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The business intelligence competence centre as an interface between IT and user departments in maintenance and release development

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WHAT WE NEED: PROJECT MANAGERS` EVALUATION OF TOP MANAGEMENT ACTIONS REQUIRED FOR SOFTWARE DEVELOPMENT PROJECTS

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Abstract

Software development projects still fail at an unacceptable rate although prior studies have identified critical success factors needed for project success. This study contributes to the project management literature by providing further insight into the nature and role of 'top management support' (TMS), which is widely recognised as one critical factor in the success of software development projects. The study seeks insight into the nature and role of TMS from the perspective of software development project managers and their perceptions of actions required by top management in facilitating project success. A qualitative case-based approach was employed. Sixteen top management 'actions' are identified, and subsequently framed by a conceptual model consisting of three top management roles: strategy, facilitate and lead. The study represents the first stage of an ongoing research program. The model will be tested in the Asia-Pacific region in the second stage. The expected final outcome of the research program is a framework that will support project environments by defining top management actions needed to support a software development project in different stages of the life of a project.

Keywords: top management support, critical success factors, project success, project manager, top manager, software development projects

1 INTRODUCTION

Software development is a highly complicated task with the involvement of many stakeholders and previous studies have indicated that low software development project success rates are a major concern (PMBOK, 2004; Reel, 1999; Meredith & Mantel, 2006). Many studies have been conducted to identify the factors that affect the success of projects, leading to a body of knowledge referred to as the Critical Success Factors (CSFs). Although the rate of project failure has declined with the application of accumulated knowledge, software development projects continue to fail at an unacceptably high rate (PMBOK, 2004; Schwalbe, 2006).

Academics and practitioners alike acknowledge the importance of CSFs (Reel, 1999; Butler & Fitzgerald, 2006). However, mere acquaintance with the factors does not bring about the skills or mastery needed to address them. There is evidence, for example, of critical success factors not being handled properly, leading to project failure (Young & Jordan, 2008). This evidence suggests that we do not yet understand well enough how we can lead a project to success by applying CSFs. This line of thought, in turn, raises questions, as to what constitutes a critical success factor, in terms of its component parts, and how the components should to be successfully applied across the life of a project.

Top management support (TMS) is one important CSF. As revealed by many studies (Loonam &McDonagh, 2005; Nah et al., 2001; Krumwiede & Lavelle, 1998; Young & Jordan, 2008; Zwilkael, 2008a-b; Zwilkael et al., 2008) it is a main ingredient in the recipe for project success. The major goal of this study is to gain insight into what constitutes TMS from the perspective of project managers (PMs), by asking them what actions they consider are needed from top management (TM) to facilitate project success. This research theme has not been adequately addressed in prior studies.

The study described in this paper is the first stage of a two-stage research project. Here, we look at software development projects from the perspective of five project managers, using extensive interviews. The qualitative findings are built into a conceptual model. The study was conducted in Sri-Lanka, the home country of the lead author.

The remainder of the paper is organized in the following way. First, the existing literature related to TMS is reviewed as theoretical background. The methodology is then presented, followed by the findings from the five case studies. The conceptual model and its future development is addressed in the discussion section, which is followed by the conclusion.

2 THEORETICAL BACKGROUND

2.1 Software development projects, project success and CSFs

Software development is pursued as projects (Schwalbe, 2006; Meredith & Mantel, 2006) and therefore draws on knowledge from both the software development discipline and project management. Project management refers to the application of knowledge and skills in the project environment to successfully complete project tasks (PMBOK, 2004). At present we have a very pressing problem in that most software projects are reported to have been unsuccessful in one aspect or another. Software projects are said to be high risk because they involve changing requirements, a variety of business domains, a variety of technical platforms and large amounts of monetary investments (Ropponen & Lyytinen, 2000; Cockburn, 2000; Schwalbe, 2006; Reel, 1999; Scott et al., 2006).

A project involves many stakeholders (Hartman & Ashrafl, 2002). Each one will have their own success criteria, and, therefore, project success is a multi faceted issue (Shenhar, Dvir & Levy, 1997;

Lim & Mohamed, 1999). It is interesting to note that some projects do not meet all predetermined criteria such as time, cost or scope, yet, are deemed to be successful as the client was happy with the project's product. Previous studies describe project success as multi dimensional. Shenhar, Dvir, and Levy (1997) maintain that project success can be measured in terms of how well the following project outcomes are met: internal project efficiency, impact on the customer, business and direct success and preparing for the future. Others take a two dimensional, macro and micro, view of project success (Lim & Mohamed, 1999; Agarwal & Rathod, 2006). At the macro level the organization looks at project completion and customer satisfaction. At the micro level only project completion is deemed important.

CSFs are the factors identified as critical to the success of a project (Reel, 1999; Nah et al., 2001; Young & Jordan, 2008; Zwilkael, 2008; Hartman & Ashrafl, 2002; The Standish Group, 1995). Most prior studies portray the CSFs as derived from a practitioner's perspective. However, there is evidence that the CSF concept is also a valid academic concept (Butler & Fitzgerald, 2006). However, very little work has been done to investigate the exact nature of each CSF. Some CSFs have been identified when projects were live (in progress), and others have been identified as important at the post-mortem phase of the project. Knowledge of CSFs is essential, as not attending to them when necessary may prove disastrous to the project. An example in this context would be if top management support was not rendered when needed. The lack of support may take the project down a perilous path, possibly ending in project failure (Young & Jordan, 2008; Schwalbe, 2006; Zwilkael, 2008a-b).

2.2 Top Management Support (TMS)

Agreement on a definition for TMS has yet to be achieved (McLagan, 1998; Loonam & McDonagh, 2005). Some authors define TMS as devoting time in proportion with the cost and potential benefits of a project (Young & Jordan, 2008). Others, however, define TMS as the degree to which top management understands the importance of the project function (Ragu-Nathan et al., 2004). Further, there is still a lack of consensus in the literature as to who comprises TM. Identification of TM may vary according to the organizational structure and with the size of the organization (Green, 1995; Sabherwal et al., 2006). Therefore the understanding of the term TM ranges from immediate superior to departmental manager, to director, CIO or even to the CEO. In the current study, we refer to the management one hierarchical level above the project managers as the TM.

Projects are managed by project managers and their definition in the management hierarchy is given as operational managers (Meredith & Mantel, 2006; Turner & Muller, 2005). They manage work on the project. However a project is part of an organization (Turner & Muller, 2003) and there is much interaction between the organization and the project. Project managers may require TMS for direction, advice or for escalation (Loonam &McDonagh, 2005; Nah et al., 2001; Krumwiede & Lavelle, 1998; Young & Jordan, 2008; Zwilkael, 2008a-b; Zwilkael et al., 2008) during the life of a project.

Prior studies indicate that project failure is strategic rather than technical (Cicmil & Hodgson, 2006). Many studies believe that top management support is essential and will most certainly increase the probability of software development project success (Schwalbe, 2006; Young & Jordan, 2008; Zwilkael, 2008a-b). Related findings from previous studies which concentrated on TMS include the critical success processes (CSPs) of TMS (Zwilkael, 2008a-b) and the introduction of a maturity model for TMS (Zwilkael et al., 2008). Although the CSPs are an interesting finding, the origins of these processes are not clear. For instance, some processes could be traced back to the top manager (e.g. project manager assignment), some to the project manager (e.g. use of new project tools and techniques) and others to the organization (e.g. project based organization). The maturity model for TMS is a subsequent development, depicting five stages of top management growth in an organization against the CSPs. This model would invariably inherit the attributes discussed above.

As interesting as the above findings are, there is a lack of critical analysis of actions required of top management, and how these actions could be understood at a theoretical level. Therefore, the authors

find it timely to undertake such a study from the perspective of project managers, who are of course ultimately responsible for project success.

3 METHODOLOGY

Five case studies were conducted to examine how TMS is viewed by project managers. Small, medium and large sized organisations were targeted in order to accommodate a range of views. The project managers were first asked to complete a short questionnaire about a project they could relate to including its level of success. The project success part of the questionnaire was based on the multidimensional project success model by Shenhar, Levy and Dvir (1997). The project managers took approximately ten to fifteen minutes to complete the questionnaire. The aim of the questionnaire was to draw attention to the project to be discussed. The projects we discussed had already been completed. Most of the project managers had multiple projects in their accounts. Therefore, we used this exercise to refresh their memory and assist in the subsequent discussion, as a road map teasing out specific practical examples, rather than discussing generally what was needed as TMS.

It was explained to the PMs that for the purpose of this endeavour 'top management' referred to their immediate supervisor(s) and the support needed from them. A semi-structured interview followed with emphasis on TMS requirements for project success. The notion of project success was also discussed, including what was meant by the term and other factors which were deemed to be important for project success. Supporting information regarding the project, from one hierarchical level above or below the project manager was sought for clarification of information and to rule out any bias in responses. In Cases 1, 3, 4 and 5 we had the opportunity to speak with a key team member, in Cases 2 and 3 we were able to undertake interviews with the departmental manager (the TM) in addition to the project manager. Ten such interviews ranging from 45 minutes to 1 hour 10 minutes were conducted. Table 1 provides details of the organizations and the projects studied.

Interviewees were encouraged to freely convey their perceptions. These discussions were recorded and later transcribed.

4 FINDINGS

Top management support was identified as important for project success. Three out of five project managers stated the fact explicitly. The two remaining project managers saw top management support as built into the organization's business model. They said that the industry approved model adopted by the organization ensured TMS. So in the discussion they did not try to explicate the factor, but agreed that it was indeed very important. Table 2 presents a comparative analysis of key attributes of each case.

Interestingly, the understanding of project success differed according to each interviewee's position in the organization. A key team member when asked why he thought the project was a success answered *"we were able to give a product which satisfied the customer"*, which relates to the micro level of success. The same question was answered by the project manager as *"the customer is happy and we met time, cost and scope constraints"*. The latter criteria relate to the macro level of success.

The project managers' perceptions of what was required of TM to facilitate project success were analysed by the researchers and agreed upon after multiple passes through the transcripts. We also sought evidence that the understanding of these requirements was congruent across an organization, since we had access to either one hierarchical level above or below a project manager at each of the organizations studied. Sixteen requirements of TM were identified, and are described below.

1. Participate in scope definitions

Project managers (Case 1) expected the top management from both the client and the performing organization to be involved in the definition of the scope of a project. PMs said that this prevents conflicts regarding requirements over the life of a project. The project manager of Case 3 described the top managers as gate keepers of scope who prevent scope creep.

2. Build support in the organizational model

Having preferred or standard methods have helped project managers to successfully conduct project activities. As one project manager (Case 2) put it *"when the customer realizes that we work with proven methods, they just fall in line"*. One major aspect of these methods (Cases 2, 4 and 5) is to ensure client management participation alongside the client.

3. Achieve a sustainable business model

One project manager (Case 5) who described his project's product as not meeting customer satisfaction, pointed out that it was important that the top management looks at the sustainability of the business model employed, both in terms of revenue and workability. He pointed out that in the particular project under discussion three parallel versions were simultaneously developed and released to the customer and the customer was billed accordingly, providing good revenue. He went onto say said that, *"because of this model the developers had to be constantly pulled out and plugged in where necessary making it difficult for them to concentrate, a sequential release mechanism would have been a more sustainable model, and the project would have had a better chance at success"*.

4. Provide guidance

Project managers, as middle level managers, are consistently pressured by operational constraints. They are well aware that they carry the responsibility of the project on their shoulders. So they expect and welcome guidance (Cases 1, 3 and 4). As one project manager put is *"it is not just passive evaluation, but active participation. For instance they might say to fine tune the resource allocation"*. More importantly one key team member pointed out that the TM should not let projects be orphans, but a part of the whole organization.

5. Supply resources

Project managers saw it as very important that the TM supplied the required quantity and quality of skilled resources when necessary. One project manager (Case 1) said that it was helpful that the TM was able to get experts from different departments when they faced unforeseen technical issues. He said *"all in all we were able to get help from others when we needed it"*.

6. Boost employee morale

TM attendance at team meetings, commending good work and offering opportunities to travel on project work was identified as having a positive effect on morale and project managers welcomed such support (Cases 2 and 3).

7. Balance project assignments

Some project managers (Cases 2 and 5) said that they have multiple projects in their accounts and that this may sometimes get in the way of success of projects that are of lower priority.

One project manager (Case 2) explained in relation to a project which did not meet the desired level of success, *"I was involved in another major project and could not give this project the attention it needed"*.

Another project manager (Case 5) said that a normal working day for him lasted twelve to sixteen hours, and that he felt overloaded since he had many projects in his account. He said that *"I would start with a stand up meeting and see what has to be done today, then I will attend to the mail which will take me up to lunch, by afternoon I would get feedback from the team about progress, I would*

then attend to any communication needs and then update the tracking documentation. In the evening I would get an update when hiccups are shown, then I have to liaise and facilitate, for example hardware problems, HR or admin problems".

8. Prioritize

Project managers (Cases 1 and 2) found that when a project is prioritized, it is much easier to receive required support from an organization. Soft and hard resources flow in and top management is available for any further requests and escalations.

9. Watch status

TMs are expected to remain vigilant in relation to the status of a project. This, according to Case 3, was expected from the top management of both the performing and client organizations.

10. Having clear business objectives and stating them

Project managers and in some cases key team members maintained that it was important for the TM to have an understanding of what the company is hoping to achieve from the project and to communicate the objectives to the project team (Cases 3 and 5).

11. Make necessary information available

According to one key team member (Case 4), it would have been easier to work with better knowledge/information than what was specified. He said "*this would have prevented ambiguity of tasks and would have helped promote the success of the project*". This action and point 10 above are somewhat related. However they are elaborating on two different levels, i.e. the project level (action 10) and task level (action 11).

12. Provide challenging work

Project managers of Cases 2 and 3 brought out the fact that TM was expected to provide challenging work. This motivated staff and was also key to retaining skilled employees in the long term.

13. Retention of key employees

Project managers value and depend largely on capable skilled resources. Removing these skilled resources to other projects or not retaining them in the organisation, what ever the reason may be, is detrimental to the success of an ongoing project. As one project manager (Case 5) put it *"I felt some attrition, for example when I wanted to retain some personnel and the management was not supportive".* He indicated that this was a cause for project failure.

14. Review project plans

Project managers expected TMs to review and formally accept project plans. Some project managers pointed out that this was beneficial in a number of ways, including securing TM buy-in and ownership at the top level for the project (Cases1, 2 and 3).

It was also maintained that when revision of time or other constraint is needed, it is helpful to have top management involved in communicating the revisions to the client.

15. Liaise with customer

Customer perception of project involvement differs according to the level of management involved, in both the performing and the client organization. PMs reported that when action is needed and does not seem to happen, an escalation to the TM followed by a discussion between the peer levels of management of the performing and client organizations gets things moving (Cases 1 and 4).

In some cases top management was reported to have had close business relationships with the client prior to obtaining the project (Case 2), and this relationship had been beneficial in executing project tasks.

16. Accept ownership and gain better understanding of project work

Case 2 brought out the fact that when TM from both the performing and the client organizations take ownership interest in the project, it helps project success. In some organizations the TM had a technical background and the project managers said that this was immensely helpful.

Case 1

The organization is a campus, with own software development centre, using company standards. They develop software for internal and external customers. The development centre consists of 14 developers. Two developers were dedicated to the project and 1-2 quality assurance engineers were used as per the need. The application system was developed to assist tea auctioning. The project was given priority by the top management. The project was seen as a success because the customer was satisfied. The scope and budget were met. However, the time frame had to be revised but was accepted by the customer.

Case 2

The organization is a software development centre with many specialised areas branching out as departments. They develop software for external customers. The product strategy is to market a core product and bridge the gap between new customer requirements and the product. A project is employed for this purpose. The project was for the very first foreign customer and was prioritized. The organization has around one thousand (1000) developers employed. This project had 15 dedicated developers. Separate quality assurance was carried out with the involvement of 4 people. Implementation was done by 5 engineers. The application was an insurance system. The project was a success; the top manager describes meeting the customer requirements 100%. The customer has returned for new business and is now a reference site. The constraints for scope, cost and budget were met. The organization has level 4 certification in Software Engineering Institute's (SEI) Capability Maturity Model Integrated (CMMI) and has also obtained certification by International standards organization (ISO 9001:2000).

Case 3

This Case is somewhat different from the others. We spoke to the software development department of a mobile service provider. This software department consists of 35 employees and is the customer. The project was conducted when the mobile service provider was switching mobile platforms, which is a rare occurrence. In order to provision the requested system to the new software environment the mobile service provider and the vendor had to work together on one project. This project is an example for involvement of multiple stakeholders. In its development phase alone four (4) parties were involved. Those being the supplier (4 developers), in-house developers (3-4 developers), telecom engineers and marketing and customer care. The project was declared a success by the customer. They said that the functional requirements and the time, cost and quality constraints were met.

Case 4

The organization is a highly reputed software development centre. They are CMMI level 4 certified and have a large employee pool, i.e. over 3500. The project concerned, handles requests at disaster situations and then handles bills and payments related to the actions taken on those requests. The product was for a foreign customer. This involved 12 developers and 3 quality assurance (QA) engineers. The project was declared a success, primarily because the customer was happy and the internal constraints such as time, cost and scope were met. The organization also has metrics with set indexes to monitor a project. The operations manager defined the project success as acceptance of the product by the customer, smooth rollout of the production system, high value on the client score card and repeated business with the customer.

Case 5

This project is from the same organization as Case 4. The project concerned is a document retention management system. The project manager spoken to was a senior consultant for delivery, a higher level manager playing the role of project manager. The project involved 10 developers and 2-3 QA

engineers. The project was declared a failure from the customer satisfaction perspective. However the performing organization's requirements had been met.

Table 1- A brief summary of Cases studied

5 Discussion: Conceptual model, future plans & limitations

We are able to group the TMS actions identified above into the three categories of strategy, facilitate and lead (see Table 3). Knowledge gathered from past studies was used to drive the categorization. The researchers sat through a brain storming session to come to a consensus on this exercise. The term strategy has been defined and spoken of by researchers as early as the 70`s (Porter, 1979). However, at the core of the various definitions that have ensued since that time, is the fact that strategy constitutes the actions to ensure long term success of the organization. Leaders are expected to take ownership and pride in their work and set examples (Green, 1995; Viswesvaran et al., 1998). A facilitator assists an existing process, and prior studies state that this is what is expected of top management at times (Sabherwal, 2006; Kearns, 2007).

Using the three categories introduced above, referred to as TMS 'roles' from here on in, a conceptual model (Figure 1) is presented. Project success is introduced into the model as the outcome of the successful execution of the three TMS roles, which are considered to be the explanatory factors. We refer to the combination of a *project's process* and a *project's product success* as *project success*. Our research is congruent with findings of previous studies, regarding the fact that project success is multifaceted.

This model is an important milestone in the context of the overall research program. It is of interest in the future to see how these TMS actions are applied in the project management processes (initiation, planning, executing, monitoring / control, and closure) and how they impact project success.

The information we grouped and present is from the perspective of practioners i.e., project managers. We believe that socio-organizational theories from the academic world can be used to better understand the three TMS roles of strategy, facilitate and lead and when they are required. Further, we believe that different theories come into play with each of these roles. At present it is considered that the following theories may be important for the reasons given. Organizational theory may be related to *strategy*, as it is based mainly on human, physical, work and coordination attributes (Hodge, 1988). The *facilitate* role involves creating the conditions for ordered rule and collective action (Stoker, 1998) and, therefore, may be related to project governance (Forcadell, 2007; Ezzamel & Reed, 2008). Human management theory may underpin the *lead* role (Leskiw & Singh, 2007) since people, however skilled they are, have to be led in situations such as project environments where people are brought together for a limited timeframe to achieve a specific goal or goals (PMBOK, 2004).

The research question to be addressed at the next stage of our project is as follows: "how do the top management roles of strategizing, facilitating and leading apply to the project management processes, and what impact do they have on project success?"

We plan to identify constructs which are related to the above roles from current theory, and use this information to operationalize the conceptual model. Then we plan to go back into the industry with a questionnaire compiled using the conceptual model and survey, firstly project managers and then top management in relation to the model. Information will be sought from the perspective of each project management process. Each role may be important in every one of the processes and one or more may be more important in different processes.

Our aim is to contribute a framework; where the three roles, strategy, facilitate and lead will be used as one dimension and the project management processes initiation, planning, executing, monitoring / control, and closure as the other.

Attributes	**Case 1** (organization 1)	**Case 2** (organization 2)	**Case 3** (organization 3)	**Case 4** (organization 4)	**Case 5** (organization 4)
Organization	Campus with separate SWD centre	SWD centre with many specialised departments	Mobile service provider	Software development centre	Software development centre
Customer	External (local)	External (foreign), first international customer	Self	External (foreign)	External (foreign)
Total no of developers	14	Around 1000	35	Over 3500	Over 3500
Developers in project	2	15	Internal 3-4, vendor 3-4	12	10
Application System	Tea auctioning system	Insurance system	Provisioning system for changing mobile platform	Disaster recovery handling system	Document Retention System
Successful? Why	Yes; Customer is satisfied	Yes: Customer is satisfied, more business given	Yes: customer satisfied, constraints were met. (discussion with customer)	Yes: Customer is satisfied	No: Customer is NOT satisfied and system is not in production.
Prioritized?	Yes	Yes: first international project	Yes: but not in isolation. Process was prioritized	No	No
Separate QA team	Yes: (1-2 when necessary)	Yes : 4	Thorough testing, both vendor and customer	Yes: 3	Yes: (2-3 as required)
Constraints met?	Time : revised / Cost: yes / Scope: yes	Time: yes / Cost: yes / Scope: yes	Time: yes / Cost: yes / Scope: yes	Time: yes / Cost: yes / Scope: yes	Time: yes / Cost: yes / Scope :yes
Experienced PM	Yes	Yes	No, new recruit	Yes	Yes
Model/ Method	Company standards	CMMI Level 4;ISO certified	Company standards	CMMI Level 4	CMMI Level 4
TM Actions	1,4,5,8,14,15	2,6,7,8,12,14,15,16	1,4,6,9,10,12,14	2,4,11,15	2,3,7,10,13

Table 2 – Comparative view of the Case attributes

It is shown in the literature (Correll, 1994) that top managers are not particularly available for operational management support on request, since they have busy schedules themselves. So it is of importance that both top managers and project managers realize that support will be needed during the life of the project. The framework that we aim to define will assist them in advance to identify and understand, when and what kind of action may be required. A theoretical insight into each element will further elaborate and justify the requirement for top management support. Therefore, this intended framework could be used as a tool to ensure top management support.

Strategy	**Facilitate**	**Lead**
Workout a sustainable business model	Supply resources	Accept ownership and gain better understanding of project work
Have clear business objectives and state them	Make necessary information available	Review project plans
Provide challenging work	Retain key employees	Provide guidance
Balance project assignments	Liaise with customer	Watch status
Build support in the organizational model	Boost employee morale	---
Prioritize	---	---
Participate in scope definitions	---	---

Table 3- Analysis of the top management actions

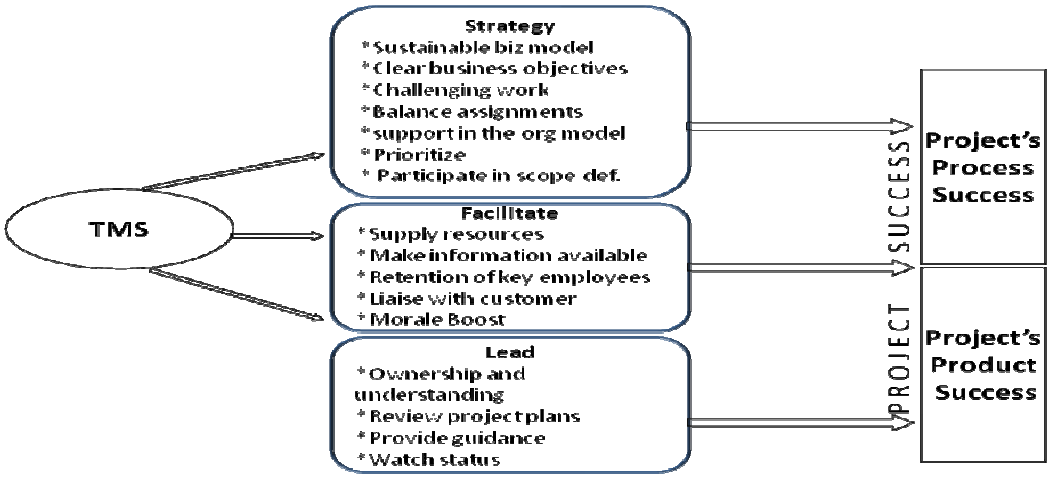

Figure 1 - Conceptual model

We see the following as limitations in this study. We were interested in researching TMS actions required for software development projects. Therefore, the majority of the organizations selected were from the software industry and as such our investigation did not investigate the relationship between TMS and the core business of the organizations. Although references to other projects were brought into the discussion, the factors needed as TMS are mostly limited to the projects that were studied in the five organizations involved. The investigation took place in one country only and, therefore, the findings may not be a generic representation. However, our plan is to extend the research to other Asia-Pacific countries, in the second stage. We have also not investigated in this stage, how the level of economic development and cultural aspects of a nation may affect TMS.

6 CONCLUSION

Many academics and practitioners believe that top management support is an important factor for the success of software development projects. This study examined five software development projects and is the first stage of an ongoing research program. We identified sixteen (16) specific actions needed by project managers as support from their immediate management. These actions were categorized into three groups (strategy, facilitate and lead) with the aid of prior literature and are identified as three important top management roles. The findings led to the development of a conceptual model with the three roles (strategy, facilitate and lead) identified as explanatory factors, and project success as the outcome.

The unique contribution from this paper is the conceptual model (Figure 1) based on the findings to date. There is promise in this framework, which not only looks at top management support roles, but can be built upon to examine the TM roles over the life of a project. The expanded framework planned for the second stage of this research program will have the capacity to explain and justify the top management actions required in each project management process using socio-organizational theories.

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