retrospective, Wiley, UK.
7. Gomolski, B. (2004) The evolution of IT performance management, Gartner, Inc.
8. Graeser. V., Willcocks, L. P. and Pisanias, N. (1998) Developing the IT scorecard, Business Intelligence Ltd., Wimbledon, London, UK.
9. Green, A. N., and Jack, A. (2004) Creating stakeholder value by consistently aligning the support environment with stakeholder needs, *Facilities*, 22, 13/14, 359–363.
10. Gregor, S. (2006) The nature of theory in information systems, *MIS Quarterly*, 30, 3, 611–642.
11. Hallikainen, P., Hu, Q., Frisk, E., Päivärinta, T., Eikebrokk, T. R. and Nurmi, A. (2006) The use of formal IT investment evaluation methods in organizations: A survey of European countries, *Proceedings of the Twelfth Americas Conference on Information Systems*, Acapulco, Mexico.
12. Hevner, A., March, S., Park, J. and Ram, S. (2004) Design science in information systems research, *MIS Quarterly*, 28, 1, 75-105.
13. Hevner, A.R. and Chatterjee, S. (2010) Design research in information systems, Integrated Series in Information Systems, 22, Springer.
14. Hitt, L. M. and Brynjolfsson, E. (1996) Productivity, business profitability and consumer surplus: Three different measures of information technology value, *MIS Quarterly*, 20, 2, 121-142.
15. Huang, R., Zmud, R. W. and Price L. (2010) Influencing the effectiveness of IT governance practices through steering committees and communication policies, *European Journal of Information Systems*, 19, 3, 288-303.
16. Irani, Z. and Love, P.E.D. (2008) Evaluating information systems: Public and private sector, Butterworth-Heinemann, UK.
17. Irani, Z. (2010) Investment evaluation within project management: An information systems perspective, *Journal of the Operational Research Society*, 61, 6, 917-928.
18. IT Governance Institute (ITGI) (2003) Board briefing on IT governance, Available at: http://www.itgi.org.
19. Jack, A. (2002) Value mapping - A second generation performance measurement and performance management solution, *Proceedings of the Third International Conference on Theory and Practice in Performance Measurement*, Boston, MA, USA.

20. Kang, H. and Bradley, G. (2002) Measuring the performance of IT services: An assessment of SERVQUAL, *International Journal of Accounting Information Systems*, 3, 3, 151-164.
21. Korac-Kakabadse, N. and Kakabadse, A. (2001) IS/IT governance: Need for an integrated model, *Corporate Governance*, 1, 4, 9–11.
22. Lee, A. S. (2007) Action is an artifact: What action research and design science offer to each, in Ned Kock (Ed.) *Information Systems Action Research: An Applied View of Emerging Concepts*, New York, Springer, 43-60.
23. Lee, A. S. (2010) Retrospect and prospect: Information systems research in the last and next 25 years, *Journal of Information Technology*, 25, 4, 336-348.
24. Mitchell, R, K., Agle, B. R. and Wood, D. J. (1997) Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts, *Academy of Management Review*, 22, 4, 853-886.
25. Najmi, M., Rigas, J. and Fan, I. S. (2005) A framework to review performance measurement systems, *Business Process Management Journal*, 11, 2, 109-122.
26. Neely, A., Adams, C. and Crowe, P. (2001) The performance prism in practice, *Measuring Business Excellence*, 5, 2, 6-12.
27. Neely, A., Mills, J., Platts, K., Richards, H., Gregory, M., Bourne, M. and Kennerley, M. (2000) Performance measurement system design: Developing and testing a process-based approach, *International Journal of Operations and Production Management*, 20, 10, 1119-1145.
28. Parker, M., Benson, R. and Trainor, H. (1988) Information economics: Linking business performance to information technology, Prentice-Hall, London, UK.
29. Seddon, P. B., Graeser, V. and Willcocks, L. P. (2002) Measuring organizational IS effectiveness: An overview and update of senior management perspectives. *The database for advances in information systems*, 33, 2, 11-28.
30. Shannon, C. E. (1948) A mathematical theory of communication, *The Bell System Technical Journal*, 27, 379-423.
31. Vaishnavi, V. and Kuechler, W. (2004) Design research in information systems, last updated August 20, 2009. URL: http://ais.affiniscape.com/displaycommon.cfm?an=1&subarticlenbr=279, Retrieved on: Dec. 22, 2010.
32. Van Grembergen, W. and De Haes, S. (2009) Enterprise governance of IT: Achieving strategic alignment and value, Springer.
33. Van Grembergen, W., Saull, R. and De Haes, S. (2003) Linking the IT balanced scorecard to the business objectives at a major Canadian financial group, *Journal of Information Technology Cases and Applications*, 5, 1, 23-45.
34. Van Grembergen, W. and Van Bruggen, R. (1997) Measuring and improving corporate information technology through the balanced scorecard technique, *Proceedings of the Fourth European Conference on the Evaluation of Information Technology*, Delft, Netherlands, 163-171.
35. Venkatraman, N. (1997) Beyond outsourcing: Managing IT resources as a value center, *Sloan Management Review*, 38, 3, 51-64.
36. Weill, P. (2004) Don't just lead, govern: How top-performing firms govern IT, *MIS Quarterly Executive*, 3, 1, 1-17.
37. Wilkin, C. L. and Chenhall, R. H. (2010) A review of IT governance: A taxonomy to inform accounting information systems, *Journal of Information Systems*, 24, 2, 107-146.
38. Willcocks, L. P. and Lester, S. (Eds.) (1999) Beyond the IT productivity paradox, Wiley, UK.