December 2004

Toward a capability maturity model for the management of outsourcing information services

Bouchaib Bahli
Concordia University

Toward a capability maturity model for the management of outsourcing information services

Bouchaib Bahli
Department of Decision Sciences and MIS
John Molson School of Business, Concordia University
Montreal, Quebec, Canada
bbahli@jmsb.concordia.ca

ABSTRACT

Research has shown that information technology outsourcing risk and performance are a real concern in client-supplier relationships and for many organizations that have outsourced part or all of their information services, a key issue is that of the maturity level they achieved in their relationship with their suppliers. This paper proposes an adaptation of the Capability Maturity Model, widely used in Software Engineering discipline, to assess outsourcing management maturity levels. Twenty-eight managers participated in this study. The findings suggest that the proposed model is an initial attempt towards assessing the maturity level of outsourcing management. Some implications of these findings for both researchers and practitioners are discussed.

Keywords

Capability Maturity Model, Outsourcing, Outsourcing management, Risk, Performance.

INTRODUCTION

According to the Software Engineering Institute (SEI), the Capability Maturity Model (CMM) for Software describes the principles and practices underlying software process maturity and is intended to help organizations improve the maturity of their software processes (Van der Pijil et al., 1997). The CMM describes five stages or levels that range from the initial chaotic first stage to the fifth and final stage at which an organization is said to be optimizing its process improvement. The upper the level in CMM, the higher the project performance and the lower the risks of failure of such a project.

Although the CMM has been originally developed for the aerospace software contracting environment, it has become more widely popular regardless of the type of the industry an organization operates in (Bamberger, 1997). This increase in popularity is further indicated in the number of organizations, which undergo CMM assessments, which is shown in the Maturity Profile document published by the SEI[1]. As of August 2002, there have been 2325 assessments, in 1756 organizations covering 9632 projects. According to the maturity profile, 70.5% of all organizations assessed are commercial organizations, 24.9% are federal or department of defense organizations, and 4.6% are military organizations. Despite its popularity among software engineering researchers and software practitioners, rarely, there is a discussion in information systems (IS) research, on the value of CMM to software development projects, and more particularly, outsourcing these projects to a third party.

Considering such a widespread use of the CMM in software engineering discipline, there is a need for research on the applicability and value of this model in information technology (IT) outsourcing arrangements. Organizations that outsourced part or all of their information services need to assess their maturity level in terms of IT outsourcing management of their relationship with their suppliers. This would allow them to evaluate their position with regard to the outsourcing performance and risk exposure to unwanted consequences.

[1] http://www.sei.cmu.edu/sema/profile.html

The overall goal of this paper is to develop a capability maturity model for outsourcing management (CMMOM). The contribution of this research is to develop a measure of each maturity level for outsourcing management. The next step, which is not yet done, is to tie each level of the CMMOM to a certain level of risk exposure and outsourcing performance. We hypothesize that the higher the level of maturity of an organization in terms of outsourcing management processes, the higher the outsourcing performance and the lower the risk exposure of failure of the outsourcing arrangement mode. The specific objectives of this study are: (only the first objective was achieved in the present study)

1. To define and develop a sound measure of each of the five levels of the CMMOM.
2. Elaborate and validate, through case studies and a large survey, a framework that links each level of the CMMOM with risk exposure and outsourcing performance. This will certainly lead to enhancing our understanding of outsourcing management maturity.

THEORETICAL BACKGROUND

The Capability Maturity Model for Outsourcing Management

Outsourcing IT services has been growing during the past decade. It was recently estimated that IT outsourcing would reach US$ 156 billion in 2004 (Lacity and Willcocks, 2000). Outsourcing may help achieve major benefits such as cost-savings, increased flexibility, better quality of services and access to new technology. Nevertheless, outsourcing may also lead to failed expected service levels and expected cost savings (Earl, 1996; Willcocks and Currie, 1997). A number of studies have been published to analyze the management of IT outsourcing, and have provided useful insights into the phenomenon (Earl, 1996; Willcocks and Currie, 1997; Aubert, Patry, Rivard, 2002; Bahli and Rivard, 2003). Notwithstanding the contribution of these efforts, systematic studies on the assessment of the maturity of IT outsourcing management are needed. This is the motivation of the present study. Based on CMM in the context of systems development, the proposed research aims at developing a CMM for Outsourcing Management (CMMOM).

Historically, CMM was originally developed by the Software Engineering Institute at the Carnegie Mellon University to assess the maturity of software development processes. Five levels are identified: Initial, Repeatable, Defined, Managed, and Optimized (Herbsleb, 1997; Ingalsbe, Shoemaker, Jovanovic, 2001).

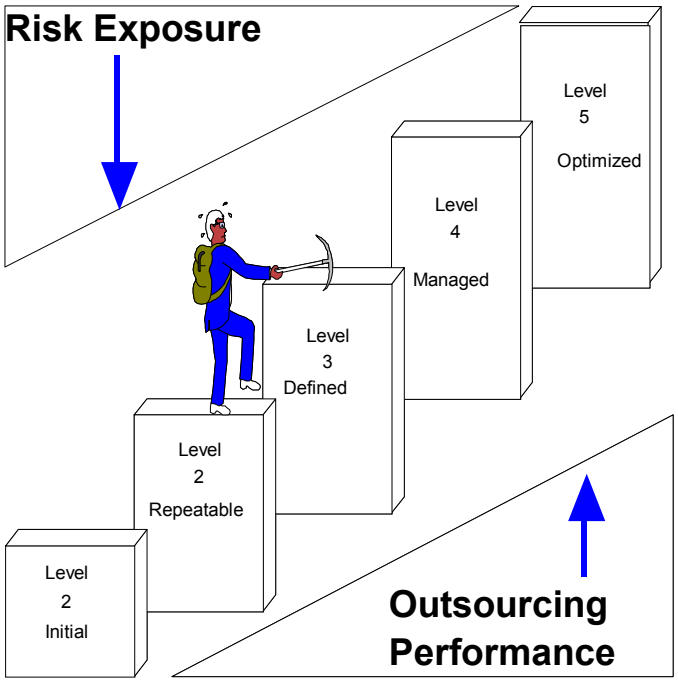

Figure 1*: Capability Maturity Model for Software*

Level 1 – initial, where the software process is characterized as ad hoc and sometimes called chaos. System development projects follow no prescribed process. Each developer uses his or her own tools and methods. Level 2 – repeatable where project management processes and practices have been established to track project costs, schedules, and functionality. The focus is on project management, not systems development. Level 3 – defined where a standard system development process has been purchased or developed, and its use has been integrated throughout the information system /services unit of the organization. Level 4 – managed where measurable goals for quality and productivity have been established. Detailed measures of the standard system development process and product quality are routinely collected. Both the software process and products are quantitatively understood and controlled. Level 5 – optimized where the standardized system development process is continuously monitored and improved based on measures and data analysis established in Level 4.

For each level, the CMM specifies some key process areas. Each key process area is associated with goals that represent the requirements to be satisfied by the process for that key process area (Diaz and Sligo, 1997). At different maturity levels, key process areas can be used for assessing the capability of existing processes as well as for identifying the areas that need to be strengthened so as to move the process from a lower level of maturity to a higher level. We adapted this model to assess the maturity of outsourcing management for IT projects. To do so, we developed five levels distinguished from the outsourcing literature (Murugappan and Keeni, 2003; Ingalsbe et al., 2001; Aubert et al., 2002; Bahli, 2002) as well as a surveying twenty-eight managers involved in IT outsourcing decisions. Section 4 presents the developed framework. The following sections describe risk exposure of outsourcing projects as well as outsourcing performance. At this stage of the research we are only concerned with the development of the five maturity levels of CMMOM.

Risk Exposure

Kaplan and Garrick (Kaplan and Garrick, 1981) argued that three questions ought to be addressed in order to assess risk. These questions are: What can happen? (i.e., What can go wrong?), (2) How likely is it that it will happen?; (3) If it does happen, what are the consequences? Risk exposure is defined as the probability of a certain scenario multiplied by the loss due to that scenario (Eisenhardt, 1989). However, assessing risk via a quantitative evaluation of probabilities has many shortcomings. For example, in many contexts such as software outsourcing projects, such an assessment is almost impossible to perform (Bahli, 2002). In these cases, many risk assessment approaches approximate the probability of a scenario by identifying and assessing situational characteristics likely to influence the occurrence of the scenario (Barki, Rivard, Talbot, 2001). Based on transaction costs and agency theory, one formal definition of the concept of information technology outsourcing risk exposure is proposed (Bahli and Rivard, 2003). This definition is adopted in the proposed research. The likelihood of costs escalation and/or service debasement is influenced by several factors including specific-relationship investments presence, high degree of uncertainty, measurement problems, and the degree of expertise of the supplier with the outsourced activity and/or outsourcing contracts (Williamson, 1985, Bahli, 2002).

Outsourcing Performance

Outsourcing performance refers to the overall organizational advantage gained from outsourcing strategy (Grover, Cheon, Teng, 1996; ae-Nam, 2001). To capture the tangible and intangible advantages of outsourcing, the concept of satisfaction has been increasingly perceived to be the best surrogate for capturing both cognitive and affective components of human actions. Based on an extensive literature review on outsourcing performance, Barthelemy (2003) suggested three dimensions for IT outsourcing performance including (1) overall success which is an indictor that reflects the extent to a which a firm is satisfied with IT outsourcing, (2) cost reduction is another indicator that reflects whether or not IT outsourcing has resulted in lower costs, (3) performance improvement is an indicator that reflects whether IT outsourcing has resulted in better performance. Since there is no uniformed measure for IT outsourcing performance in the IS literature (firms do not always outsource to achieve costs reduction). We adopted a different view of IT outsourcing performance. We conceptualized IT outsourcing performance as the gap between the initial goals set by the client and the outcome of the outsourcing arrangement. The lower the gap (i.e. the outcome is equal or close to the goals originally set by the client) the higher the outsourcing performance.

RESEARCH METHODOLOGY

Data collection

The proposed research consists of a surveying 43 senior managers who attended a seminar on IT outsourcing. The respondents had no obligation to respond to our questions and they were not evaluated to do so, hence, reducing research bias. Only 28 of them accepted to participate in the study. The average year of experience was 13.28. The managers come from different industry sectors. Manufacturing (10), Insurance (2), Entertainment (3), Telecommunications (5), Finance (2) Transportation (2), Construction (1), and Health (2). The selected 28 managers were chosen because of accessibility opportunity. Our choice was partly opportunistic, in that these managers attended this seminar, thus making accessibility less

of a problem. More importantly, these managers met our criteria of suitable cases on information technology outsourcing. These managers were involved at different degrees in IT outsourcing arrangements of their organizations.

After explaining CMM in the context of systems development, we asked the respondents about their perceptions on the maturity level of their organization in terms of managing the outsourcing relationship with their supplier. For instance, if one manager perceived that his or her organization is at level 3 in terms of managing the outsourcing arrangement, he or she needs to explain what constitutes their judgment. All responses were transcribed, interpreted and analyzed. The following section describes the data analysis process. We limit our study to the development of the five levels of CMMOM. Risk exposure and outsourcing performance were already defined and measured in previous research (Bahli, 2002; Barthelemy, 2003) but were not included in this study. The next step of this research is to conduct a survey that validates the relationship between each level of CMMOM, risk exposure and outsourcing performance.

Data analysis

By using only twenty-eight respondents, we are limited in our generalization of results. However, as recommended by Glaser and Straus (Glaser and Straus, 1967), we have produced some explanations of theoretical concepts and patterns (Orlikowski, 1993) of each of the CMMOM levels. Three steps are required: (1) initial analysis of transcripts where the responses were transcribed and analyzed. We highlighted comments about managers' perceived maturity level their organization is at in terms of managing the outsourcing arrangement. (2) Interpretation of transcripts using the maturity levels, presented in Section 2, as a guide to dissect patterns in responses. (3) Analysis of the interpretations. Two people performed this task individually, then, we corroborate both analyses as suggested by Tesch (1990) in order to decontextualize comments. Both individuals agree on the labeling of each level.

RESULTS AND DISCUSSION

To demonstrate how the results were compiled, highlights of each of maturity level are presented. Results of analyzing the data from the managers' responses are displayed below. We note that these responses are not objectives but perceived measures. Figure 2 provides each level of CMMOM.

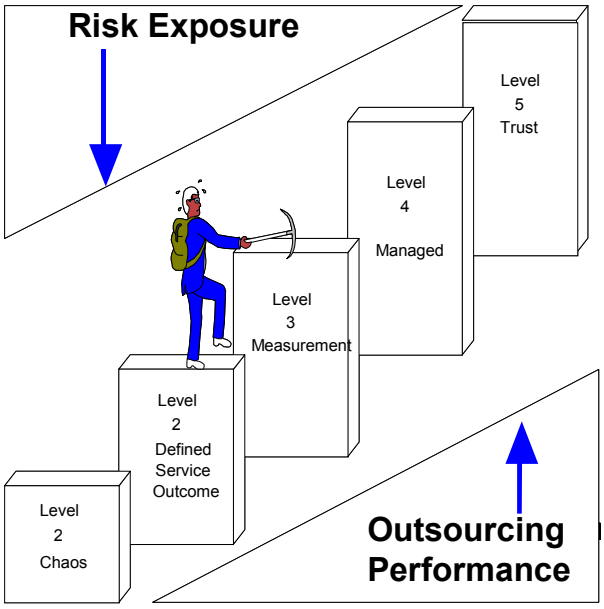

Figure 2*: Capability Maturity Model for Software Outsourcing Management (CMMOM)*

Level 1 (Chaos). This level represents the worse case scenario in managing outsourcing relationships. It is characterized by a narrow contract management focus, misaligned expectations (Persse, 2001), absent Service Level Agreement (SLA) reporting (Murugappan and Keeni, 2003), nonexistent processes, and no foundation to build trust and create value (Lanfield and Smith, 2003).

Level 2 (Defined Service Outcome). To reach this level, defined service outcome needs to be established. It is characterized by well-established SLAs for all outsourcing services, benchmarking strategies in outsourcing contracts, and a relationship management structure (Earl, 1996; Eisenhardt, 1989). This level is equivalent to "Repeatable level" in CMM.

Level 3 (Measurement). Measurement is one of the most difficult issues in the IT industry (Aubert et al., 2002). There is a measurement problem when it is difficult to evaluate fairly the supplier's contribution. A behavioural-based focus addresses supplier processes rather than simply outcomes (Zsidisin and Ellram, 2003). When there is some degree of supply risk, behaviour-based management efforts initiated by the purchasing organization better align suppliers' objectives with those of the buyer's (Anderson and Oliver, 1987). Improved information sharing, monitoring the progress and actions of suppliers, and closer relationships with suppliers are part of a behaviour-based orientation. These approaches also reduce the firm's risk of moral hazard (lack of supplier effort) and adverse selection (inaccurate assessment of supplier abilities) (Eisenhardt, 1989). This level is equivalent to "Defined level" in the original CMM.

Level 4 (Managed). Business and information systems executives continue to struggle with a host of complex issues involved in managing IT investments (Talon, Kreamer, Gurbaxani, 2000). Cronk and Fizgerald (1999) stated that the business value may be reflected in the realization of business goals through well established management mechanisms. In the context of the present study, management mechanisms include the following: decisions are made based on objective data, measurement and analysis at every stage, data on actual performance of the current outsourced projects are compared with past performance, monitoring and corrective action takes place on ongoing basis. If there are deviations proper corrective actions are taken. This level is equivalent to "Managed level" in the original CMM.

Level 5 (Trust). Although the notion of trust has always been at the heart of the management field, in the last few years there has been an explosion of research on trust and its implications for the management of organizations (Jarvenpaa and Leidner, 1999; McKnight, Choudhury, Kacmar, 2002). Trust is important because it helps clients overcome perceptions of uncertainty and risk and engage in "trust-related behaviours" with their suppliers (Johnson and Grayson, 2004). In their survey of articles on trust, Geyskens, Steenkamp, Kumar (1998) described the literature as burgeoning but found that trust was uniformly defined in the dependency continuum of opportunism – risk – trust (Perks and Halliday (2003). We note that trust could be regarded as a factor present in each level of the CMM model. However, since trust involves distributive justice (Wicks et al., (1999), there is knowledge or understanding which underpins the decision to trust, or the act of trusting. In the context of outsourcing arrangements, the knowledge resides in actions, by the supplier, such as SLAs targets are met continually, vendors' delivery processes are based on operations excellence best practices, and the vendor's contribution to business metrics is reported regularly. Innovative ideas are identified and tested proactively by the supplier. Continuous product and process improvement is conducted. The presence of these actions by the supplier are "a proxy" for trust by the client. The findings are summarized in Table 1.

CMMOM Level	*Number of organizations*	*Outsourcing Management Characteristics*
Level 1	*3*	*Narrow contract management focus* *Misaligned expectations* *Absence of SLA reporting* *Nonexistent processes* *No foundation to build trust and create value*
Level 2	19	Defined service outcome Established SLA
Level 3	6	Relationship management structure Improved information sharing Monitoring supplier's actions Closer relationship with supplier
Level 4	0	Decisions are based on objective data Measurement and analysis at every stage Benchmarking Monitoring and corrective actiosn takes place on ongoing basis
Level 5	0	SLAs targets are met continually Vendor's contribution to business metrics is reported regularly Innovative ideas are identified and tested proactively by the supplier Continuous product and process improvement is conducted

Table 1*: CMMOM Levels*

As can be seen from Table 1, most of the responses studied in this research fall below level 3 (79%) of CMMOM. This result shows that these organizations have defined service outcome with well-established SLAs for all outsourcing services, benchmarking strategies in outsourcing contracts, and a relationship management structure. However, there were measurement problems associated with these indicators. In addition, three organizations fall into Level 1. There was no defined contract management focus, misaligned expectations, absent of regular SLA reporting, and nonexistent processes or foundation to build trust and create value. The perceived risk exposure was high and outsourcing performance was scored low. This result is alarming because an organization that is characterized by the attributes of level 1 or level 2 will increase its risk exposure of failure of its outsourcing arrangement. Finally, only six organizations were assessed at Level 3. In this case, there was evidence of improved information sharing, monitoring the progress and actions of suppliers, and closer relationships with suppliers. Both risk exposure and outsourcing performance were rated medium. None of the studied organizations were assessed at either Level 4 (Managed) or Level 5 (Trust). These findings suggest that six organizations need to do more to achieve a well managed level of their relationship with their supplier. In the context of the present study, the trust level is far from achieved. This is in line with prior research on IT outsourcing (Grover et al., 1996) where most of the organizations that outsourced their information services have not achieved or realized yet a high trust level in their outsourcing relationship.

CONCLUSIONS AND FURTHER RESEARCH

As stated in Section 2, the overall goal of the proposed research is to contribute to the development of both information systems research and practice by developing an IT outsourcing management maturity model. To the best of our knowledge, this is the first study that attempts to develop a Capability Maturity Model for Outsourcing Management. More research is, indeed, needed in this area. According to our findings, only 21 % are at level 3 of CMMOM. The majority of organizations in our sample (79 %) are bellow level 3, which is very alarming. The risk of failure of these projects is high as stated by our respondents. These findings corroborate with the widely negative stories about outsourcing software development projects to a third party (Lacity and Willcocks, 2000). Hence, organizations need to assess regularly and monitor their maturity level when it comes to managing their outsourcing arrangements.

The implications of these finding for both researchers and practitioners are the following: at the theoretical level, researchers interested in this area will have a framework of reference of what constitutes each level of the capability maturity model for software outsourcing management. More research is needed to examine how does risk components fluctuate and what makes them do so throughout the contract duration. By furthering our understanding of the mechanisms through which risk components change over time, this research could serve as the basis for future research on the assessment of IT outsourcing risks and its management as well for each level of CMMOM. At the practical level, the implications of the proposed research for software outsourcing managers reside in its ability to provide a tool for assessing an organization's outsourcing management maturity level and the conditions to move to an upper level of the CMMOM model.

Several limitations of the study need to be mentioned at this stage. First, the research design of this study has incorporated only a small sample of twenty-eight managers. We do not know whether these results would apply to other projects and organizations. More empirical work would likely to increment our knowledge in this area. Second, we relied on the respondents' perceptions. Even though, we carefully analyzed patters in their comments, it is, perhaps, worth reiterating the usual cautions about over interpreting results from only a small sample. Applying a combination of case studies and surveys is appropriate in studying information technology services delivery in organizations (Gable, 1994). These limitations do not invalidate the results because they are not serious enough to render the results invalid.

Finally, our study raises some interesting avenues for research in the future. First, this study can be replicated to conceptually and operationally define, measure, test and validate the CMMOM levels and their impact on risk exposure and outsourcing performance. Second, the results of this study can be applied to other types of outsourcing to test whether the model holds. Furthermore, a comparison analysis of other maturity competing models (i.e. ISO) is, indeed, needed to validate the proposed model.

REFERENCES

1. Anderson, E. and Oliver, R. (1987) Perspectives on Behavior-Based versus Outcome-Based Salesforce Control Systems, *Journal of Marketing*, 51, 76-88.
2. Aubert, B.A., Patry, M.and Rivard, S. (2002) Managing IT Outsourcing Risk: Lessons Learned. In Hirschheim, R.A., Heinzl, A., and Dibbern, J. (eds.), Information Systems Outsourcing: Enduring Themes, Emergent Patterns and Future Directions. Springer-Verlag.
3. Bahli, B. (2002) Assessing Information Technology Outsourcing Risks, Unpublished Doctoral Dissertation, HEC-Montreal, Montreal. QC.
4. Bahli, B. and Rivard, S. (2003) The Information Technology Outsourcing Risk: A Transaction Cost and Agency Theory Base Perspective, *Journal of Information Technology*, 18, 211-221.
5. Bamberger, J. (1997) Essence of the Capability Maturity Model, *IEEE Computer*, 30, 112-114.
6. Barki, H., Rivard, S. and Talbot, J. (2001) An integrative contingency model of software project risk management, *Journal of Management Information Systems*, 17, 37-70
7. Barthelemy, J. (2003) The hard and soft sides of IT outsourcing management, *European Management Journal*, 21, 539-548.
8. Cronk, M. and Fitzgerald, E. (1999) Understanding "IS business value": derivation of dimensions, *Logistics Information Management*, 12, 40-51.
9. Diaz, M. and Sligo, S. (1997) How Software Process Improvement Helped Motorola, *IEEE Software*, 5, 75-81.
10. Earl, M.J. (1996) The Risks of Outsourcing IT, *Sloan Management Review*, 37, 26-32.
11. Eisenhardt, K.M. (1989) Agency Theory: An Assessment and Review, *Academy of Management Review*, 14, 57-74.
12. Gable, G. (1994) Integrating Case Study and Survey Research Methods: An Example of Information Systems, European *Journal of Information Systems*, 3, 112-126.
13. Geyskens, I., Steenkamp, J.B. and Kumar, N. (1998) Generalizations about trust in marketing channel relationship using meta-analysis, *International Journal of Research in Marketing*, 15, 223-248
14. Glaser, G. and Straus, L. (1967) The discovery of grounded theory: strategies for qualitative research. Aldine publishing company, NY, NY.
15. Grover, V., Cheon, M. and Teng, J. (1996) The Effect of Service Quality and Partnership on the Outsourcing of Information Systems Functions, *Journal of Management Information Systems*, 12, 89-116.

16. Herbsleb, J. (1997) Software Quality and the Capability Maturity Model, *Communications of the ACM*, 40, 30-40.
17. Ingalsbe, J., Shoemaker, D. and Jovanovic, V. (2001) A Metamodel for the Capability Maturity Model for Software, *Proceedings of the Seventh Americas Conference on Information Systems*, Boston, MA..
18. Jae-Nam, L. (1999) The impact of knowledge sharing, organizational capability and partnership quality on IS outsourcing success, *Information & Management*, 38, 323-335.
19. Jarvenpaa, S. and Leidner, D (1999). Communication and Trust in Global Virtual Teams, *Organization Science*, 10, 791-815.
20. Johnson, D. and Grayson, K. (2004) Cognitive and affective trust in service relationships, *Journal of Business Research*, (Forthcoming).
21. Kaplan, S. and Garrick, B.J. (1981) On the Quantitative Definition of Risk, *Risk Analysis*, 1, 11-27.
22. Lacity, M.C. and Willcocks, L.P. (2000) Inside IT Outsourcing: A State-Of-Art Report. Templeton College, Oxford.
23. Lanfield, K. and Smith, D. (2003) Management control systems and trust in outsourcing relationships*, Management Accounting Research*, 14, 281-307.
24. McKnight, H., Choudhury, V. and Kacmar, C. (2002) Developing and Validating Trust Measures for e-Commerce: An Integrative Typology, *Information Systems Research*, 13, 334-359.
25. Murugappan, M. and Keeni, G. (2003) Blending CMM and Six SIGMA to meet Business Goals, *IEEE Software*, 6, 42-48.
26. Orlikowski, W. (1993) CASE tools as organizational change: investigating incremental and radical changes in systems development, *MIS Quarterly*, 3, 309-340.
27. Perks, H. and Halliday, S. (2003) Sources, signs and signalling for fast trust creation in organizational relationships, *European Management Journal*, 21, 338-350
28. Persse, J. (2001), Implementing the Capability Maturity Model. John Wiley & Sons Ltd. NY.
29. Talon, P., Kreamer, K. and Gurbaxani, V. (2000) Executives' Perceptions of the Business Value of Information Technology: A Process-Oriented Approach, *Journal of Management Information Systems*, 16, 145-173.
30. Tesch, R. (1990) Qualitative research: analysis types and software tools, Falmer Press, New York. NY.
31. Van der Pijil et al. (1997) ISO 9000 versus CMM: Standardization and Certification of IS development, *Information and Management*, 32, 267-274.
32. Wicks, C. et al. (1999) The structure of optimal trust: moral and strategic implications, *Academy of Management Review*, 24, 99-116.
33. Willcocks, L. and Currie, W. (1997) Contracting out information technology in public sector contexts: research and critique, *Journal of the Australian and New Zealand Academy of Management*, 3, 2, 34-49.
34. Williamson, O. E. (1985) The Economic Institutions of Capitalism, Free Press, NY.
35. Zsidisin, G. and Ellram, L. (2003) An Agency Theory Investigation of Supply Risk Management, *Journal of Supply Chain Management*, 39, 15-27.