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M.K. ISLAM, S.K. DAS AND M.A. NASHIRY

Department of Computer Science and Engineering, Jessore Science and Technology University, Bangladesh.

Corresponding author & address: Md. Kamrul Islam, E-mail: polash_2k4@yahoo.com
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ABSTRACT

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Software development is an extremely dynamic and fluid business. For the supplier, the project is a way to do business, and for the customer, the benefits gained with help of the output of the project should be worth the price. Accordingly, a great deal of importance is placed on the successful delivery of these software projects that produce these products and services. But software development projects have a reputation that they often fail. It is difficult to find trustworthy figures of the economic impact of software development project failures both on the customers or stakeholders and supplier or project developing companies. Researchers have discovered many factors that cause software project failure. But isn't better to find out the project success factor in sub-contracting phase between supplier and customer of software? In this paper, we have mentioned some important project success criteria perspective to supplier and customer of software in sub-contracting situation.

Key words: *software development project success, software requirements, software risk management, tangible and intangible cost, software budget planning and time scheduling*

INTRODUCTION

Software development has its roots in the 1960s. The first concept, 'project', is defined in the standard ISO/IEC 12207 Systems and software engineering – Software life cycle processes as "an endeavour with defined start and finish dates undertaken to create a product or service in accordance with specified resources and requirements". Munns and Bjeirmi define a project as "achievement of a specific objective, which involves a series of activities and tasks which consume resources"(Munns and Bjeirmi, 1996). In a project the work is unique, complex, non-routine, on-time effort limited by time, budget, resources, and performance specifications designed to meet customer needs (Newton 2009). Therefore a project should have defined start and finish dates and specific resources should be allocated to do unique and complex work.

Software plays a crucial role in overall economy. However, despite the successful application of software to almost all possible areas, software development projects have a reputation that they often fail; they are e.g. late, over-budget, or not able to satisfy customers' needs (Cerpa and Verner, 2009; Glass 2006). Although the reputation of software project failure, it is difficult to find trustworthy figures of the economic impact of software development project failures, and even the percentage of cancelled projects is not clear (Glass 2006; Glass 2005). Charette, after several decades as an IT consultant defines project failure as the total abandonment of a project before or shortly after delivery, and therefore his figures do not include projects which exceeded their budgets, were delivered late, or costs of rework of bug-ridden systems (Charette 2005). Assuming that Charette's estimates are correct, the number of cancellations is daunting, and their economic impact is significant. The inaccuracy of the rate of the economic impact of software development project failure is said to be due to the situation that most of the software failures, especially in private-sector organizations, remain unreported and are written off as part of the cost of doing business (Ewusi-Mensah 2003). However, there have been studies on unsuccessful software development projects. Those studies on failed software projects which have identified various factors that lead to failure have usually done this in a rather generalized fashion, and the reason for the failure of a specific project is often ignored. The CHAOS study was also able to calculate success rates at different tolerance levels due to the data collected on time and cost being continuous data (Collins and Baccarini, 2004). This is perhaps a more realistic approach to defining failure as most reasonable stakeholders will expect some small discrepancies. However, 30% seems to be a fairly high tolerance level. Fig. 1 shows the CHAOS results of CHAOS survey on software projects from 1994 to 2004.

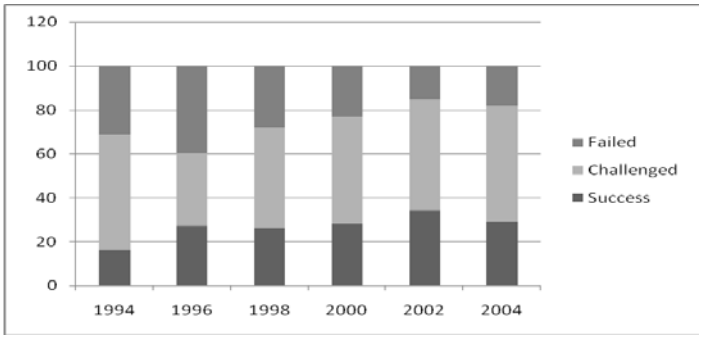

Fig. 1. Project status from 1994 to 2004 according to CHAOS survey

There are so much researches have been conducted on finding the causes of project failure and they have found many important causes of project failure. All these researches have been done during software project on running. But there are already some expenses on those failed projects. What about that loss of dollars and time? But prevention is better than cure. It is always will be wise to analyze the factors that determine the success of a software project during the sub-contracting period between the stakeholders and the project developing company. In this research, according to the opinion of projects managers and senior software project developers of failed projects; there were some serious mistakes in sub-contracting between stakeholders and project developing software companies. The aim of this research is to extend understanding of software development project success and have answers to question what are the project success criteria; those can be determined in sub-contracting situation In this paper, some important criteria have been discussed those should be considered during the sub-contracting period of software projects. The criteria are identified depending on a survey that have executed on 10 failed projects and 5 successful projects from Bangladeshi software project practitioners and customers of these projects.

The next section describes the related works by the researchers. The section after next section describes the project success criteria perspective to project suppliers and customers and then a survey data related to these criteria have been described. And the last section summarizes the findings of this research and gives some future research dimension depending on this paper.

LITERATURE REVIEW

Although software development projects have been carried out for over 50 years, it seems that we have not yet learned enough to ensure that our software development projects are successful (Cerpa and Verner, 2009). Software development project failure means loss of economic resources. Hence the focus is on software development project success. When software development is carried out by an external supplier, there are two parties which have their own goals, i.e. the aim of the customer is to minimize the costs of the project whereas the aim of the supplier is to maximize the profit (de Wit 1988). For the supplier, software development projects are a way to do business and therefore the business context has to be taken into account. This has been mentioned by Anda *et al.* (2009) referring to cost and effort drivers which may not be well described (Anda *et al.* 2009), and by Taylor who has found that the supplier has additional goals and new risks which are not discussed in literature (Taylor 2007). Projects are often poorly defined, codes of practice are frequently ignored and there is a woeful inability to learn from past experience (Miller 2007). Another study conducted at Loughborough University found that the success rate for UK IT projects was 44% (Pinto and Mantel, 1990). These studies also suggest a trend of increasing success over. Over the past several decades, numerous research studies (Belassi and Tukel, 1996; Tukel and Rom, 2001; White and Fortune, 2009; Sadeh *et al.* 2000) have been performed in the area of project management to identify critical factors that influence the success and/or failure of projects.

In this paper, some important criteria have been identified during sub-contracting period depending on a survey. If these criteria are considered during sub-contracting period then it is hoped that the probability of project failure will be decreased.

PROJECT SUCCESS CRITERIA IN SUB-CONTRACTING SITUATIONS

There are two parties of software development project, a customer and a supplier, of which the customer is acquiring software and the supplier is developing software for the customer. The customer and the supplier are from different organizations, and they have made a sub-contract regarding a software development project. Consequently, both parties have different perspectives with diverged goals. For the supplier, the project is a way to do business, and for the customer, the benefits gained with help of the output of the project should be worth the price. Hence, at the same time the aim of the customer is to minimize the costs of the project and aim of the supplier is to maximize the profit of the project (de Wit 1988; Turner 2009). Project success is defined in this dissertation according to Turner: “Overall the project will be successful if it delivers the desired performance improvement, or better, at a time and a cost that provides value for the organization” (Glass 2001). The following sections describe important factors that have great impact on software development project succession from supplier’s and customer’s perspective.

Project success criteria from the supplier’s perspective

Three criteria for evaluation of a software development project success from the supplier’s perspective are as follows:

1. Customer satisfaction,
2. Short-term business success for the supplier, and
3. Long-term business success for the supplier.

The first criterion is customer satisfaction that defines the satisfaction level of customer. The second criterion is short term business success for the supplier which defines that customer accepts the software project delivery

and pays the invoices although it is not known if the project was profitable for the supplier. The third criterion is long-term business success for the supplier is that it is less likely that the customer might have more projects with that supplier in future.

From the supplier's perspective for the succession of software development project the following criteria should be considered during the project sub-contracting phase where SFPS stands for Success Factors Perspective to Suppliers.

1. **Involvement of customer/user for realizing the scope of project (SFPS-1):** This is the most important criteria for supplier that is needed to be considered during the sub-contracting phase between supplier and customer. Without this level of customer/user involvement, it is not easy to identify the problem to be solved. Without this identification it is impossible to define a project's scope. Asking, "What are the functions do you want?" and not asking, "What is this system for, who's involved?" is not likely to help define scope accurately. You can only ask these question throughout the project when you have a high level of customer/user involvement. The scope of project also defines the size of project. When the size of a project impacted on requirements gathering, project failure was more likely. This result agrees with (Charette 2005), suggesting that project size hampers requirements gathering, and leads to unclear, incomplete, and potentially unstable requirements.
2. **Realizing the stability of information and its flow (SFPS-2):** It is important to prevent the onset of "scope creep" on a project. There will always be new requirements to support, slightly better ways of modifying your data model and better ways to design an application. Unless you set a formal rule that prevents the majority of well meaning suggestions about improvements from "creeping" into the system, the system will never be completed. So it is very important to know the frequency of changing the information structure and the information flow of the system. If the frequency value is more then it will be difficult to develop the software to accommodate the customer's requirements. Moreover it will create error in budget planning and time scheduling. Analyzing of customer's system document and discussing with system analyst and end-users may be helpful to know about the stability of information and information flow before signing the sub-contract.
3. **Proper budget planning (SFPS-3):** Optimistic estimation is still one of the two most common causes for runaway projects (Collins and Baccarini, 2004). From the supplier's perspective it is important to complete the project on time and within budget in order to have a profitable project (Mao *et al.* 2008; Brossler *et al.* 2003). The budget should include tangible and intangible cost. It is much easier to estimate tangible cost of the software development project than estimating the intangible cost. To estimate the intangible cost experience of another successful project of same kind is very much helpful. The more accurate the budget plan, the more chance the software to be successful. To care should be taken on budget planning in the sub-contracting situation.
4. **Proper time schedule planning (SFPS-4):** Good estimates of effort and schedule have a huge effect on project success (Glass 2006). As early as 1975 Brooks stated that more projects have gone awry for lack of calendar time than from all other causes combined (Glass 2003). Optimistic estimation is still one of the two most common causes for runaway projects (Collins and Baccarini, 2004) with cost and schedule failures exceeding any other kinds of software failures in practice (Boehm 1991). Boehm includes unrealistic schedules and budgets in his top 10 risk items (Keil *et al.* 2000). Proper time is needed for proving quality product. When suppliers do not get enough time for development of software project, they tends to skip some important testing of software at unit testing level and hence more chance to fail the projects. But the time should not be more than enough. Hence, if the time schedule is more than enough then the requirements will be changed and then it will effect on budget and also in time schedule. This factor should be considered carefully during the sub-contract period by the supplier.
5. **Use proper technology (SFPS-5):** Don't use a truck of load limit 100kg to carry 10kg load if 15kg load limit truck is available and the vice-versa. Every technology has its own advantages and disadvantages. The choice of proper technology in software development project should be done carefully depending on its features. It has effect on budget planning.
6. **Determine the software re-engineering effect on project (SFPS-6):** This is an important factor that is not properly considered by most of suppliers during budget planning and time scheduling. But it has great effect on those two factors. The more components have effect on the proposed software project, the less the development cost and time. But do not forget the integration testing cost and time.
7. **Risk analysis (SFPS-7):** Risk generally can be regarded as the combination of the probability of an undesirable event occurring and the magnitude of the loss that is associated with the event (Mao *et al.* 2008). The software risk management advocates would argue that managers may not accurately perceive risks, causing them to pursue software development projects that ultimately result in failure (Alter and Ginzberg, 1978). Many researchers have suggested that inadequate assessment of project risk may be a

major source of problems in software development (Ginzberg 1981; McFarlan 1981; Charette 1989; Boehm 1991; Barki *et al.* 1993; Collins and Baccarini, 2004). So the risk analysis should be done in sub-contract situation. It creates effect on time scheduling. Also the budget will be affected.

8. **Considering safety time and cost (SFPS-8):** From the supplier's perspective it is important to complete the project on time and within budget in order to have a profitable project (Standish Group 1999; Brossler *et al.* 2003). During project time scheduling, it must include the safety time. There are some external events such as national strike day hampers the development time. These events are unpredictable. But these events have negative impact on development of project. And similarly some costs are really invisible during the budget planning. So some safety cost should be added with the original budget. Experience helps to estimate the safety time and cost.

Project success criteria from the customer's perspective

Three criteria for evaluation of a software development project success from the customer's perspective are as follows:

1. User satisfaction,
2. Short-term business success for the supplier, and
3. Long-term business success for the supplier.

The first criterion is user satisfaction that defines the satisfaction level of user of developed software. The second criterion is short term business success for the customer which defines that after installing the software whether the short term objectives of software development project is obtained or not. The third criterion is long-term business success for the customer defines the stability of software and the effort, time and cost required for updating the software.

From the customer's perspective for the succession of software development project the following criteria should be considered during the project sub-contracting phase where SFPC stands for Success Factors Perspective to Customers.

1. **Properly express the need (SFPC-1):** The Standish reports on the state of software engineering practice indicate that requirements engineering is critical to software success (Silvasti 1987). Only patient knows where is the pain in his body. Depending on patient's description doctor decide what to do. Similarly, only customer knows what is his need? Customer has to properly express his need to supplier. Submission of system general document, reports will be helpful to clear the need. The requirements should be clear before going to sub-contract situation. If necessary some meeting should be seated with the supplier to help the supplier to be clear about the scope and requirement of the software development project.
2. **Co-operate the supplier (SFPC-2):** When software is developed by supplier, the customer and the supplier should have a common understanding of the project and its objectives. It is not surprising that this is an important factor should be considered by customer. Because only customer knows what is his need and cooperation with supplier is needed to help supplier to realize the need. If the requirements are not clear the project will be failed and here remains no doubt. But as customers want to best utilize of their employees, most of customers think that to allow their employees (end users) to give times on this software projects during the sub-contract period is just spoiling of their important time. During the development and testing phase of project make sure the presence of end-users for cross checking the fulfillment of requirements. During the sub-contracting situation the customer should consult with supplier about checking the requirements by end user.
3. **Negotiate with supplier about time scheduling and budget planning (SFPC-3):** During the start-up phase there is a need for a rapid start-up of the project after the customer has made an order (Barry *et al.* 2002), and there are pressures to start the project as soon as possible. The need for a rapid start-up may lead the supplier to rush and forget that time is needed in order to set up the project team, train them, and allow them to become familiar with the project. Moreover the customer wants the software as soon as possible. But this hurry decreases the quality of software. So the customer should negotiate with supplier about time schedule so that supplier gets enough time to develop the software to supply quality software. As suppliers also do business with software project and they think about their profit on projects. The low the budget for software project the low the quality of product. Experience of other company who is using same kind of software can be used here by the customer to estimate the investment needed for this software development project.

VALIDATION AND ASSESSMENT

An assessment has been done on 10 failed and 5 successful projects from Bangladeshi software suppliers and customers of these projects. The interviewee suppliers were mainly project managers from above 10 projects. The interviewee customer level was system analysts from above 15 projects. Depending on their personal

identified success criteria, we have listed the top criteria those happen most frequently. They also give each factor a priority value where the high the ranking value indicates the more the important criteria. The following Fig. 2 shows the rank value for each criterion with supplier's feedback.

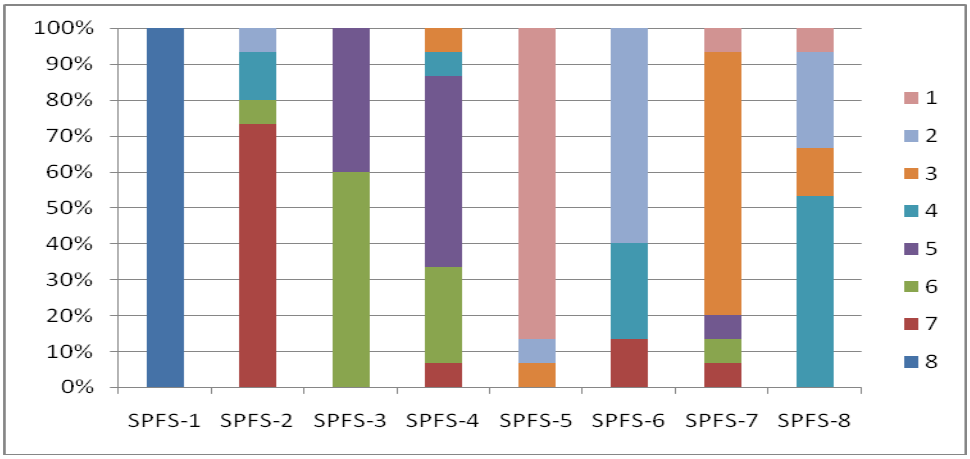

Fig. 2. Supplier's ranking for each project success criteria during sub-contract situation

From the above Fig. 2, we can set the priority for each factor can be set depending on supplier feedback rate. The following Table 1 shows the priority value for each project success factor perspective to supplier.

Table 1. Priority of project success criteria from supplier perspective

Success criteria	**Priority**
Involvement of customer/ user for realizing the scope of project (SPFS-1)	1
Realizing the stability of information and its flow(SPFS-2)	2
Proper budget planning(SPFS-3)	3
Proper time schedule planning(SPFS-4)	4
Use proper technology(SPFS-5)	8
Determine the software re-engineering effect on project(SPFS-6)	7
Risk analysis(SPFS-7)	6
Considering safety time and cost(SPFS-8)	5

From the above Table 1; it can be said that all suppliers think the factor "involvement of customer/user for realizing the scope of project (SFPS-1)" has the highest priority than other factor. According to this survey the factors can be arranged in decreasing order of importance as SPFS-1, SPFS-2, SPFS-3, SPFS-4, SPFS-8, SPFS-7, SPFS-6, SPFS-5.

The customers marked from 1 to 3 to rank the three factors of project success criteria from the customer's perspective where 3 indicates that the top ranked factor and 1 indicates that the bottom ranked factor. The high the ranking value indicates the more important factor. The following Fig. 3 shows the rank value for each factor with customer's feedback.

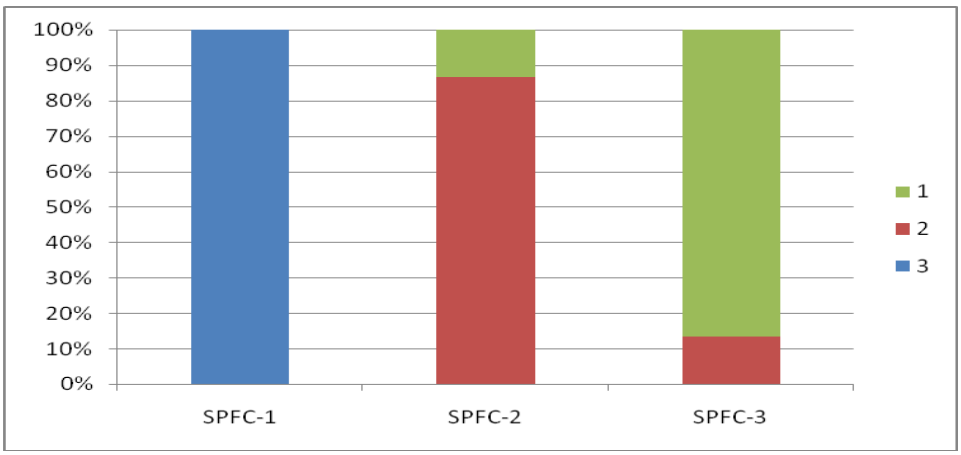

Fig. 3. Customer's ranking for each project success criteria during sub-contract situation

From the above Fig. 3, we can set the priority for each factor can be set depending on customer's feedback. The following Table 2 shows the priority value with customer feedback rate and rank value.

Table 2. Priority of project success criteria from customer perspective

Success criteria	**Priority**
Properly express the need (SPFC-1)	1
Co-operate the supplier (SPFC-2)	2
Negotiate with supplier about time scheduling and budget planning (SPFC-3)	3

From the above Table 2; it can be said that all customers think the factor "properly express the need (SFPC-1)" has the highest priority than other factor. According to this survey the factors can be arranged in decreasing order of importance as SPFC-1, SPFC-2, SPFC-3.

CONCLUSION

Software development is a dynamic process. It is alarming that significant numbers of projects still fail to deliver benefits on time, within budget and to expectations. There are several areas or causes because of which software project failure occurs that have been identified by many researchers. But prevention is better than cure. In this paper, some project success criteria have been discussed perspective to supplier (software developer) and customer (stake holder) in sub-contracting situation between supplier and customer.

To validate the factors a survey have been done on 10 failed and 5 successful projects. The result of this survey can be figured as Fig. 2 and Fig. 3. Fig. 2 shows the data on the project success factors during sub-contract situation perspective to suppliers. From Fig. 2, for each factor we can set the priority of importance depending on rank value and supplier feedback rate. Table 1 shows the priority value. From Table 1, the priority of success factor as SFPS-1, SFPS-2, SFPS-3, SFPS-4, SFPS-8, SFPS-7, SFPS-6, SFPS-5. Fig. 3 shows the data on the project success factors during sub-contract situation perspective to customers. From Fig. 3, each factor we can set the priority of importance depending on rank value and supplier feedback rate. Table 2 shows the priority value. From Table 2, the priority of success factor as SFPC-1, SFPC-2, SFPC-3.

In this paper, some of the project success criteria during the sub-contracting period perspective to customers, suppliers have been identified. During the sub-contracting period, the suppliers and customers should consider the success factors that have been discussed above. There may be some other factors that leave for future research.

REFERENCES

Alter S, Ginzberg M (1978) "Managing uncertainty in MIS implementation.", Sloan Management Review, pp. 23-31.

Anda BCD, Sjøberg DIK, Mockus A (2009) "Variability and Reproducibility in Software Engineering: A Study of Four Companies that Developed the Same System.", IEEE Transactions on Software Engineering, pp. 407-429.

Barki H, Rivard S, Talbot J (1993) "Toward an assessment of software development risk.", *Journal of Management Information Systems*, pp. 203-225.

Barry EJ, Mukhopadhyay T, Slaughter SA (2002) "Software Project Duration and Effort: An Empirical Study.", *Journal of Information Technology and Management*, pp. 113-136.

Belassi W, Tukel OI (1996) "A New Framework for Determining Critical Success/Failure Factors in Projects.", International Journal on Project Management, pp. 14.

Boehm BW (1991) "Software Risk Management Principles and Practice", IEEE Software Proceedings Vol. 8 No 1, pp. 32-41.

Boehm BW (1991) "Software risk management: principles and practices.", IEEE Software Proceeding, pp. 32-41.

Brossler P, DeMarco T, Lister T, Waltzing (2003) "Knowledge Management at a Software House: A progress report", Proc Workshop on Learning organizations, pp. 77-83.

Cerpa N, Verner JM (2009) "Why Did Your Project Fail?", Communications of the ACM. pp. 130-134.

Charette RN (1989) "Software Engineering Risk Analysis and Management.", Intertext Publications, New York.

Charette RN (2005) "Why Software Fails?", IEEE Spectrum Proceeding, pp. 42-49.

Collins A, Baccarini D (2004) "Project success - A survey." *Journal of Construction Research*, pp. 211-231.

Collins A, Baccarini D (2004) "Project success - A survey", *Journal of Construction Research*, pp. 211-231.

de Wit A (1988) "Measurement of project success.", *International Journal of Project Management*. pp. 164-170.

Ewusi-Mensah K (2003) “Software Development Failures: Anatomy of abandoned projects.”, USA: MIT Press.

Ginzberg M (1981) “Early diagnosis of MIS implementation failure: promising results and unanswered questions”, International Journal of Management Science, pp. 459-478.

Glass R (2003) “Error-Free Software Remains Extremely Elusive”, IEEE Software Proceedings, pp. 103-104.

Glass RL (2001) “Frequently Forgotten Fundamental Facts about Software Engineering”, IEEE Software Proceedings, pp. 110-112.

Glass RL (2005) “IT Failure Rates – 70% or 10-15%?”, IEEE Software Proceedings, pp. 111-112.

Glass RL (2006) “The Standish report: does it really describe a software crisis?”, Communications of the ACM, Vol 49, pp. 15-16.

Keil M, Wallace L, Turk D, Dixon-Randall G, Nulden U (2000) “An investigation of risk perception and risk propensity on the decision to continue a software development project”, *The Journal of Systems and Softwar*e, Vol 53.

Mao J, Lee J, Deng C (2008) “Vendors' perspectives on trust and control in offshore information systems outsourcing”, *International Journal on Information & Management*, pp. 482-492.

McFarlan FW (1981) “Portfolio approach to information systems.”, Harvard Business Review, pp. 142-150.

Miller KB (2007) “IT Project Success”, The Computing Holy Grail.

Munns AK, Bjeirmi BF (1996) “The role of project management in achieving project success.”, *International Journal of Project Management*. pp. 81-87.

Newton R (2009) “The practice and theory of project management: creating value through change.”, UK: Palgrave Macmillan.

Pinto JK, Mantel SJ (1990) “The Causes of Project Failure.”, IEEE Telecommunication Engineering Management, pp. 305-327.

Sadeh A, Dvir D, Shenhar A (2000) “The Role of Contract Type in the Success of R&D Defence Projects Under Increasing Uncertainty.”, *International Journal on Project Management*, pp. 14-22.

Silvasti J (1987) “Start-up of Small Delivery Projects. In M. Fangel (Ed.) Handbook of Project Start-Up.”, Denmark: INTERNET Committee on Project Start-up.

Standish Group (1999) “Chaos: A Recipe for Success”, Standish Group International.

Taylor H (2007) “Outsourced IT Projects from the Vendor Perspective: Different Goals, Different Risks.”, *Journal of Global Information Management*. pp. 1-27.

Tukel OI, Rom WO (2001) “An Empirical Investigation of Project Evaluation Criteria.”, *International Journal on Project Management*, pp. 400-416.

Turner JR (2009) “The Handbook of Project Based Management”, 3rd edition.eBook: McGraw-Hill.

White D, Fortune J (2009) “Current Practice in Project Management – An Empirical Study”, *International Journal on Project Management.*