Delivering successful projects in the New Zealand process engineering industry.

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Abstract

The objective of this study was to identify the critical success factors that provide a focus to assist project managers in New Zealand deliver successful process engineering projects.

Possible critical success factors derived from the literature review formed the design of a semi-structured interview questionnaire to survey nine New Zealand project managers in the process engineering industry. Conclusions were drawn based on comparing the empirical data with findings and recommendations from the literature review.

The literature review highlighted the difficulty of defining project success. Distinction is made between project process success (the project is delivered to scope, on time and within budget) and project product success (the product of the process satisfies its various stakeholders). This distinction proved helpful in understanding the challenge that these project managers were facing when attempting to manage to achieve success.

Within identified limitations it is concluded that the critical success factors that provide a focus to assist project managers in New Zealand deliver successful process engineering projects are:

- Managing client expectations and perceptions in an ongoing manner such that the project, as delivered, meets those expectations and is perceived as a success.
- Clear scope definition (that aligns with client expectations).
- The ability to assemble the required resources within the budget.
- The generic hard skill of project process management.
- The generic soft skills of people management.

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1.   Introduction

Background

The topic area chosen for the dissertation is project success factors or factors which, "if addressed, will significantly improve the chances for successful implementation" (Pinto & Rouhianinen, 2001). The purpose of project management is to successfully deliver projects. To do this the project manager can draw upon a complex and wide ranging knowledge base and a continually expanding toolkit of techniques. This dissertation is concerned with identifying the key areas within this complex array of knowledge and techniques where the project manager needs to focus in order to make a difference.

The research focus of project success factors emerged for me over a period of time, through talking to project managers, managers and general employees of engineering/consulting companies involved in the Process Engineering Industry. My employer is involved in the industry and we have regular contact with other companies involved in the processing industry. Also, in my capacity as the coordinator of the local Project Management Institute (PMI) in Hamilton, I had the opportunity to talk to a number of Project Managers within the industry on a regular basis.

It became evident to me that despite being successful, most of the people in the industry that I talked to did not know specifically why they are successful, or what factors contributed to that success. What started as curiosity has turned into a genuine interest in finding out what are the factors that project managers need to focus on in order to make projects successful.

The Industry

The process engineering industry is involved in the design and construction of processing plants that process, treat and/or prepare raw materials in a series of stages, e.g. milk processing or chemical processes. The industry includes food, beverage, oil refining, petrochemicals, water and sewage treatment, and pharmaceuticals.

The research question

The research question has been formulated after some preliminary literature research and is as follows:

"What are the critical success factors that provide a focus to assist project managers in New Zealand deliver successful process engineering projects?"

The Research Approach

The research approach involved a literature search to find current scholarly knowledge on the subjects of project success and critical success factors in the project management industry in general and the New Zealand process engineering industry. The research included related topics and management disciplines to ensure a balanced point of view.

The findings in the literature were used as a basis for the design of a question sheet for a semi structured interview with nine project managers from a cross section of New Zealand companies from the process engineering industry.

The questionnaire consists of six sections aimed at identifying the specific factors that respondents retrospectively perceived to produce project success. The interview transcripts were then analysed for critical success factors and the relevant information recorded in section 4 of this report. This analysis was then compared with the findings from the literature review and conclusions drawn.

Dissertation Structure

Following an introduction, the literature review examines different themes concerning critical factors that have emerged during the literature investigation. This is followed by the research procedures chapter that justifies and details the research method employed in this study. The Results Chapter provides a detailed account and analysis of the information gathered during the interviews, and is divided into different sections to reflect the main inquiry approaches within the interview question. This is followed by the Discussion Chapter that considers the findings in relation to key ideas derived from the literature section and experiences of the researcher as a project manager. Finally the

Conclusions Chapter resolves the research question, identifies limitations and makes recommendations for the future.

2. Literature Review

Introduction

The purpose of this literature review is to explore current published thinking relating to the research question:

"What are the critical success factors that provide a focus to assist project managers in New Zealand deliver successful process engineering projects?"

The review is broken into the following sections:

Project and Project Processes: This is not intended to be an exhaustive review of this topic however it sets out the context within which the debate on critical success factors is conducted.

Project Success: In order to debate success factors it is necessary to consider what is success? As will be seen in this section it is harder to define that would first appear.

Project Success Factors: Having set the context by exploring what is meant by projects, project processes and how project success is viewed, the core issue of this research project is then explored.

2.1 Projects and Project Processes

What are Projects?

Generally a project can be defined as an endeavour with a specific start and finish date. The PMBok® Guide (2004), defines a project as, "A project is a temporary endeavour undertaken to create a unique product, service or result" (p. 5). A definition with a different emphases is offered by Wysocki, Beck, & Crane (1995) "A project is a sequence of unique, complex and connected activities having one goal or purpose that must be completed by a specific time, within budget and according to the specification" (p. 38).

Project management relates to the organising, managing resources, and planning to achieve project objectives and goals. The PMBok® Guide (2004) defines project management as "Project management is the application of

knowledge, skills, tools and techniques to project activities to meet project requirements"(p. 8). In his book Taylor (2004) defines project management "as the art and science of managing projects to a specific schedule, at or below a predetermined budget, to the customer's performance requirement and within the resource availability" (p. 27).

Typical Project Processes

Generally projects are broken into phases that are similar to those listed by Haugan (2002).

A.   Initiating
    1. Establishing Project Objectives
B.   Planning
    2. Define the Work
    3. Schedule work and Resources
C.   Executing
    4. Perform the Work
    5. Provide Progress Reports
D.   Controlling
    6. Track Actual Performance
    7. Analyse Project Progress
    8. Initiate Corrective Action
    9. Re-plan as Required
E.   Closing
    10. Complete the Project

The necessity for having solid project processes in place remains undisputed (Charvat 2003)

Figure 1 below shows the various levels that processes affect.
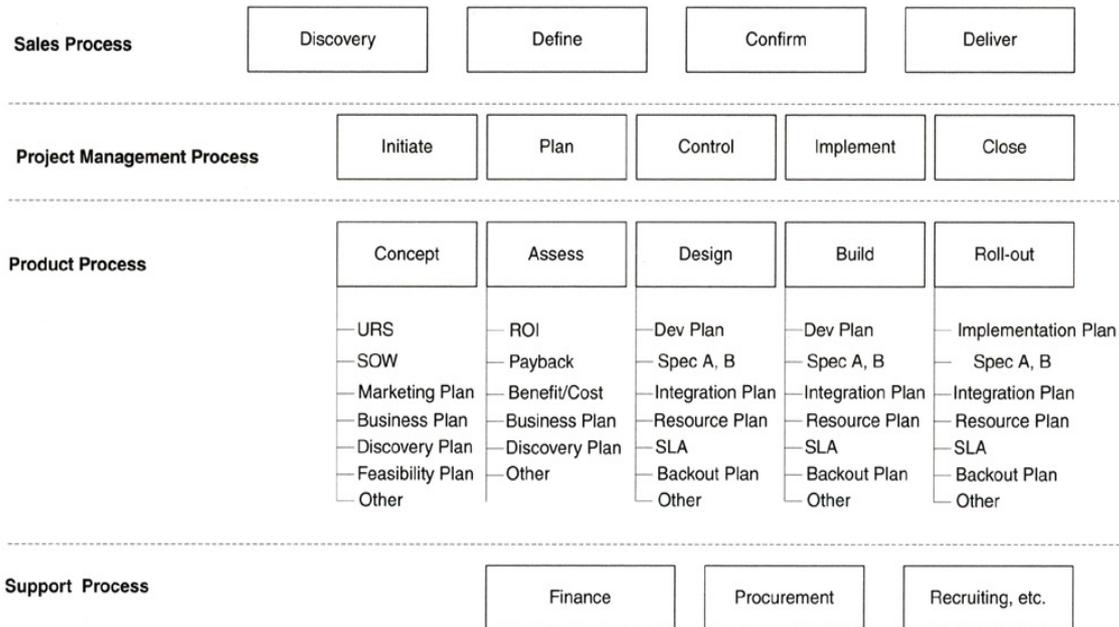
Figure 1. Integration of Process Area on a Project. (Charvat 2003)

Project Management Knowledge Areas

The process of project management involves a number of knowledge areas. A widely accepted list of knowledge areas is provided by the PMBOK® Guide (2004). It lists the following knowledge areas:

1.   Integration Management

2.   Scope Management

3.   Time Management

4.   Cost Management

5.   Quality Management

6.   Human Resource Management

7.   Communications Management

8.   Risk Management

9.   Procurement Management

The knowledge areas above may be seen as being made up of two groups, "Hard Skills" and "Soft Skills".

The hard/soft dimension concerns the tangible and intangible aspects of performance. Hard criteria tend to be measurable, the most frequent being to do

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with time, cost, resources and technical standards. Soft criteria on the other hand are more subjective and difficult to measure. Yet they are clearly used frequently in evaluating performance. They are more about "how" the task was accomplished, the attitudes, skills and behaviour demonstrated by the team and its members (Archibold, 2001).

Somewhere in these knowledge areas are key factors that contribute to the success of projects and the management thereof.

2.2 Project Success

Introduction

The importance of the concept of project success is reflected by the Project Management Institute (PMI) devoting its 2006 Annual Seminars & Symposium to this topic. Defining project success is a difficult task:

"Project success is a topic that is frequently discussed and yet rarely agreed upon. The concept of project success has remained ambiguously defined. It is a concept which can mean so much to so many different people because of varying perceptions and leads to disagreements about whether a project is successful or not (Liu & Walker, 2005. p. 211)."

A review of the project management literature provides no consistent interpretation of the term project success. McCoy (2006) observes that a standardised definition of project success does not exist nor an accepted methodology of measuring it. Wateridge (2005) notes that very few people in the past have thought seriously about the success criteria. Similarly, Wells (2005) is disappointed about the lack of attention given to defining success except in quite general terms. His study proposes the use of the logical framework method (LFM) to provide a detailed framework for defining and understanding project success. Importantly, the author proposes that it is common for project management literature to confusingly intertwine two separate components of project success--product success and project management success.

Conceptually, the determination of project management success disregards product success, e.g., a project has been managed efficiently but eventually does not meet customer or organizational expectations (Shenhar, Levy, & Dvir,

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2004). The focus of project managers on project management success is highlighted by research on information technology projects by Wateridge (2005), whereby project managers interpreted a failed project as one not meeting budget and schedule, i.e., project management success; while users placed greater emphasis on meeting requirements such as response time and reliability, i.e., product success. This indicates that project managers are focusing on the short-term criteria relating to the project 'process' and concentrating on meeting time and budget constraints ... as opposed to the longer-term criteria relating to the 'product,' such as delivering a system with which the users are happy (Wateridge, 2005).

A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (PMI, 2004) defines project management as the application of knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project. Project stakeholders are individuals and organizations who are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or successful project completion. Both project success components, product success and project management success, must meet stakeholders' satisfaction. The PMBOK® Guide links stakeholders with project success. The project management team must identify the stakeholders, determine what their needs and expectations are, and then manage and influence those expectations to ensure a successful project. So, stakeholder satisfaction is a crucial part of project success. Tuman (2006) observes that the days when we could define success in terms of cost, schedule and technical objectives are gone. We must address a much wider range of needs, concerns and issues that are presented to us by a diverse mix of project stakeholders.

Both Baker, Murphy & Fisher, 1988 and Hartman and Ashrafi (2006) suggest that the perception of project success changes with time. However, it seems they have in fact intermingled the two separate concepts of product success and project management success. It is not that the focus and perception of project success changes with time but rather two different success concepts are being measured, project management success during and at the end of the project; and product success during the operational use and end of the project's product life.

Project Management Success

While project success is difficult to define, Baker et al. offer a definition that covers most of the points found during the literature research.

"The project meets the technical performance specifications and/or mission to be performed, and if there is a high level of satisfaction concerning the project outcome among key people on the project team, and the key users or clientele of the project effort" (Baker et al., 1988. p. 903)

Project management success as commonly discussed in the literature has three key components: (1) meeting time, cost, and quality objectives (project outputs and inputs); (2) quality of the project management process; and (3) satisfying project stake-holders' needs where they relate to the project management process.

Time, Cost and Quality

Time success can be measured in terms of meeting the schedule (McCoy, 2006; Morris & Hugh, 2004; Pinto & Slevin, 2005; Turner, 2003). The time success criterion could be measured in terms of schedule over/under run as a percentage of the initial plan (Might & Fisher, 2005).

Cost success can be measured in terms of meeting the budget (McCoy; Morris & Hough; Pinto & Slevin; Turner). The cost success criterion could be measured in terms of cost over/under run as a percentage of the initial budget (Might & Fisher). The setting of the cost objective is easier when the project is procured externally of the project-initiating organization because contracts set out the cost target. Whereas for internal projects it is much more difficult to obtain an objective target cost when there are no market forces operating and there are many costs which should be allocated to the project but are treated as general organization overheads (Freeman & Beale, 2002).

Judgment of whether a project has successfully met the objectives of time, cost, and quality is a short-term measure made on completion of the project. Judgment of whether a project has been conducted in a quality manner and has successfully met the needs of the project team occurs throughout the project. Research by Baker et al. (2005) showed that in a post-project analysis the successful accomplishment of time and cost objectives were not considered of

greatest importance in evaluating the project success. They suggest that as this research dealt with completed projects, time and cost objectives may have seemed somewhat unimportant with the passing of time if the project's output meets the strategic goals of the project. But, if the survey had been conducted on current, ongoing projects only, the management emphasis on meeting schedules and staying within budgets would undoubtedly have been reflected more heavily in the research results (Baker et al., 2005). Similarly, research by Hartman and Ashrafi (2006) found that time and cost are the most important priorities during the project definition to execution phases; however, client satisfaction became the most important priority and project success criteria at project completion.

Quality of the Project Management Process.

Project management success should also encompass consideration of how efficiently the project has been managed. Criteria such as cost, time, and quality are only effectiveness criteria; however, consideration of efficiency is also necessary (de Wit, 2005). Other examples include:

- Anticipating all project requirements, having sufficient resources to meet project needs in a timely manner, and using these resources efficiently to accomplish the right task at the right time and in the right manner (Tuman, 2006).
- Dealing with the issues early or as soon as they surface and keeping management informed (Lientz & Rea, 2005).
- Effective coordination and relation patterns between project stakeholders, e.g., team spirit, participative decision-making (Baker et al., 2005).
- Minimum scope changes, no disturbance to the organization's main flow of work, and no disturbance to corporate culture (Kerzner, 2002).
- Completeness of the termination, absence of post-project problems, quality of post-audit analysis, identifying technical problems during the project and solving them (Freeman & Beale, 2002).

It might be considered that these efficiency factors are in fact variables contributing to project management success rather than measures of project management success itself.

Quality success can be measured in terms of conformance to functional and technical specifications (Baker et al., 2005; Morris & Hough, 2004; Turner, 2003). In other words, the project must produce what it said it would produce (PMI, 2004). Technical performance success depends on to what extent the technical requirements specified at the commencement of the execution phase were achieved (Freeman & Beale, 2002).

Stakeholder Satisfaction.

As stated previously, project management success entails satisfying project stakeholders' needs where they relate to the project management process. The key stakeholders during the project management process are the client and the project team (Munns & Bjeirmi, 2006).

Every project has a wide variety of stakeholders, all of whom will have their own particular subjective perception of success (Stuckenbruck, 2006; Wideman, 2005). In fact Baker et al. (2005) suggest the term "perceived success of a project". Consequently, a project can be a success for one party and a disaster for another (de Wit, 2005). Stuckenbruck (2006) points out that the question as to whether a project was or was not a success will depend to a great extent on who is asking the question. Different stakeholders in the project, unfortunately, may have very different criteria as to what constitutes project success.

Each stakeholder will have their viewpoint of success depending on their needs and how well these needs are satisfied by the project. For example, an architect may consider success in terms of aesthetic appearance, an engineer in terms of technical competence, an accountant in terms of dollars spent under budget, a human resource manager in terms of employee satisfaction, and chief executive officers rate their success in the stock market (Freeman & Beale, 2002). To reach consensus of success criteria among all stakeholders is quite unrealistic and so only by establishing common goals, can criteria acceptable to all be achieved (Liu & Walker, 2005). De Wit provides a sobering conclusion on the ability to objectively measure project success:

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"Measuring success is complex and a project is hardly ever a disaster or failure for all stakeholders during all phases in the project life cycle. A project can be a success for one party and a disaster for another: (Also), a project may be perceived a success one day and a failure the next. Therefore, to think that one can objectively measure the success of a project is an illusion" (2005, pp. 164-170).

Success criteria must be prioritised. Success criteria can conflict with each other, which means there will often be trade-offs that must be agreed by all parties before the project is started (Wateridge, 2005). In many projects there will be a large number of stakeholders, in which there is a need to identify which stakeholders are going to have the most influence in determining project success (Tuman, 2006). From this, attention must be focused on important stakeholders if project success is to be accomplished. Each success criterion has its own timescale for measurement (Turner, 2003). For example: Judgment of whether the project goal has successfully been met can only be made once the project's product has been utilized and this can be many years after the project's completion. Therefore, determination of successful achievement of the project goal tends to be of a long-term nature, orientated toward the expected total life span of the completed project (Munns & Bjeirmi, 2006). However, successful attainment of project purpose can be assessed after a short time, when the project has been delivered to the customer and the customer is using the product. Customer satisfaction can typically be assessed within a few weeks to a few months of the date of purchase (Shenhar et al., 2004).

The project manager should be able to control and influence the achievement of the project management success criteria of cost, time, and performance. Whereas, stakeholder satisfaction may be beyond their control. However if they do successfully influence stakeholders perception, project managers can attain high levels of perceived project success even under adverse circumstances (Baker et al., 2005).

2.3 Project Product Success

Project Goal

Product success means achieving the project goal, i.e. the project reaches a favourable termination in support of the enterprise mission and succeeds as a building block in the design and execution of enterprise strategy (Cleland, 2006). Organizations initiate projects to meet their strategic objectives such as profitability, market share, or technological advancement. For example, Cooper and Kleinschmidt (2004) identify three dimensions for measuring product success: financial performance, opening new opportunities and market impact. Project definition and early decision-making is critical to product success (Munns & Bjeirmi, 2006). Product success is in fact measured against the criteria used to select the project. Consequently, as Munns and Bjeirmi observe, the quality of the decision-making process in selecting an appropriate project in the first place is critical in the ultimate achievement of product. Furthermore, the project goal must be clearly articulated prior to project launch ... Project managers must be made aware of the results expected from their projects (Shenhar et al., 2004).

Shenhar, Dvir, Levy, and Maltz (2001) developed a multifunctional framework to represent the different dimensions of the meaning of success in different project circumstances. The four different dimensions identified by Shenhar et al. are;

1. project efficiency
2. impact on the customer
3. direct business and organisational success and
4. preparing for the future (p. 699).

The key difference in the four dimensional model is the consideration of the long-term organisational goal.

Project Purpose

The project's product must have fitness for use, i.e., the product or service produced must satisfy real needs (PMI, 2004). Pinto (2005) claims that the traditional focus on the project management objectives of time-cost-quality shows a lack of any real concern for the customer. Customer satisfaction means that a project is only successful to the extent that it satisfies the needs of its intended user. Project managers must now devote additional time and

attention to maintaining close ties with and satisfying the demands of external clients (Pinto, 2005).

Stakeholder Satisfaction

Product success entails satisfying project stakeholders' needs where they relate to the project goal and purpose. The key stakeholder here is the customer/user. Research by Shenhar et al. (2004) found project managers consider project customers to be the most important stakeholders. PMI (2004) and ISO (2004) advise that in trying to satisfy the conflicting needs and expectations of stakeholders, differences should be resolved in favour of the customer. Similarly, the real measure of project success is to be found in customer satisfaction (Wideman, 2005).

2.4 Project Success Summary

Contrasting Product Success and Project Management Success

One Can Succeed--AND Fail! Projects can be product failures even when the project management success objectives of time, cost and quality have been successfully met. Conversely, projects can be project management failures but a product success (de Wit 2005), he goes on to explain,

> "one frequently observes that a project team gets credit for a successful project which it does not deserve and, conversely, the team may be incorrectly blamed for project failure. A project can be a success despite poor project management performance, and vice versa. For example, the North Sea oil development projects in the 2000s suffered substantial cost and time overruns (i.e., project management failures) but were considered a product success. The main reason was the substantial increases in the price of oil in 2003 and 2005 that made them very successful in achieving the project goal of profitability" (pp. 164-170).

De Wit, (2005) goes on to say

> "Project Management Success is Subordinate to Product Success. The project management success criteria of time, cost and performance are subordinate to the higher product success objectives of goal and purpose. Consequently, this explains why projects, which ought to be considered a

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disaster in project management terms, are perceived as successes simply because the higher-level objective was met" (pp. 164-170).

The fitness-for-use objective of product success is of a higher order than the conformance to requirements focus of project management success:

"Meeting specifications is not enough. Poor project definition and weak articulation of product requirements may result in dissatisfied customers even when project specifications are fully met. One should notice the possible disparity between meeting performance objectives and satisfying the customer. The traditional assumption is that performance is well defined and, if met correctly, the customer must be satisfied. In reality, however, this is not always the case. Many projects have failed because they did not fulfil customer expectations, even though they were well executed. Project managers must be attuned to customer requirements and to his or her real needs. Consequently, project managers must act decisively to rectify the gap between project perceived performance and actual customer needs (Shenhar et al., 2004, p. 5)".

Project Management Success Influences Product Success

Project management success can influence the achievement of product success. Good project management can contribute toward product success but is unlikely to be able to prevent product failure. For example, project management may help to identify, the unfeasible nature of the project and indicate that it should be abandoned or changed (Munns & Bjeirmi, 2006). Poor project management in terms of cost and/or time overruns may result in the non-attainment of product success such as profitability, or market share. And increased competition and shorter project life cycles means that meeting project deadlines will add to the competitiveness of new products (Shenhar et al., 2004).

Project management success measured in terms of cost-time-quality can be viewed as internal measures of efficiency (Shenhar et al., 2004). Each objective is intended to satisfy some interest group internal to the organization so that, for example, accountants are concerned with time and cost considerations while engineers are primarily concerned with the performance criterion (Pinto, 2005).

In contrast, achieving product success is concerned with the project's external effectiveness (Shenhar et al., 2004).

Project success may be partially achieved and projects can also be measured in varying degrees of success. Very often success and failure is seen as 'black and white.' However, projects may not always be seen as completely successful or complete failure (Wateridge, 2005). The determination of project success can be ambiguous and becomes extremely difficult to give an unequivocal verdict of success or failure as some criteria are successfully meet whilst others are not (de Wit, 2005).

2.5   Project Success Factors

What are Success Factors?

A definition on Critical Success Factors is offered by Pinto & Rouhiainen, 2001 "Those factors which, if addressed, will significantly improve the chances for successful implementation" (Pinto & Rouhiainen, 2001).

2.5.1 Success Factors in Project Management

A review of the literature on successful project management factors required for any type of industry shows that there are a number of competency standards that have been developed in recent years to assist with the PM competency development; such as A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 3rd Edition (PMI, 2004), and The Association for Project Management Body of Knowledge (APM Bok) (Dixon, 2000). Both of these standards heavily rely on processes and methods, and have a strong focus on scope, time, cost and quality for project success. While the processes and methods in the standards form part of the success or criteria, they only make up part of the equation.

Pinto and Rouhiainen (2001) claim that several authors have developed sets of Critical Success Factors (CSF). Typical of which is the Pinto and Slevin (1988) 10 factor model shown in table 1.

Table 1. 10 Success Factor Model.

	Factor	Description
1	Project mission	Clearly defined goals and general directions
2	Top management support	Willingness of top management to provide the necessary resources and authority/power for implementation
3	Schedule/plans	Detailed specifications of individual action steps for system implementation
4	Client consultation	Communication, consultation and active listening to all parties
5	Personnel	Recruitment, selection and training of the necessary personnel for implementation
6	Technical tasks	Availability of technology and expertise to accomplish specific technical steps
7	Client Acceptance	Selling the final product to its ultimate intended user
8	Monitoring and feedback	Timely provision of comprehensive control information at each stage
9	Communication	Provision of an appropriate network and necessary date to all key stakeholders
10	Trouble Shooting	Ability to handle unexpected crisis and deviate from plan

Pinto and Slevin (1988)

As well as validating this 10 factor model Pinto and Rouhiainen's (2001) research determined that, to a large degree, the CSFs remain within the control of the project manager responsibility for implementing the project. A review by Cleland (2003) revealed agreement that the competence, or knowledge, skills, and attributes of the project manager, are critical to project success.

Murray (2002) identified nine factors for project success in the IT industry. Despite the known difficulties of IT projects Murray claims that a relatively small number of factors control the success or failure of every IT project, regardless of its size or complexity.

Table 2. Nine Factors for Project Success in the IT Industry.

1	Appropriate senior management levels of commitment to the project.
2	Adequate project funding.
3	A well-done set of project requirements and specifications.
4	Careful development of a comprehensive project plan that incorporates sufficient time and flexibility to anticipate and deal with unforeseen difficulties as they arise.
5	An appropriate commitment of time and attention on the part of those outside the IT department who have requested the project, combined with a willingness to see it through to the end.
6	Candid, accurate reporting of the status of the project and of potential difficulties as they arise.
7	A critical assessment of the risks inherent in the project, any potential harm associated with those risks, and the ability of the project team to manage those risks.
8	The development of appropriate contingency plans that can be employed should the project run into problems.
9	An objective assessment of the ability and willingness of the organization to stay the project course.

An interesting viewpoint is presented by Rad and Levin (2002), suggesting that, client and the project team viewpoints on the success of the project are fundamentally different; the former is focused on the deliverables, and the latter on the means by which the deliverables are created. However, it is the means by which the deliverables are created, that relate to the CSFs.

A similar dual concept is presented by Crawford (2003) who suggests that project success has two major strands to this concern - how success is judged (success criteria), and the factors that contribute to the success of the projects (success factors) (p. 110). The two major strands above (Crawford 2003; Rad

and Levin 2002) have not been specifically identified or mentioned in the other literature reviewed.

Morris, (1983) in his study of British firms clearly identified that behavioural and organisational factors far outweigh technical issues in terms of importance for success. Rather than focusing undue concern on technical issues, it was far more important to pay attention to the human side of the process.

Table 3 by Morris (1983) demonstrate three important points. First, the relative importance of the various CSF changes as the implementation effort proceeds through its life cycle. For example, at stage one, team formation, the most important factors are personal motivation and top management support. However, by the time the implementation process is in its closeout stage, personal and team motivation have become the most important factors affecting the success of the project (Pinto and Millet 1999)

Table 3. Morris' Critical Success Factors.

Stage	Critical Success Factors (in order of importance)
Formation	Personal Ambition Top Management Support Team Motivation Clear Objectives Technological Advantage
Build-up	Team Motivation Personal Motivation Top Management Support Technical Expertise
Main Phase	Team Motivation Personal Motivation Client Support Top Management Support
Close out	Personal Motivation Team Motivation

	Top Management Support
	Financial Support

Morris (1983)

Metrics, a key factor that has little mention in the literature other than the need to measure progress. Hayes (2002) in his study on Six Sigma Critical Success Factors states, You can't manage what you can't measure. To be able to measure progress against success factors, one needs metrics.

Important 'hard' outcomes are new product success and timeliness. A Product Development and Management Association (PDMA) Task Force identified the most common categories of measures by surveying the literature and 50 best-practice firms (Griffin and Page 2003):

• Customer measures (e.g. market share, customer satisfaction)

• Financial measures (e.g. profit goals, margins)

• Process measures (e.g. technical performance, on-time delivery)

• Firm-level measures (e.g. success/failure rate, % of sales from new products)

• Programme measures (e.g. new product programme achieved objectives).

2.5.2 Logical Framework Method (LFM)

Belout (2005) claims that a synonym for success is effectiveness, i.e., the degree of achievement of objectives. Projects are formed to accomplish objectives and success is measured in terms of how well these objectives have been met. He goes on to argue that a project has, in fact, a hierarchy of linked objectives that can be identified and structured by use of LFM. The American Aid Agency developed LFM in the 2000s for International Development to improve project management of development projects (Couillard, 2005; Youker, 2003). Youker (2004) notes that the production of a hierarchy of project objectives acts as a communication tool and a clear target for the project team. The terminology for the different types of project objectives varies between authors. Conceptually, there is no logical limit to the number of levels of project objectives; however, a common four-level structure can be identified (Couillard,

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Lajoie, & Lowthian, 2005; Davis, 2005; Einsiedel, 2004; Youker, 2003). Figure 1 below shows an example of a horizontal logic for a rice project.

The application of LFM can become bogged down by semantic arguments over the meaning of words such as goal and purpose. Youker (2003) recommends the use of the word objective for each level (i.e., goal objective, purpose objective, output objective, and input objective) and agreement by all concerned on a common understanding. A key role of LFM is to provide a step-by-step conceptualisation of the important elements of a project, both for planning purposes and for post-project evaluation (Youker, 2003).

Hierarchy of Project Objectives

Level of Objectives	Means-Ends Chain	Measurable Indicators of Results	Assumptions
Policy Objectives	*Objective (end-outputs)* Double farmer income to $200	per capita income	Price of rice does not fall with increased production
	Strategy (means-inputs) Increase rice production 50%	total tons grown	
Strategic Objectives	*Objective* Increase rice production 50%	tons/hectare	Proper use of fertilizer will increase yields
	Strategy Use new seeds and fertilizer	number of tons distributed	
Project Objectives	*Objective* Use new seeds and fertilizer	number of loans	Loans will lead to better practices
	Strategy Loans and extension work with farmers	value of loans	
Input Objectives	*Objective* Loans and extension work with farmers	level of effort/ expenditure	
	Strategy Bank loan of $10 million		

Figure 2. Logic Frame Method Sample (Youker2004).

The PMBOK® Guide (PMI, 2004) states that all projects should be supportive of the performing organization's strategic goals. The project goal is the overall strategic orientation to which the project will contribute and should be consistent with the strategic plans of the organization. The project goal provides the

rationale behind the project and describes its long-term objective. A program of projects can have the same project goal. Davis (2005) recommends that a project should only have one purpose, otherwise efforts become diffused and the project design weakened.

LFM is a how-why logic chain that displays the relationships between the hierarchy of project objectives. The why's are the ends and the how is the means. Therefore, LFM shows cause-and-effect between the hierarchies of project objectives. LFM structures clear thought and judgment as to whether the hierarchical relationships between the project objectives are logical and viable. Importantly, the stronger the cause-and-effect linkages between the project objectives, the better the project design (Davis, 2005). This ensures that the project contributes to the strategic plans of the organization.

Objectives

The goal and purpose can be viewed as strategic objectives while the outputs and inputs are operational objectives. Couillard et al. (2005) observe that the organization's strategic plans to which the project goal contributes are external to the project and considered by the project as given. Senior management within the project-initiating organization (sometimes referred to as the sponsor, client, or owner) sets the project goal. This organization is the main party concerned about the success of the project in the long term and cannot expect to relinquish responsibility by passing all duties to the project teams (Munns & Bjeirmi, 2006). Thus, senior management within the project-initiating organization is ultimately responsible for ensuring the link between organizational plans and the goal and purpose of selected projects and the creative processes in identifying possible ideas for a project (Munns & Bjeirmi). The project management team is responsible for producing the project output but, as mentioned previously, the determination of the project purpose is beyond their responsibility (Davis, 2005; Einsiedel, 2004; Youker, 2003). So, from a project management perspective, projects end when they are delivered to the customer. That is the point at which project management ends. They do not consider the wider criteria that will affect the project once in use (Munns & Bjeirmi, 2006).

Linking LFM and Project Success

The LFM provides a very useful framework for articulating the concept of project success, in that project management success relates to the LFM objectives of project outputs, and project inputs and product success relates to the LFM objectives of project goal and project purpose.

2.5.3 Teams

The majority of projects are conducted by companies that have a Functional or Matrix structure and the emergence of cross-functional teams is one of the most dramatic recent trends in organizational design. However, 'the evolution of these teams in organizations is rapidly outstripping scholarly research on the topic' (Denison, Hart, and Kahn. 2006). Reviewing 11 surveys of best practice in new product development, Griffin (2004) found consensus that effective implementation of cross-functional teams 'is crucial to success', but commented that 'we have not yet been able to define the organization and infrastructure which best supports effective multifunctional teams over time and across projects'. This part of the review sets out to explore the critical success factors for cross-functional teamwork and address some of the soft aspect of project success.

The Drive towards Cross-functional Teams

The long-term survival of a business hinges upon its ability to successfully introduce superior products or services into the marketplace 'innovate or die'. Shortening product life cycles and imperatives for faster development and global roll-out demand more flexible organizations. Competition is increasingly fought on the basis of intangible organizational competencies and it is not so much what firms do as how they do it, which determines their ability to compete (Clark and Wheelwright 2003).

A 2005 survey of US firms found that over 84% of more innovative product development projects used cross-functional teams (Griffin 2004). This popularity reflects numerous anecdotal reports of their effectiveness (Parker 2004).

A large bench-marking study of 103 new product projects in 21 divisions of major chemical companies found 'true' cross-functional teams to be the top

driver of project timeliness, and an important driver of profitability (Cooper 2005). In another benchmarking study of the 244 firms responsible for 80% of Research and development (R&D) spending in Western Europe, Japan and North America, 'multifunctional teams' had the greatest statistical impact on time to market for new products (Roberts 2005).

Although many authors refer to cross-functional teams, few offer a definition. A definition of what is meant by a 'team' is offered by Cohen and Bailey's (2004): "A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems (for example, business unit or the corporation), and who manage their relationships across organizational boundaries" (p. 239).

The key point here is the word interdependence. Team members need to work with each other to succeed.

Ancona and Caldwell (2002a) define a cross-functional product development team as follows: 'members of different departments and disciplines are brought together under one manager and given the charge to make development decisions and enlist support for them throughout the organization'. It is interesting that 'enlisting support' is regarded as critical. This definition lacks focus on delivering outcomes and makes the overly broad assumption that the team are 'under one manager'.

There are advantages and drawbacks to both matrix and project-based designs. Matrix organizations maintain functional specialization while improving integration, but may create goal conflicts for employees. Project teams focus a group on a specific goal, thus allowing the team to create a shared world (Dougherty 2000). The optimal format for a cross-functional team may be dependent upon the type of project and stage of the project (Dvir, Shenhar and Tishler. 2005; Larson and Gobeli 2005; Verganti 2004).

What is Special about Cross-functional Teams?

Cross-functional teams differ from conventional teams in three significant ways (Denison et al. 2006). Firstly, their members usually have competing social identities and loyalties. Individuals tend to identify more strongly with their function, both socially and psychologically, than with their organization as a

whole (Ashforth and Mael 2005; Kramer 2001). Since teams also generate their own identities and loyalties, this can create conflicts for team members. Secondly, cross-functional teams are often temporary task teams undergoing significant pressure and conflict. Thirdly, such teams often face high performance expectations, with aspirational goals of compressing development times, creating knowledge and enhancing organizational learning. A survey of 43 Fortune 500 companies in the US revealed six major obstacles impeding the effectiveness of cross-functional teams (Wall and Lepsinger 2004). The key issue, affecting 80% of respondents, was the tension which exists between team goals and functional priorities.

Cross-functional obstacles

- Conflicting organizational goals
- Competition for resources
- Overlapping responsibilities
- Conflicting personal goals
- No clear direction or priorities
- Lack of co-operation

Critical Success Factors for Cross-Functional Teamwork

Literature searches were performed to identify relevant studies. The most rigorous studies were reported by Denison et al. (2006), Jassawalla and Sashittal (2005), Donnellon (2003), Pinto et al. (2003) and Vinokur-Kaplan (2005). Denison et al. and Jassawalla and Sashittal used a careful grounded theory approach, while Donnellon adopted a detailed anthropological, linguistic approach. Pinto et al. conducted path analysis of data from questionnaires and Vinokur-Kaplan developed and quantitatively validated Hackman's (2000) contextual model. Brown and Eisenhardt (2005) also provide a valuable review of the literature on factors critical to product development success.

Cohen and Bailey's heuristic model of team effectiveness provided a useful framework for content analysis of the literature. Each study was examined for claimed critical success factors, and these were allocated to the six categories defined by the model.

The critical importance of 'empowerment' was cited by many authors, also labelled as 'autonomy', 'authority' or 'power' (Denison et al. 2006; Henke and Krachenberg 2003; Jasawalla and Sashittal 2005; Parker 2004). Mohrman, Cohen and Mohrman (2005) dispel some myths about empowerment, defining it as 'the capability to make a difference in the attainment of individual, team and organizational goals'.

Two key activities undermine team empowerment: meddling by functional managers and micro-managing by senior managers. The greatest drawback perceived by cross-functional sourcing team members was that 'managers outside the team attempt to control team activities or influence team decisions' (Trent and Monczka 2004). In a large postal survey, Larson and Gobeli (2005) found that the most successful projects, rated against a number of criteria, were those with a 'project matrix' structure. A project manager is assigned to oversee the project and has primary responsibility and authority for completing the project. Functional managers assign personnel as needed and provide technical expertise.

As emphasized by Hackman (2000), it is also important that senior managers respect team outputs and do not try to 'micro-manage' projects (Cooper 2005; Henke et al. 2003). Jassawalla and Sashittal (2005) describe how managers in highly collaborative firms empower teams to solve problems themselves and coach members to take a holistic view. Experimentation and risk-taking is encouraged by treating failure as a learning opportunity.

Reported degrees of empowerment vary greatly. 3M possibly gave its Action Teams the greatest freedom, allowing team leaders to choose their own projects and team members, and removing resource constraints (Hershock et al. 2004). The results were highly successful -- time to market was halved, completely new products were developed and corporate goals for the percentage of sales from new products were exceeded. In another company, teams could proceed with product development plans if senior management decision making was too slow (O'Connor 2004). Jassawalla and Sashittal (2005) found the highest levels of inter-functional collaboration in firms where cross-functional teams that had autonomy to make all new product development decisions and to design their own workflows. While these may seem extreme

examples, there is solid empirical evidence that empowerment enhances performance (Denison et al. 2006).

Cooper (2006) and Griffin and Hauser (2006) highlight a process developed by Mitsubishi, which provides a translation mechanism from the language of the customer to the language of the engineer/scientist by explicitly linking the two types of information in a 'House of Quality' (Hauser and Clausing 2005). Cross-functional teams are particularly prone to the problem of becoming too large to be effective (Katzenbach and Smith 2003). Research on group size suggests that too few or too many members reduce performance (Cohen and Bailey 2004). Belbin (2001) favours a team size of six.

Henke et al. (2003) found that there were typically eight to ten functional representatives on cross-functional teams. The choice of which functions to involve impacts success by affecting how much information is easily available (Rochford and Rudelius 2002). Quinn (2005) found that the most innovative companies limited project team size to six or seven. This provided a critical mass of skills while fostering communication and commitment.

Souder and Sherman (2003) state that the primary problem in cross-functional teams is the problem of leadership. Should the team be R&D or Marketing led? The emergence of a 'functional' project managers may be the solution, i.e. managers outside the traditional functional hierarchy in the organization. Jassawalla and Sashittal (2005) found a clear distinction between organizations where R&D led new product decision-making and appointed team leaders, and those where Marketing had an equal say and senior managers selected leaders. R&D appointed leaders had relatively higher stature than other team members, whom they consulted as necessary. Participants in these teams had 'unequal power, an unequal stake in ... outcomes and a host of hidden agendas'. In contrast, selected leaders were chosen for their ability to manage human interactions within a team-working environment. These people were more likely to hold team-building exercises, network with functions, and coach team members to appreciate the bigger picture and work together more effectively. This improved inter-functional collaboration.

Clear mission from senior management.

This refers to the vision which senior managers communicate about the purpose of teams within the organization. In a comparison of four companies, Donnellon (2003) points out that the one which most successfully implemented team working had a conscious aim to develop a more entrepreneurial, collaborative culture, whereas the others focused solely on speed and efficiency goals. Similarly, Jassawalla and Sashittal (2005) found greater cross-functional collaboration in firms where senior managers aimed at 'creative utilization of every participant's potential'.

Senior managers at 3M gave their Action Teams eight aspirational goals (Hershock et al. 2004):

- Increase our base of technology by a quantum leap.
- Cut new product development time in half.
- Develop products that result in new business.
- Create a new atmosphere of entrepreneurship.
- Push decision making down to the lowest possible level.
- Build a management style that encourages leadership throughout the division.
- Eliminate barriers to innovation within the organization.
- Take a strong stand on quality right from the start.

Griffin (2004) and Jassawalla and Sashittal (2005) emphasize that senior management must give a high priority to and define a clear overall strategy for new projects. Hutt, M.D., Walker, B.A. and Frankwick, G.L. (2005) concur that a fundamental task for leaders is to create a strategy map that organizational members can strongly identify with. A compelling vision builds commitment and provides a common goal.

Strategic alignment between functions.

Kahn (2006) argues that implementation of a cross-functional team programme when interdepartmental integration is insufficient or non-existent may isolate teams and that such integration should be seen as predicating cross-functional team implementation. Cooper (2005) emphasizes that all senior managers from

the various functions must be supportive and there should be alignment among them regarding prioritisation of, and commitment to, projects.

2.5.4 Senior management support.

Cooper (2005) emphasizes the critical importance of top management, acting as executive sponsors of projects, and maintaining commitment. Senior management sponsors were crucial to the success of Action Teams at 3M (Hershock et al. 2004). They were 'enablers', reviewing, approving and allocating resources, and played a vital role in altering the mindset of middle managers. Their visible support was motivating for team members.

Leaders play a vitally important role in shaping organizational culture (Hampden-Turner 2000). As prescriptive hierarchical behaviour becomes less appropriate in flatter, knowledge-based organizations, culture has become an important way to influence behaviour. The leader defines good performance and then celebrates success or criticizes its non-attainment, leaving responsibility for actual performance with subordinates. For cross-functional teamwork to flourish, organizational leaders must send out clear signals as to what is expected, and explicitly recognize and reward achievements.

Jassawalla and Sashittal (2005) describe how, in highly collaborative firms, managers 'functioned primarily as educators and coaches' and 'fostered a flexible, integrative, inclusive team culture'.

Several researchers have highlighted the power of the project leader as a factor in new product success (e.g. Clark and Wheelwright 2002). These 'heavyweight' leaders have significant decision-making responsibility, organization-wide authority and high hierarchical level (Brown and Eisenhardt 2005). They are effective at lobbying for resources and protecting the team from outside interference.

2.5.5 Leadership

A great deal of research and practical observation points to the fact that effective project managers can, by themselves, go far toward ensuring whether a project will be a success or a failure (Pinto & Trailer, 1998). "The best project managers are outstanding leaders. They have vision, they motivate, they bring

people together, and, most of all, they accomplish great things" (Verzuh, 1999, p.25).

Zeitoun (2004) quotes "The artistic side of the project manager as a leader is what allows project managers to be who they could best be. Projects do not succeed in creating the wow for customers and society only because the best technology was used; they succeed because the collaboration of minds towards a well-defined objective took place as directed by proper leadership. It is that side of the project manager that makes the miracle happen".

Wideman (2008) defines leadership as "The ability to identify what work has to be done and then to select the people who are best able to tackle it. It is about setting goals and objectives and generating enthusiasm and motivation amongst project team members and stakeholders to work towards those objectives". Pinto et al. 1998 offer a different definition, "Leadership is a social influence process in which the leader seeks the participation of individuals in an effort to obtain organizational objectives".

Pinto et al investigated project manager skills—traits, characteristics, attributes, behaviours, and techniques that make a difference in successfully managing projects. A summary of the six skill areas as shown in the table below.

Table 6. Project Management Skills

Communication Skills (84)	Listening, Persuading
Organizing Skills (75)	Planning, Goal-Setting, Analyzing
Team Building Skills (72)	Empathy, Motivation, Esprit de Corps
Leadership Skills (68)	Sets Example, Energetic, Vision (big picture), Delegates, Positive
Coping Skills (59)	Flexibility, Creativity, Patience, Persistence,
Technological Skills (46)	Experience, Project Knowledge

Pinto & Trailer (1998)

The more that project managers understand power and are able to identify situations in which it arises, the more effective they will be in obtaining and tracking resources and in establishing their leadership position within the project team (Kezsbom & Edward, 2001). True leadership involves the ability to conceptualise the vision and direction of the project and then communicate and sell this vision to the functional managers, team members, and various stakeholders (Imparato and Harari, 1996). They go on to say that leadership also involves designing a strategy that accurately reflects the vision of the leader.

Because the implementation process is intensely people oriented, some of the most important skills to be developed are the abilities to motivate, inspire, and lead the team (Pinto, Thoms, Trailer, Palmer, & Govekar, 1998). Time and again, true project manager leadership has been shown to be one of the most important characteristics in successful implementation not just because its impact is felt within the team, but also because it has an impact on other managers and important information systems stakeholders (Slevin & Pinto 1988; Pinto et al. 1998).

Pettersen (1991) conducted research specifically relating to project managers and the leadership traits necessary to be successful in this more specialized arena. It identified five important characteristics for proficient project management:
1.   Oral communication skills,
2.   Influencing skills,
3.   Intellectual capabilities,
4.   The ability to handle stress, and
5.   diverse management skills, including planning, delegation, and decision making.

In a different study Einsiedel (1987) identified five characteristics closely associated with effective project team leaders.

Table 7. Five Characteristics Associated with Team Leaders.

Credibility	Is the project manager trustworthy and taken seriously by both the project team and the parent organization?
Creative problem solver	Is the project manager skilled at problem analysis and identification?
Tolerance for ambiguity	Is the project manager adversely affected by complex or ambiguous (uncertain) situations?
Flexible management style	Is the project manager able to handle rapidly changing situations?
Effective communication skills	Is the project manager able to operate as the focal point for communication with a variety of stakeholders?

Einsiedel (1987)

Great leaders move us. They ignite our passion and inspire the best in us. When we try to explain why they are so effective, we speak of strategy, vision, or powerful ideas. But the reality is much more primal: Great leadership works through the emotions (Goldeman, 2008).

2.5.6 Emotional Intelligence
The concept of emotional intelligence (EQ) has been published by David Goleman in his best seller Emotional Intelligence in 1995. His studies included more than 500 organisations, confirming that self-confidence, self-awareness, self-control, commitment, and integrity have the potential to create more successful employees and more successful companies.

Chapman (2000) claims that emotional intelligence is increasingly relevant to organizational development and developing people, because the EQ principles provide a new way to understand and assess people's behaviours, management styles, attitudes, interpersonal skills, and potential. Emotional Intelligence is an important consideration in human resources planning, job

profiling, recruitment interviewing and selection, management development, customer relations and customer service, and more.

An emotionally intelligent leader can monitor his or her moods through self-awareness, change them for the better through self-management, understand their impact through empathy, and act in ways that boost others' moods through relationship management (Harvard Business School Press, 2001).

In his book Taylor (2004) said that emotional intelligence is much deeper than having good interpersonal skills. It is being aware of and in control of our own emotions while being empathic enough to perceive and manage the emotions of others. This does not mean controlling others, it means understanding others' emotions well enough to lead them to better performance. The competencies of EQ fall into the five groups shown below.

Table 8. EQ Competencies

Self-Awareness	Self-confidence, Emotional self-awareness, Accurate self-assessment
Self-Management	Self-control, trustworthiness, conscientiousness, flexibility, goal-oriented
Self-Motivation	Self-starting, commitment to improving, enthusiasm, persistence
Social Awareness	Empathy, organizational awareness, service orientation.
Social Skills	Mentoring, leadership, communication, change agent, conflict management, building bonds, teamwork and collaboration.

Taylor (2004)

Taylor (2004) loosely defined emotional quotient as, the ability of a person to manage his emotions as well as to manage the emotions of others. He goes on to explain that organizations are concerned about hiring project managers with high IQs and about providing them with high-quality training, but the more successful project managers will also possess a high EQ. Not too surprisingly, it is also becoming more apparent that many in the project team hierarchy need to

possess higher levels of EQ. Among other things, these top performers possess more interpersonal skills and confidence than the average employee.

Emotional intelligence is the source of organizational savvy that enables individuals, working effectively together, to produce exceptional performances. In fact, it is emotional intelligence that is the heart and soul of teamwork. Developing an understanding of what constitutes emotional intelligence can be an integral part of nurturing and developing one's team-based skills. (Johnson, 1997).

2.5.7 Training in Team Process Skills

Typically, 'far more effort is invested in the design of the team structure than in the preparation of the team members to function effectively in the team environment' (Henke et al. 2003).

Parker (2004) argues that the organization should provide training to help colleagues and strangers work together effectively and should encourage an open learning environment. Training played a very important role in the success story at 3M (Hershock et al. 2004), helping team members understand each other, the environment they worked in, who had power to get things done and how to get cooperation from others.

It is important that training extends beyond the teams themselves to encompass senior and, critically, middle managers. As pointed out above, the latter can represent a particularly important obstacle to success and need to see their role in a new light. To achieve meaningful cultural change an 'organization-wide commitment to learning' is required (Donnellon 2003).

2.5.8 Team Leader Skills and Vision.

The characteristics and capabilities of the team leader are regarded by many authors as a critical contributor to group effectiveness (e.g. Leigh and Maynard 2005). Adair (2003) offers a 'functional' model in which the leader must be aware of the needs of the task, the group and the individual team members. Belbin (2001) found that, under artificial conditions, team performance was optimal when the leader had a 'Chair' type profile. These people were not

spectacularly able or creative, but were very good at drawing the best out of others.

The innovation literature emphasizes the greater effectiveness of project managers who draw upon work challenge and expertise (rather than formal authority, rewards and sanctions) to influence others, and who can adapt their conflict-resolution mode according to the situation (e.g. Thamhain and Wilemon 2004; Barker, Tjosvold and Andrews 2005).

The cross-functional team leader must be able to pull together a diverse group of people in support of team goals (Parker 2004). Denison et al. (2006) found that successful leaders 'facilitated flexible problem-solving and team development'.

A good cross-functional team leader will:

1. generate appropriate and sustained involvement
2. eliminate unnecessary and unproductive digressions
3. maintain high standards for decision-making
4. manage conflict constructively and
5. achieve continuous levels of satisfactory group output without excessive burnout or rancour. (Henke et al. 2003)

Clear Roles and Responsibilities

Cooper (2006) states that the team leader must be dedicated to one project, rather than being spread too thinly. All projects must have a clearly assigned team of players with a defined and accountable team leader. Project leaders should be responsible for the project from beginning to end -- not just one phase -and there should be as few leadership changes as possible. Cooper (2005) also states that team members' first loyalty should be to the team or project, rather than the function, with team members dedicated to the project on a full-time basis (or a high percentage of time allocated), i.e. a 'project matrix' type approach (Larson and Gobeli 2005).

2.5.9 Communication.

A 10-year study of 289 projects provides evidence that inter-functional communication and cooperation strongly correlate with success (Souder 2005). A detailed study of nine pairs of successful and unsuccessful new product

projects discovered sporadic communication among team members associated with failed products and consistently high communication across many topics among team members involved in successful products (Dougherty 2000). Jassawalla and Sashittal (2005) reported a strong association between effective cross-functional collaboration and 'transparency' 'a condition of high awareness achieved as a result of intense communication'.

The probability that two people communicate at least once per week drops off rapidly with the distance between their offices, falling below 10% at office separations of 10 m (Allen 2000). Separation decreases chance meetings and fortuitous sharing of information. Long distances between groups make face-to-face communication inconvenient, and lead to decision-making delays. Isolation worsens the problems of separate cultures, jargon and perceived personality differences (Allen 2006).

Cooper (2006) found that high-quality teams interact and communicate well and often. The best had short but weekly meetings to ensure that the entire team was up to speed. Pinto and Pinto (2000) established that highly co-operative project teams made significantly more use of informal communication methods (particularly phone calls) than less effective teams. Also, their reasons for communication were more likely to be for brainstorming, obtaining project-related information, reviewing progress and receiving feedback, rather than resolving interpersonal differences.

Jassawalla and Sashittal (2005) identified 'mindfulness' and 'synergy' as two key features of cross-functional collaboration. 'Mindfulness' refers to team decision-making and actions which reflect an 'integrated understanding' of diverse interests, needs and constraints. 'Synergy' refers to the creativity which results from true team-working, where the team adds a new dimension to organizational capability through innovative ideas and approaches. New product development is seen as a means of stretching functional groups' thinking and roles.

Denison et al. (2006) highlight 'breadth' and 'creative strategy' as important attributes of an effective cross-functional team process, while Hauptman and Hirji (2006,2005) emphasize 'overlapping problem-solving' between upstream (product design) and downstream (manufacturing process) functions.

The extent to which team members release and use incomplete, uncertain and/or ambiguous information has been shown to be positively linked to product development project outcomes (Hauptmann and Hirji 2006). Susman and Dean (2002) explain that sharing provisional information, being prepared to act upon it, and treating decisions as tentative renders teams more flexible in responding to problems.

The criteria for determining the effectiveness of cross-functional teams are many and varied. A wide range of outcomes is expected -- including innovation, learning, and new capabilities, as well as compressing time and hitting stringent task targets (Denison et al. 2006). Hackman (2000) defined success along three dimensions:

- Extent to which the group's productive output meets standards of quantity, quality, timeliness required by users. Requires performance assessments from clients.
- Degree to which the process of carrying out the work enhances the capability of members to work together interdependently in the future.
- Degree to which the group experience contributes to the growth and personal well being of team members.

Member satisfaction is a key outcome if the team approach is to remain viable. Cross-functional teams also offer great potential for employee development. By gaining insight into other functions, they become more knowledgeable, broader-thinking employees (Henke et al. 2003). These 'soft' outcomes of team satisfaction and personal growth are often easier to measure at an early stage of cross-functional team implementation, and are markers for success on the 'hard' outcomes.

2.6   Literature Review Summary

The literature review set out to discover present published thinking relating to critical success factors in project management and in relationship to the research question "Which factors do experienced project managers in New Zealand attribute to successful projects in the process engineering industry, and how do those factors contribute to success?". For the purposes of this summary Pinto & Rouhiainen's (2001) definition of success factors, "Those factors which, if addressed, will significantly improve the chances for successful implementation", has been adopted.

During the literature review it became obvious that project success was a complex issue, especially when it came to identifying factors that were responsible for project success. The topic of success factors has frequently been discussed and yet it is seldom agreed upon, because it is a concept which can have so many different meanings to so many different stakeholders. There is no standardised definition or interpretation of the term project success and its definitions remains ambiguous. So far there seem to be no acceptable methodology available to measure project success but the necessity for having solid project processes in place remains undisputed (Charvat 2003).

In the research two distinct components were identified. One was Project Management Success, which is primarily concerned with the accomplishments of cost, time, scope, quality and how the project management process was conducted, while the Product Success deals with the effect of the project's product i.e. delivering a product that the client is happy with.

The problem is illustrated by the two definitions below.
Wysocki, Beck, & Crane (1995) define project success as "a sequence of unique, complex and connected activities having one goal or purpose that must be completed by a specific time, within budget and according to the specification" (p. 38) and Taylor (2004) defines project management as "the art and science of managing projects to a specific schedule, at or below a

predetermined budget, to the customer's performance requirement and within the resource availability" (p. 27).

However, it seems that these two statements have in fact intermingled the two separate concepts of product and project management success. Both project management i.e. cost, time and quality and the goal or purpose and customer's performance criteria are part of the same statement.

Conceptually, the determination of project management success disregards product success, e.g., a project has been managed efficiently but eventually does not meet customer or organizational expectations (Shenhar, Levy, & Dvir, Wateridge (2005). A post project analysis has shown that the consideration of cost and time (project success) as a success factor was of less importance and that the client satisfaction or product success became the important success factor.

Project success is also considered to be perceived. Projects tend to have a large number of different stakeholders, all of whom have their own subjective perception of project success. Measuring project success is considered complex and it is suggested that projects are seldom a complete failure for all stakeholders during all project phases and project success in many cases cannot be decided until the project's product has been used for some time.

Product success means achieving the project goal, i.e. the project reaches a favourable termination in support of the enterprise mission and succeeds as a building block in the design and execution of enterprise strategy (Cleland, 2006). Customer satisfaction means that a project is only successful to the extent that it satisfies the needs of its intended user.

Stakeholder Satisfaction

Product success entails satisfying project stakeholders' needs where they relate to the project goal and purpose. The key stakeholder here is the customer/user and stakeholder satisfaction is a crucial part of success. The management of stakeholder expectation requires soft skills, communication and influencing the most influential stakeholders, to satisfy stakeholder perception and to achieve success.

Project success also depends on many different stakeholders that most likely have very different criteria and view point as to what constitutes project success depending on their needs and how well these needs are satisfied by the project. However, to reach consensus of success criteria among all stakeholders is quite unrealistic and so only by establishing common goals, can criteria acceptable to all be achieved (Liu & Walker, 2005).

Success Factors

The success factors identified in the literature can be categorised into "Hard Skills" and "Soft Skills". The hard skills relate to tools, techniques, methodologies and processes that are used to produce project success and the soft skills refer to people skills such as leadership, team building and emotional intelligence.

Generally, the literature supports the concept of critical factors. However, the literature also indicates that such critical factors cannot be applied universally to all types of projects and all situations. While current competency standards cover generic project management hard skills and some soft skill, they do not deal with the complexity of soft skills. This is despite the fact that previous studies suggesting that there is a balance between soft and hard success factors. Hard criteria is usually considered as relatively easy to manage and get some agreement on whereas the soft criteria is subjective, subtle and difficult to measure

Linking Logical Framework Method and Project Success

The LFM provides a very useful framework for articulating the concept of project success. The log frame's objectives of project outputs and project inputs relate to project management success and the LFM objectives of product goal and project purpose relate to product success and as such is seen to provide a useful structure to convey the concept of project success. This ensures that the project contributes to the strategic plans of the organization.

Soft Skills

A number of soft skills for managing projects and project team have been identified. Teamwork was seen as an important factor for success and for the many functional and matrix organisations. Project and team leadership were also considered essential factors for project success. Another key success factor that gets a frequent mention is communication, and essential tool for managing all stakeholders and project information.

Senior Management Support and Leadership

Senior management support is crucial to the success of projects and the visible support of management was found to be motivating to the teams and its members. Research presented in the literature review provided evidence that consistent high level communication was a key success factor in new product projects and with cross functional teams.

Substantial evidence was found that leadership is a key success factor in project management. Several researchers have highlighted the power of the project leader as a factor in new product success (e.g. Clark and Wheelwright 2002). The capability of the team leaders was also regarded by many authors as critical to team effectiveness. The characteristics and capabilities of the team leader are regarded by many authors as a critical contributor to group effectiveness (e.g. Leigh and Maynard 2005).

Training

Training played a very important role in the success story at 3M (Hershock et al. 2004), helping team members understand each other, the environment they worked in, who had power to get things done and how to get cooperation from others. It is important that training extends beyond the teams themselves to encompass senior and, critically, middle managers.

Communication.

A 10-year study of 289 projects provides evidence that inter-functional communication and cooperation strongly correlate with success (Souder 2005). Locating team members in close proximity improves information exchange. Increased distance between team members leads to delays as is separate cultures, personalities and jargon. Well functioning team are likely to brainstorm and give feedback. Pinto and Pinto (2000) established that highly co-operative project teams made significantly more use of informal communication methods (particularly phone calls) than less effective teams.

Communicating is a key success factor as it is used to convey all project information i.e. project purpose, scope, budget schedule and it is essential for stakeholder communication.

3. Research Procedure

3.1 Method

The research question is seeking to extract knowledge from project managers that they have acquired through practical experience over many years. The knowledge relates to tools, techniques, methodologies (hard skills) and people skills (soft skills) that in their opinion make projects in the process engineering industry successful.

I have chosen to use survey as the research method. "The aim of a survey is to obtain information which can be analysed and patterns extracted and comparisons made" (Bell, 1999, p. 13). Because the information sought is not project or company specific, I surveyed a number of experienced project managers from a cross-section of the process engineering industry.

The purpose of the survey was to get a systematical collection of data followed by an analysis and interpretation. One of the benefits of the survey method is that "surveys can provide answers to the questions what, where, when and how" (Bell, 1999, p. 14).

The data will be used to improve ongoing project management methods and techniques. I would also expect that the survey from this dissertation project will help support the development of presentation and training material for use in the relevant industry.

3.2 Methods of Data Collection

My initial intention was to use two methods for data collection, one being a questionnaire, the other an interview. However, because a considerable number of project managers in New Zealand process engineering industry are self-taught and not likely to be fully versed with the formal project terminology, I have chosen to use the interview method only. The second reason for dismissing the questionnaire as a data collection method was that the chosen research sector in New Zealand was too small to return a large enough sample to produce reliable and accurate data.

In order to collect any meaningful data, I have to be able to explain the question in a way that it can be understood by the participants without using project terminology. The second option "Interview" seemed to be a much more appropriate method to get the type of data required for the research.

The issue here was "fitness for purpose"; the more one wishes to gain compatible data across people, across sites – the more standardised and quantitative one's interview tends to become; the more one wishes to acquire, non standardised, personalised information about how individuals view the world, the more one veers towards qualitative, open ended, unstructured interviewing (Cohen, Manion, & Morrison, 2000, p. 270).

I used a combination of an exploratory approach and a semi-structured or guided approach for the interview to collect quantitative data.

The interview covered both hard and soft skills and intended to bring some of the tacit knowledge to the conscious level. Hinds (2000) suggests that this interview method is useful when "the issues under examination would benefit from development or clarification" (p. 44). Because of the many soft skills (people related skills) and tacit knowledge that needs to be covered in the interview, "a mix of two approaches is used, where some structured questions are asked followed by the exploration of general themes related to those questions" (Hinds 2000, p. 47). The semi-structured interview did also provide the opportunity to develop answers to the "why" questions.

The literature research indicated that most of the findings are based on the retrospective opinion of experienced project manager on which factors they considered critical for project success. The interview questionnaire was designed to elicit the same type of information from the respondents. The structure of the questionnaire was intended to approach the subject from different angles to increase the amount of tacit knowledge becoming available to answer relevant questions. The PMBOK guide and the literature review served as a guide for the development of the interview questions to ensure full coverage of the essential topics.

Section 1 of the questionnaire was collecting demographic information from the participants to establish their professional background, years of project

management experience and training. This was to ensure they were sufficiently qualified to answer the questions.

The first two questions in section 2 were aimed at finding out what they retrospectively thought the critical success factors in project management were and why they thought they were critical. Question 2.3 and 2.4 were asking the respondents if they were using any specific methodologies, tool and techniques that are critical to project success and the reason why they thought the answers from 2.3 are critical to project success.

Section 3 is intended to find out if, and to what degree the respondents agree with the 10 Factor Model by Pinto and Slevin (1988). The model was used because it seems to have widespread acceptance. The questions in section 4 were specifically aimed at the soft skills of the project managers. The questions were semi structured and based on the key soft skill areas found in the literature. The participants were ask how important they thought the specific skills were and what difference they made to the success of the project. The questions covered motivation and team development, stakeholder management, emotional intelligence, leadership and technical knowledge.

The Questions in section 5 were structured to look at factors that were synonyms with project failure and what the difference was between good and bad projects. The purpose was to approach the same topic from a different angle and to give the participants the opportunity to develop their thinking from the opposite side, allowing new factors that were important for success to surface.

The final section ask the respondents to select what they thought were the top 5 factors given in question 2.1 and then rate them from 1 to 5 with 1 being the most important. This gave the participants the opportunity to review their answers to question 2.1, based on the thinking on the subject that has developed during the interview.

3.3   Participants

Participants for the research project were selected from the Process Engineering Industry and nine project manager/engineers were selected for the interview. The selected participants were expected to have at least three years experience in project management in the process engineering industry and the interviews did take about 50 to 60 minutes to complete. The participants were fully briefed on the research project and were required to sign a consent form before the interviews were scheduled.
There were no dependant relationships with the participants.

3.4   Data Analysis

The interviews were recorded with a Dictaphone and transcribed into text files for analysis. The information in the transcripts was analysed into relevant groups based on the questionnaire and the research question i.e. hard skills, soft skills, project success, product success and relevant success factors.

3.5   Ethics

As can be seen from the information above, the proposed research was aimed at obtaining information or professional opinions relating to project success factors only. The information sought did not relate to any specific company, project and did not include personal questions or commercially sensitive information.
In her seminar paper on the ethics of qualitative research, Niven (1996) listed four main categories that need special consideration in qualitative research.

- The right not to be harmed.
- The right to full information.
- The right to self determination.
- The right to anonymity and privacy.

The four categories have been expanded in the context of the proposed project.

The Right Not to be Harmed.

Consideration was given to the questioning during the interview to maintain the focus on the subject matter and avoid personal issues, questions relating to negative experience on projects by the participant and other questions that could have negative psychological effects on the persons self esteem, confidence etc. Cultural differences was considered as well.

The Right to Full Information.

The participants were fully informed of what the research was about, their involvement, the expected outcome, the potential benefits and how the information was managed.

The participants were given information on the researcher, approval procedures, supervisors, contact details to get further information and how to withdraw if they wish to do so.

The Right to Self Determination.

Time was given for full consideration by the participants before giving their consent. Both parties did have a copy. Participants were given the opportunity to confirm the correctness of the data and the time to correct and comment on the data. Participants could withdraw from the project up to X point or stage in the process time.

The Right to Anonymity and Privacy.

Confidentiality and anonymity for participating individuals is one of the key consideration in the proposed research project. New Zealand is a small country and the individuals in the selected industry sector do know each other.

The following methods were used to protect the ethic issues listed above.

a) Individuals were allocated a confidential code for the purpose of the analysis and reporting. Names were only use for the letters relating to the consent and other correspondence with individual participants. The interview was intending to collect opinions from the project managers only and not commercially sensitive date.

b) Feedback to individual participants will be in the form of a summary of the total research and will have no references to individuals, companies or specific projects that could be used to deduct the identity of participants.

c) A full set of information on the researcher, approval procedures, supervisor/s, contact details for further information, and how to withdraw, will be included with the correspondence relating to obtaining consent.

Information

Information about the research project was given to the participants in writing and was followed by some verbal dialogue.

The initial approach was by letter, giving background information, contact details and outlining my intent and the project. This was followed by a short phone conversation to discuss all relevant issues and concerns. The interviews did take place after the receipt of written consent.

3.6   Outcomes / Outputs

The research did produce a set of activities that are critical for project success in the New Zealand Process Engineering Industry. This paper was complemented with information from the literature research to extend and/or complement the research finding in New Zealand. The information from the research will be made available to the industry and is intended to be used in training, conferences and project management presentations.

4. Results

Introduction

This chapter provides a summary of the interviews conducted with a sample of Project Managers from the New Zealand Process Engineering Industry. The interview covered the following areas:

- Participants demographics.
- Their opinion on what they see as the critical success factors in project management in the New Zealand process engineering industry and why.
- Specific methods, processes, tools and techniques (Hard Skills) they are using that they attribute to project success and why.
- Their opinion on the degree of which they agree with the importance of the 10 factors listed in the "10 Factor Model" (Table 1) by Pinto and Slevin (1988)
- How important they thought the project manager's people skills (Soft Skills) were and what difference they made to project success.
- Question relating to project failure
- Their opinion on the top five success factors and their ranking from 1 to 5.

The names of the individuals and their respective employer's or companies are not disclosed in this dissertation or referenced for confidentiality reasons. The information given by the individuals is their personal opinion on the subject matter and does not represent the view or opinion of the companies they are working for.

4.1 Interview Section 1

Demographics

Section 1 of the questionnaire is aimed at collecting demographic information from the participants.

I interviewed nine people in total, eight project managers and one Program Manager. All the participants are from the Process Engineering Industry, one from the Food and Beverage, one from the Chemical and the rest are in the

Dairy related industry. The average years in project management is just over 11 year with the lowest 5 year and the highest 17.

Five of the participants had some formal training in project management, one had training in general management, one post graduate engineering with a project management component and one had training in Admin and reporting. One of the participants had no formal training. All learned project management "on the job" and all but one did self study to some degree.

The nine project managers selected for the interview are very experienced Project Managers in Process Engineering projects and are well qualified to answer the research questions put to them.

4.2   Interview Section 2

Section 2 of the questionnaire is seeking the opinion of the project managers on which factor they retrospectively attribute as critical for project success in the New Zealand process engineering industry and why they contribute to success. It also seeking the opinion on specific methods, processes, tools and techniques (Hard Skills) they are using that they attribute to project success and why.

Question 2.1

What do you see as the critical success factors in project management in the New Zealand process engineering industry projects?

Participant 1

A substantially complete budget and matching scope that is as complete as possible. The schedule and engineering needs to be correct. There has to be a stakeholder relationship and specific attention needs to be paid to the client relationship and trust.

Participant 2

The communication with the stakeholders has to be effective. Contract and project outcomes need to be known and you have to have a schedule, scope,

budget and a committed project team. Change management procedures need to be defined and stakeholder need to be management.

Participant 3
Proper execution of the contract and scope. Monitor budget and communication frequently to relevant stakeholders. Transition/handover from the sales department to the project manager and team with complete project information i.e. contract, scope and schedule. The team and relevant Stakeholders need to take ownership of the project. Critical path, internal and external politics, and relationships need to be managed. Client ownership of the product early in the project.

Participant 4
It is important to manage the project life cycle and to have accountability for the project. Need to have scope, planning, schedule and milestones as well as a full risk assessment. It is essential to have a change management plan and project management capability to resolve issues. Provide stakeholder management.

Participant 5
High level of communication especially with customer i.e. stakeholder management & influence, and subcontractors. Need to understand the customer's needs, production and budget needs and it is critical to have sufficient resources and technical knowledge. Sufficient time to plan the project, manage the projects schedule, scope and budget.

Participant 6
People involved in the project need to be motivated and there needs to be degree of cooperation between all parties. Good contract, scope, schedule and responsibility chart. The project environment needs to be supportive. Project outcomes and requirements need to be defined.

Participant 7

Manage customer expectation. Change management methodology and good procedure for monitoring and controlling. Need to have scope, budget and quality procedures to insure compliance.

Participant 8
Realistic Scope for design is critical. Design review process is a key factor for success. Other factors are technical ability, quality drawings, the right amount of information in tender documents, realistic schedule and budget, due diligence, hazard/risk assessment and communication. Peer review for process and quality.

Participant 9
Setting up (project initiation), procedures, communication between all parties and protocol for reporting between the project, client and subcontractors. Complete scope (specs and standards), schedule, budget and financial reporting. Approval process for project schedule. Subcontractor's ability to deliver on time and at the right quality. Use common tools for the team and stakeholders.

Question 2.1 Summary
The respondents clearly indicated that tools are an essential part. All of them listed scope, schedule and budget/financial among other tools, methods and processes as key factors in achieving project success. Some of the respondents emphasised that it is important that the scope has to be "correct" and "substantially complete" as much as possible, at the outset. Similar comments were used for the budget and schedule as well as having to be "realistic". Other tools, methods mentioned are, change management procedures, project life cycle, responsibility chart, risk assessment, protocol for reporting, approval processes, peer reviews and procedures for monitoring and controlling.
An equally strong response was given for factors associated with soft skills. With the exception of respondent 8 all listed "communication with all parties i.e. customer, project team and general stakeholders," is a key factor. Stakeholder management also featured frequently 8 out of 9 responses. Other factors

frequently mentioned were the project teams having to be committed and take ownership of the project and motivated. As with the hard skill, qualifying statements like "specific attention" needs to be paid to the client relationship, communication with the stakeholders has to be "effective" and "high level" of communication especially with customer, stakeholder and subcontractors.

Question 2.2

Why do you see the success factors from the previous question (2.1) as critical for project success?

Participant 1

Budget - gives constraints i.e. business needs to make money. Scope - is important because we need to know what to do to meet customer's expectations. Schedule - is also important and it ties in with budget and customer expectations. Relationship - makes dealing with issues easier and may lead to future business.

Participant 2

Information needs to flow in the right direction at the right time to communicate with relevant people. Contract - everybody needs to know the desired outcome of the project. The project team – need to get buy in from everybody and communicate closely with people and take an interest in what they are doing. Schedule and budget - in our industry we have contracts with deadlines and contractual budgets, so, we need to finish on time and on or below budget. Need to manage and control changes.

Participant 3

Proper contract execution is required to satisfy client's expectations. Need budget to provide commercial and financial success for both parties. A committed team and good relationship with the client is required to be able to execute the project efficiently. Need to communicate with client to find out what their success criterion is. Early ownership of the product by the client saves problems at the end and aids acceptance of the project.

Participant 4

The success factors from question 2.1 provide good structure and base for planning. Provides good fundamentals for different types of projects and gives structure to process and project management. The "hard tools" like scope, schedule, risk and milestone plans provide essential metrics to manage the project.

Participant 5

Communication is the key to understanding the customer and everything about the project and stakeholders as well as keeping control of the project. Need to have the customer relationship to satisfy their needs. Need sufficient resources to do the required work within a certain timeframe. Need the Scope for costing and doing the work. The other tools, methods and processes are a means of recording and tracking of the project.

Participant 6

People need to be motivated to the same end/goal, and there needs to be a supportive environment and culture. There is a need to have defined project outcomes/requirements to insure the "big picture" can be seen by everyone. A good contract is required to provide the scope and specification and the scope needs to be clear so the important steps can be seen.

Participant 7

Sales need to get all the technical information so we know what the projects product is and where the project needs to go. So, the scope and customer requirements are the key. All this needs to be documented and communicated to the technical people and other stakeholders. Need to monitor the project so that you know where you are especially scope and time. Customer needs to know about progress and issues as well.

Participant 8

Tender docs need to be "fit for Purpose" to avoid ambiguity. The schedule and budget need to be realistic and achievable to achieve a successful project. Proper risk assessment analysis saves larger problems later.

Participant 9

Budget has to be correct, client does not want variations and contractors need to know that as well. Common tools make monitoring and reporting easier for all stakeholders. Scope, specs, standards, budget and schedule is essential to provide a roadmap for project.

Question 2.2 Summary

The reasons why the critical success factors were important varied among participants but there were some common themes. The tool, techniques, methods and contractual requirements were generally seen as important in providing data needed to produce the product of the project, schedule and budget constraints and a way of monitoring and controlling key areas of the project to satisfy client's expectation. Scope was frequently mentioned as an important factor because "scope is needed for costing", "we need to know what to do to meet customer's expectations", need to know the desired outcome" and it provides "essential metrics". Schedule and budget were also frequently mentioned because they also provide important metrics for the project and are directly affected by the scope. The response indicates that project managers tend to be focused on process success rather than product success.

The soft skill area is focussed on relationships with the customer and communication with stakeholders. Respondent 5 considers communication as the key to understanding the customer and everything about the project and stakeholders. The project team needs to be committed, motivated and buy into the project and have a supportive environment and culture.

Question 2.3

Do you use any specific methodologies that you think are critical to project success? tools and techniques? processes? or methods?

Participant 1

Scheduling software, electronic document management system (simple meeting minutes and reports), simple form of spreadsheet, personal time management

(essential) more of a personal management system. Templates. Computer, as I like electronic format rather than hard copies.

Participant 2

Documentation system i.e. email, meeting minutes, hardcopies etc. Microsoft Project, Excel. Laptop and printer. Organised soft skills.

Participant 3

Critical path management, database software (Proprietary to Company) for budget, scope and resources. Whiteboards (communication and meetings), Risk and stakeholder analysis, Issues priority list system.

Participant 4

Live cycle management, project management software, assessment processes. Project management and project portfolio management system. Standardisation, skill building and general training.

Participant 5

Microsoft Project software for scheduling. Excel for quoting, costing and monitoring during the project. Database for the scope and sub-contractor work. Budget control document and purchasing control document.

Participant 6

Microsoft Project scheduling software. Cost control and database. Stakeholder groups developing writer plans. Safety procedures, check sheets and audits. Communication system and plan. Detailed reporting structure. Installation and commissioning plans.

Participant 7

Microsoft Project for scheduling. Lotus Notes for email communications and database software to monitor and control budget and resources. Check sheets, procedures, stage gate control and meetings.

Participant 8

Microsoft Project and/or Sure track, (depends on client), team reviews, technical design analysis/reviews, peer review of concept/design and breakdown, functional description, quality review.

Participant 9
Team meetings, forecasting, issues register, Microsoft Project software for scheduling and budget control for smaller projects. Special software for financial reporting on larger projects, gut feeling and big picture project objective. We will use client specific software if required.

Question 2.3 Summary
Computers and software is the most common tool used by the participants followed by the use of hardcopies in the form of templates, checksheets, reports and project documentation used by project team members. All respondents are using scheduling software, mostly Microsoft Project and all are using spreadsheet or database software for budget/financial management. General or proprietary software is used for almost all other aspects of generating information, reports and communication. Methods and processes include, Organised soft skills, Whiteboards (communication and meetings), Risk and stakeholder analysis, Issues priority list system, Live cycle management, assessment processes, skill building and general training, purchasing control document, Safety procedures, and audits, detailed reporting structure, Installation and commissioning plans, peer reviews and gut feeling and big picture project objective.

Question 2.4
Why do you think the methodologies, T&T and processes from the previous question are critical to project success?

Participant 1
Schedule software- control tool, insurance to complete on time, essential monitoring tool. Document management system - for reference, easy access for others. Meetings - records essential information for follow-up communication. Spread sheet are used to track budget and monitor progress. Personal time and

general management to manage yourself. Computer – easy way to communicate and manage information, holds software to manage projects.

Participant 2

Documentation system is needed to handle and store information. Microsoft Project is a valuable tool to give visual indication of what impacts on what. Spreadsheet good for tabulating budgets and easy to update and communicate. Drawings are essential to get things made. I like being involved at the cold face by daily visits to worksite to monitor progress. Once a week meeting with supervisors for updates and issues that may have arisen.

Participant 3

Critical path management gives focus to the critical things that need to be managed and help to reduce risk. Database software for monitoring and controlling the projects budget, scope and resources. Meetings - communication and team understanding and reporting.

Participant 4

Large diverse company have limited resources for all the projects. Tools, methods and processes help us to evaluate the business case of project in the first instant. If we decide to proceed we use the tools, processes and methods to monitor and control the project.

Participant 5

Microsoft Project software is used for the planning but one should try to keep it simple so people are happy to use it and it is easy follow. We use the database to allocate different parts of the scope to subcontractors, control purchase orders, monitoring the work and do the budget reports.

Participant 6

The methods, processes, tools and techniques are required to produce a quality project and to have structured way of achieving the goal. Need to know where we are and where we should be with the project at any time. Avoids thing falling trough the cracks. Need tools so that the PM can "manage" the project.

Participant 7

Scheduling software provides baseline versus actual schedule tracking. The database provides a consistent means of measuring, recording, monitoring and controlling tasks, budget, and changes to scope. Check sheet and procedures insure quality and the stage gate control act as an audit of project performance. Documentation helps with collecting information from "lessons learned" to avoid future mistakes.

Participant 8

Scheduling software is ok for guideline but to easy to manipulate. Like to trash the design and technical aspects trough with a small team to insure everything is correct. Peer reviews to insure we have not missed anything.

Participant 9

Tools and methods help to discipline, document and articulate activities. Using the same tools and methods and information source across the team and stakeholders will insure everyone has the same information and creates an open environment. Tools are useful for monitoring and controlling.

Question 2.4 Summary

The methodologies, T&T and processes from the previous question are used by the respondents as planning tools, visual indicators of important data, critical path management to reduce risk, baseline vs. actual data comparison, monitor and control project activity and a structured way of achieving the project goal. Document management systems are needed to manage and store essential information for reference, access for stakeholders and reporting, evaluate the business case for project, stage gate control, control purchase orders and as tools for the project manager to manage the project.

4.3   Interview Section 3

Section 3 of the questionnaire is seeking the project managers opinion on the degree of which they agree with the importance of the 10 factors listed in the Pinto and Slevin (1988) "10 Factor" Model.

A summary of the response is tabulated below, listing the short answer to the question. A more detailed account of the extra comments is give for each question after the table.

Table 4. Questionnaire Section 3 Summary of Responses to Pinto and Slevin (1988) 10 Factor Model

	Respondent								
	1	2	3	4	5	6	7	8	9
1	Not sure	Very important	Very important	Critical	Important	Almost ultimate	Relatively Important	Critical	Important
2	Think is important	Important	Very important	Very important	Very important	Incredibly Important	Highly Important	Important	Very important
3	Important	Very important	Highly Important	Highly Important	Very Important	Important	Important	Reasonably Important	Important at first
4	Real Important	Important Skill	Important	Very Important	Important	Important	Maybe 6 out of 10	Very Important	Important
5	Important	Important	Very Important	Fundamental	Important	Important	Important	Very Important	Important
6	Important	Very Important	Important	Important	Important	Important	Important 7/10	Important	Very Important
7	Important	Important	Very Important	Very Important	Very Important	Really Important	Important	Important	Important
8	Important	Important	Important	Important	Important	Very Important	Very Important	Critically Important	Very Important
9	Essential	Important	Very Important	Important	Pretty Important	Very Important	9/10 Most Important	Very Important	Important
10	Essential	Very Very Important	Very Important	Important	Very Important	Important	Absolutely Important	Very Important	Important

Question 3.1

Project mission - Clearly defined goals and general directions.

Respondent 1 commented that he has not done or used this before, so is not sure of importance. 2 thought that a clear definition upfront about requirements will minimise changes. 4 said it is critical, gives strategic vision to the project and alignment to corporate strategy and 6 said that the mission is really what we try to achieve. Respondent 7 talked about the mission giving the team direction and 8 said it is absolutely critical, need to have a clear understanding at the outset. What your are trying to achieve, is absolutely fundamental to the project. 9 noted that the client has different goals to the project manager. Getting sign off by the client helps keeping the focus on the client's goal.

Question 3.2

Top management support - Willingness of top management to provide the necessary resources and authority/power for implementation.

Similar views were expressed by respondent 1, 2 and 6. Top management support is important. But needs to be as top management, not into details. Project manager should have control, it is his job, but not a continual presence by management that may undermine the project manager. Top Management provides resources. 3 said it is very important, especially in a multiple project environment and 4 thought that demonstrating commitment to the project by management can removes roadblocks. 5 said it is critical to have dialogue and support. 7 emphasised that it was especially important in a functional company and 8 commented that you can't have a project where the management does not buy into. 9 also thought it was important but difficult to get. Need top management involvement by all subcontractors, client and management company.

Questin 3.3

Schedule/plans - Detailed specifications of individual action steps for implementation.

Respondent 1 considered it as important especially if staff changes and 4 commented that it needs scaling to project. 2 and 7 talked about the importance of everybody knowing what is required of the project and Monitor progress. 5, 8 and 9 shared similar views and said it is important for contractors and metrics to measure progress against and something you need to have up front. Important at first but less so after establishing trust. 6 made the interesting point that schedule is important but that the outcome is the main focus and priority.

Question 3.4

Trouble Shooting - Ability to handle unexpected crisis and deviate from plan.

The first respondent thought it was real important but hard to measure and 2 said it is that flexibility and ability to think on your feet, however, a greater skill is to avoid it in first place. Respondent 3 stated that engineering companies like ours need to have trouble shooting ability. 5 considered it to be a very important part of project capability and 6 said you need to know people's limitation and get help if need be. 7 and 8 noted that you need to be able to deal with issues. Risk assessment can identify potential troubles. Need comprehensive review at random and 9 uses intuition as an early warning system and deal with trouble a.s.a.p.

Question 3.5

Monitoring and feedback - Timely provision of comprehensive control information at each stage.

Respondent 1 and 8 thought it is important to have good information. - comes back to people and relationship to get good information and allows making timely decisions. 2, 3, 6 and 9 talked about the importance of having regular dialogue on what is going on. Again, it is down to communication. Important to

have disciplined monitoring but don't think you need to wait for specific date on the calendar. 4 considered it to be a fundamental requirement within a project, while 5 said it is important, but it is more important to deal with the day to day urgent matters and issues. 7 rated it important and intimately linked to the project health.

Question 3.6
Technical tasks - Availability of technology and expertise to accomplish specific technical steps.

Respondent 1 mentioned that in his experience it was not an issue, but important to recognise when you need the expertise and 2 said you need to know your companies and your sub-contractors technical ability. Respondent 3, 4, 6 and 8 shared similar views in that it is important to understand the technical role, have the right expertise and people available to do projects. If expertise is not in house, find it outside. 5 thought it is important for the project manager to have some technical understanding but needs to know his limitations and let experts deal with tech issues. 7 and 9 emphasised that clients in our industry require the latest technology and need to be able to have access.

Question 3.7
Client consultation - Communication, consultation and active listening to all parties.

Respondent 1 thought it was important to have client consultation early or even before the project starts and must continue to the end of the project. 2 thought this was covered under his response in communication. 4 I see it as stakeholder management while 5 said it's essential to have client contact to keep them happy. 6 and 7 considered it to be important as client's expectations might be different from reality and less room for errors and misunderstandings. List as risk if direct contact is not possible. 8 thought communication allows to work around problems with the client to insure he is OK with it. The client needs to be around to see what he is getting is what he wants. 9 said it is important for client

and other stakeholders like operators who have to run the plant. If job losses people affected need attention.

Question 3.8
Personnel - Recruitment, selection and training of the necessary personnel for implementation.

The first respondent thought of it as "Not the most important but important, especially in functional organisations where the PM may not have any say in the resource selection. 2 thought it is important to bring new talent along and 3 suggested that the companies should have a training budget. 4 emphasised the need to identify the type of skill needed at the beginning. Participant 5 thought it was important in general but his experience in this industry is that they usually work with small groups that have worked together before and have the necessary experience. 6 made a special mention of the fact that it is not just the Team that need attention, the PM should be part of the assessment and training schedule. 8 thought it was "critically important" because "the project is only as good as the people that built it", especially in the design phase and execution.

Question 3.9
Client Acceptance - Selling the final product to its ultimate intended user.

Respondent 1, 2 and 9 consider that this should be done up front with the scope and is an ongoing process during the project. Respondent 5 rated it as "pretty important" but from his experience the clients tend to disappear after the order has been issues. 6 thought it was the point of the project and expects this to be managed throughout the project and 4, 7 and 8 considered it is essential for project success and part of client/stakeholder consultation. An interesting point was made by 9 that process engineering plants need to be "sold" to the operator of the plant as they are the key to a successful takeover and operation of the plant.

Question 3.10

Communication - Provision of an appropriate network and necessary date to all key stakeholders.

Respondent 1 emphasised the need to make the stakeholders part of the project and that is how relationships are built. Everybody needs to have the right information to be able to deliver the product. Similar views were expressed by 3, 5 and 7 with the addition of the need to define the line of communication at the outset and the need to keep good records of all communications. 4 mentioned the need to have a balance and to establish the right levels and "what" is communicated to whom and when. 6 commented on the need to understand the expected outcome of the project while 7 saw it as an early warning system and to avoid mistakes. 8 thought that a good structure to distribute information is essential and 9 talked about the need for regular communication updates

4.4   Interview Section 4 – Project Managers People Skills

Section 4 of the questionnaire is dealing with the people skill and is trying to establish on how important the project managers thought the project manager's people skills (Soft Skills) were and what difference they made to project success.

Question 4.1

How important do you think motivation and team development is, and what difference does it make to project success?

Respondent 1

It is quite important but the PM does not always have the amount of control required because of outside influence i.e. private lives of team members. PM has to be self motivated and set a good example. It is important to have a social aspect for the team spirit.

Respondent 2

Very important, and it makes a huge difference to the project, but fine line having to have the authoritative presence in order to "get things done". It is having that relationship with the people that are working for you, such that they are keen to do a good job. Complement/reward, give prise if done well.

Respondent 3

Very important and has significant effect on the project. Management on a day-to-day basis with good teams is significantly easier. Information you get from a good team is phenomenally different than a less cohesive one. Need social relationship.

Respondent 4

Important especially when projects get bigger and more complex i.e. larger and more diverse teams.

Respondent 5

It's pretty important. Project teams can require lots of attention. You need to get involved with people in order for them to do the job. Sub-contractors are generally easier.

Respondent 6

I think it is really important to the project harmony. I think it is difficult to do due to inherited personalities involved.

Respondent 7

It is very important to be able to motivate your team. Only a harmonious team works well together and ultimately performs.

Respondent 8

Somewhat important but think it is far more important to respect people for their skills and ability. Should have some sociable aspect to work. We have dedicated teams for the project and they are all focussed on the job without getting to friendly.

Respondent 9

It makes a huge difference. You need to have a team that wants to get to the end. You do not need negative people on the team. It is always good to have people who are willing to make it happen.

Question 4.1 Summary

The response to this question varied from "somewhat important" to "huge difference" with most of the respondents thinking it was important or very important to have a motivated team. It was considered to be important to have "that relationship with people", that "having good teams is significantly easier" and that "harmonious teams work well together".

Some of the respondents commented that it can be difficult because "the Project manager does not have the amount of control", that people have "inherited personalities" and that there is a "fine line having to have the authoritative presence". Respondent 4 considered team motivation especially important for bigger, more complex projects with larger and more diverse teams and respondent 8 thought it was "far more important to respect people for their skills and ability".

Question 4.2

How important do you think stakeholder management is, and what difference does it make to project success?

Respondent 1

Not critical but important. In our situation there are a lot of stakeholders the PM does not have control over like overseas clients. But if Project manager is motivated to make things happen it will have a follow on effect on the team. The Project manager should at least get top management on his side.

Respondent 2

Very important. Again all to do with communication, dialogue etc. Everybody needs to know what is happening to be able to support the project.

Respondent 3

Yes very important. We try to sit with people and try to get a lot more involvement and understanding.

Respondent 4
Very important. Stakeholders need to buy into the delivery of the project, avoiding costly time wasters.

Respondent 5
Very Important. Need to understand each others problem and find solutions and execute them. But stakeholders need to do their part of the job as well. Makes a big difference on how endurable the project is. Understanding people and their hidden agendas. Deal with people that can make decisions

Respondent 6
Really important for buy-in of all participants. People involved can make huge difference to the efficient running of the project. Need to have stakeholder involvement early in project.

Respondent 7
Definitely important, especially with large and complex project structures. The customer needs to get special attention.

Respondent 8
Important. Need good monthly reporting and reporting system, an open management system that allows free access to site and to talk trough the project. Need feedback from all parties. If stakeholders are informed, they are generally………everybody's happy.

Respondent 9
Very important. If you want to have people involved in a project who are interested in making the project to finish on time, on budget, yes, you want to have a high stakeholder involvement. It removes many barriers.

Question 4.2 Summary

Stakeholder management was considered important or very important by all respondents and there was general agreement that it is important to have stakeholder involvement, to keep them informed and have buy in. Some of reasons for the importance of stakeholder involvement were, more involvement and understanding, big difference on how endurable the project, huge difference to the efficient running of the project and it removes many barriers.

Question 4.3

How important do you think the project manager's emotional intelligence is, and what difference does it make to the project?

Respondent 1

Very important. I'm reasonably emotional and I like others to be happy as well and their mood affects me as well. Happy people work better and have a positive effect on the project as a whole.

Respondent 2

Important to maintain control of emotions. Sometime things happen that are more important for people than the project. It is a very good skill to have. People will relate positively to an approachable manager.

Respondent 3

Very important that you are aware of whom you are as a leader. Need to understand and listened to others and understand their feelings and issues. An unhappy team or conflict between team members can start the rot and have a bad influence on the project.

Respondent 4

Very important. Managing the people effects and emotions is of growing importance. Project Management is much more encompassing and emotional intelligence is well established in our company now. Change project that affect people personally require high level of emotional intelligence to manage.

Respondent 5

Reasonably important. Need to be realistic when people are not feeling OK. Project managers needs to be aware of what is going on with the people. Will get better performance from individuals and the team.

Respondent 6

Quite important. I think understanding how what you do will be interpreted and how it will affect others, is important. Some Project managers have this ability and some not. The way we go about this is important as it impacts on project performance.

Respondent 7

Yes important. You need to know or be aware of where your emotions and that of others are to effectively deal with them. I don't think it is intimately linked to the project success, but it definitely makes life easier and the project evolution smoother if you understand the emotional side of those around you.

Respondent 8

Important. Need to understand people's strength and weaknesses, and project managers need to be able to take others feelings into account. Need to be aware of our own shortcomings.

Respondent 9

It is very important that you have emotional intelligence and are aware of peoples emotional state i.e. problems with families, problems with other team members, unhappy stakeholders hinder the project. Social aspect, need to have some fun.

Question 4.3 Summary

Emotional intelligence was considered important by all participants to a varying degree. They recognised that it is important to listened to others, understand their feelings and issues, be aware of other's and your emotions and effectively deal with them. Respondent 2 noted that "things happen that are more important for people than the project". Some of the positive reason for the importance were, "Happy people work better and have a positive effect on the

project", "People will relate positively to an approachable manager"," better performance from individuals and the team", and "makes life easier and the project evolution smoother". Negative effects on the project were "unhappy team or conflict between team members can start the rot", "bad influence on the project and "unhappy stakeholders hinder the project".

Question 4.4

How important do you think leadership is and how does it affects the project?

Respondent 1

Very important. Project management needs to provide leadership to the team and the project. Need to be open to different types of leadership. The Project team also needs to provide leadership to the project itself.

Respondent 2

Very important. Leadership has a lot to do with communication and dialogue. Need to have the ability to lead, the ability to be authoritative and direct people. The buck stops with the project manager and he has to take ownership of problems that come up. A lot of that will result in the team having respect for you.

Respondent 3

Absolutely, significantly important, leadership is the key. If the project manager can lead well, the project will run a lot more efficient. You can manage or lead projects. I prefer to lead a project and only manage the parts that need to be managed. You need to lead your people forward and make sure you provide enough momentum and support to deliver the project.

Respondent 4

Important at all levels, from top management down to the project manager. Project management is more of a leadership roll. Particularly relevant in a matrix type of organisation where you also have departmental managers involved.

Respondent 5

Important. Think there is a lot to be said on how the team is made up and who is leading it. The project manager needs to be in charge.

Respondent 6

Very important. Project management needs to have the steering wheel under control, but not by dictatorship or general consensus. Awareness of other's skills, attributes and attitudes.

Respondent 7

Important. Need to give structured knowledge of where we are going and what we need to achieve. Don't necessary need to be a natural leader but needs to be able to lead people.

Respondent 8

Very important. I think that is what project management is all about. If you are running a project you are running a team of people and you are leading the team. Need to lead by example and you require the respect of the people that work for you.

Respondent 9

Important to provide leadership, team motivation, customer and subcontractor confidence. Leaders need to be involved and care about the project and the people. Aids project performance.

Question 4.4 Summary

Project leadership is considered important or very important by all participants. There is also consensus that the project manager needs to provide leadership to the team and project. Other related comments were, "Need to be open to different types of leadership", "I prefer to lead a project and only manage the parts that need to be managed", "Awareness of others skills, attributes and attitudes" and Leaders need to be involved and care about the project and the people". A number of different reasons were given for the effect it has on the project and they include statements like "project will run a lot more efficient",

"team having respect", "provide enough momentum and support to deliver the project", "relevant in a matrix type of organisation where you also have departmental managers", "respect of the people that work for you", "provides team motivation, customer and subcontractor confidence", Aids project performance".

Question 4.5

How important do you think the project manager's project related technical knowledge is?

Respondent 1

At the beginning of my project management days I thought it was important because that is where I come from. Now I think it is not essential but needs to have some technical understanding to understand what is happening. Also, it is too difficult in being an expert in a multi discipline environment.

Respondent 2

It's not vital but a big help. For technical project you need to have some "technical" knowledge. Need to be able to recognise potential problems. Helps if the project manager has knowledge of what is going on, but is not the technical expert.

Respondent 3

Important, but in my opinion leadership, management, relationship and stakeholder skills rank above technical skills. It is important that the process that is undertaken to find the solution is done correctly, rather than me actually giving technical input.

Respondent 4

Important, but also depending on the project. Generic project management is becoming more the norm but project managers needs to have enough technical knowledge so that the stakeholders can have trust in them. Our company is still looking for technical skills.

Respondent 5

Project managers needs to be astute and needs to be able to deal with the sub-contractors. Stakeholders need to be able to have trust in the project managers. In our industry it is important to have a good technical understanding and the need to understand the job.

Respondent 6

Important, but not imperative. It can be a problem if the project manager has insufficient relevant technical knowledge.

Respondent 7

In our industry it is hugely beneficial for the project manager to have a broad technical knowledge. He needs to understand the discussions with stakeholders and in meetings etc.

Respondent 8

Important, but project dependent. I would not like to do a project that I don't understand the technical aspect of. Need enough technical knowledge that you can't be bluffed or resolve some day to day issues.

Respondent 9

Important to have some knowledge. Need to understand the "language"

Question 4.5 Summary

Respondent 1 and 9 thought it was important to have some technical knowledge, respondent 2 said it is not vital but it would help and respondent 4 and 8 said it was important but project dependent. Respondent 7 thought it was hugely beneficial, respondent 5 said important and respondent 6 important, but not imperative. While respondent 3 thought it was important, his opinion was that leadership, management, relationship and stakeholder skills, rank above technical skills.

The reasons for the project manager having some technical knowledge and understanding were given as: "too difficult being an expert in a multi discipline environment", "need to be able to recognise potential problems", "needs to have

enough technical knowledge so that stakeholders can have trust in them",
"needs to understand the discussions" and "need enough technical knowledge
that you can't be bluffed or resolve day to day issues.

4.5   Interview Section 5 - Factors associated with project failure

Section 5 is asking the respondents to identify factors that in their experience
have contributing to project failure and factors that made projects failures or
successes.

Question 5.1
Now looking on the other side of the coin, are there some factors that you think
are synonymous with project failure?

Respondent 1
Selling something that can not be delivered. Lack of scope definition, technical
knowledge, poor workmanship and systems, poor relationship with client, lack
of information, assumptions and leaving things to late.

Respondent 2
Expecting too much of people. Constantly changing people on the project.
Client interference and incompetent subcontractors.

Respondent 3
Poor communication and planning are to top two. Poor scope definition,
technical solutions, and no risk assessment.

Respondent 4
Lack of agreed project brief and approval. Poor planning and lack of resources.
Poor stakeholder management. Commitment to cycles and processes. Lack of
strategic alignment.

Respondent 5

Lack of communication, scope and direction. Ill conceived project. Bad time and cost factors.

Respondent 6

Lack of defined outcomes, budget, time and unrealistic expectations/specifications.

Respondent 7

Insufficient information at start. Unnecessarily complicated path to communicate with customer. Change of PM during projects. Unrealistic expectations by customer.

Respondent 8

Unrealistic expectation at the beginning, lack of clarity of scope, lack of pre-construction planning, risks not identified. Assume technology will solve the problem.

Respondent 9

Poor project management, technical skills, people skills and communication. Lack of contract detail and scope definition

Question 5.1 Summary

Factors seen as synonymous with failure are summarised below.

- Poor relationship with client, expecting too much of people, constantly changing people on the project.
- Client interference and lack of people skills, poor project management and communication.
- No risk assessment, lack of technical knowledge, planning and resources.
- Incompetent subcontractors, bad time and cost factors, poor workmanship and lack of information were also seen as factors for failure.
- No defined outcomes and strategic alignment, lack of contract detail and selling something that can not be delivered.

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Scope was one of the most frequent factors. "Lack of scope definition", "poor scope", "lack of clarity of scope" and "unrealistic expectation/specification" were mentioned with regards to project failure. The focus on scope is consistent with the responses to the success factor question in section 2 of the questionnaire.

Question 5.2

Thinking about projects you have been involved with that were successful and those that were not successful – what were the key differences?"

Respondent 1

Pricing the project wrong, scope not correct or complete.

Respondent 2

Lack of support and knowledge by the subcontractors. Client's understanding of project poor.

Respondent 3

People's ability to do the job.

Respondent 4

Lack of governance, vision, detailed brief and approval of resources.

Respondent 5

Same factors as above. Unknown factors. Lack of time to develop project. Unknown set of objectives. Lack of clarity of scope.

Respondent 6

Mix of people and team dynamics. People are challenged (ability)

Respondent 7

Intermediary persons. Complicated communication. Unable to get correct information.

Respondent 8

Understanding issues at the outset and lack of thought at outset.

Respondent 9

Project management, lack of understanding what needs to be done and over committed contractors

Question 5.2 Summary

Factors that were seen as the difference between successful and unsuccessful projects are summarised below.

• Lack of governance, vision, objectives, detailed brief. Client understanding of project poor,

• Lack of support and knowledge by the subcontractors. Pricing the project wrong, scope not correct or complete.

• People's ability to do the job. Approval of resources. Mix of people and team dynamics. Dealing trough intermediary persons. Complicated communication.

• Understanding issues at the outset and lack of thought at outset. Lack of time to develop project and Project management,

4.6   Interview Section 6 – Top 5 Factors

Interview Question 6

Thinking about all the factors we have talked about, which would you regard as the top five factors contributed to the success of projects in the process engineering industry, and how would you rank them on a scale from 1 to 5, with 1 being the most important.

The response from the participants has been tabulated below to better reflect the relationship of the responses. Looking at the complete table, it can be seen that there is a mix of hard and soft skills.

Table 5. Top 5 Factors

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1	Scope	How people	Project	Client	Budget

		perceive project management	Stakeholder Relations	Relationship	
2	Communication	Project Scope	Project Organisation	Relationship	Availability of Resources
3	Communication	Planning	Stakeholder Relationship	Scope	Timeline
4	Agreed Project Vision	Project Framework	Defined Governance	Effective Planning	Risk and Issue Management
5	Communication	Clear Scope	Good Planning	Quality Resources	Budget Control
6	Clearly Developed Outcomes	Cooperative Environment	Competent Team	Realistic Cost and Timeline	Management Support
7	Scope	Contract	Project Team	Budget	Timeline
8	Practical Conceptual Design	Good Design Team	Sensible Budget	Sensible Timeline	Good Reporting System
9	Team Spirit	Good Specification from Client	Stakeholder Management	T & T, Methods & Procedures	Project Management

5.   Discussion

Introduction

The 10 factor model developed by Pinto and Slevin seem to have wide spread support and has been adopted as part of the questionnaire and to discuss the success factors presented by the interviewees. The discussion will also compare some of the main themes presented in the literature review.

The interview questionnaire had several different sections aimed at soliciting information regarding project success factor and supporting information. For the purpose of clarity some of the sections will be combined to form common themes.

5.1   Findings

Demographics

There is no demographic information on the project managers that were used in the surveys that produced the findings in the literature, other than that most of them were professional project managers in large private or government organisations. The project managers interviewed in New Zealand were working for companies of substantially different size. The company size ranged from very large international to small consulting company with 5-6 people. However, the projects managed by the New Zealand project managers are of similar size within the same general industry and hence offer some comparability.

Critical Success Factors

There was general consensus by the respondents that there are factors that are critical to project success. The response to question 2.1 on what they thought the success factors were, was an evenly mixed response with hart tools and soft skills. All respondents thought that Scope is a key factor with budget (8 out of 9) being the 2nd most frequent response. Schedule was in 3rd position and it included specific aspect of scheduling like, critical path management and milestone charts. Interestingly, both scope and budget are not included in the top 10 success factor model (Table 1) presented in the literature, schedule is

the only one listed at position 3 in the model. This may be due to the fact that the literature holds the view that project success i.e. scope, budget, schedule and quality take a diminished role when considering the more important product success. On the other hand, most of the New Zealand project manager deal with contract for a specific scope of supply within a given budget and schedule. The respondents reason for scope being a key factor was that "you need to know what you are expected to deliver and what the client expects". This reason is supported by the 4th most mentioned success factor, contract. Risk management, technical knowledge and review process taken a distant 5th place with only technical knowledge being mentioned in the 10 factor model in 6th position. The only other factors mentioned by individuals during the interview that is also represented in the 10 factor model is monitoring & control and resources, occupying position 8 and 5 respectively.

Hard skills and soft skills do share about the same proportion of the success factors mentioned by the interview respondents and is similar in proportion to the hard/soft skills in the 10 factor model, but the order of importance (based on frequency of mentioning) is different.

The interviewees most frequently mentioned communication, closely followed by stakeholder management and client relationship. The 10 factor model lists communication as factor number 9 out of 10 and while "stakeholder management" is not listed as a factor in the 10 factor model, the concept is represented by top management support, client consultation, Client acceptance and communication positioned in position 2,4,7 and 9 respectively. Some of the other soft factors mentioned by the interviewees are teams, motivation and project politics, factors not listed in the 10 factor model.

In section 6 of the questionnaire participants were ask to pick the 5 most important success factors and rate then in order of importance with 1 being the most important. The result showed a majority of hard factors overall and this is different from the general responses or trend. The likely reason for that is the fact that section 6 was based on the participants initial response to question 2.1, rather than after their thinking had time to develop as the questioning progressed.

The interviewees seem to have a strong focus on delivering client expectations rather that just project success. Frequent comments during the interview about

satisfying the client or key stakeholders, communication with the customer indicated their thoughts on overall success. Apart from completing the project successfully and satisfying the client, getting repeat business from the client was given as the reason by some for why satisfying the client is so important and that the measure of success is client satisfaction and not just project management and project success.

Interview Section2.2 (Why)

The reasons why the factors were important generally support the key factors presented in the literature. The hard factors like scope, budget and time provide the metrics required to produce the product of the project and is the essential ingredients for monitoring and controlling, during the project execution. The respondents did recognise the important part soft skill played in the relationship with the stakeholders and specifically understanding the client and his needs. Again it was communication that was seen as the key mechanism to make everything else work. One needs to communicate all relevant project information in a timely manner between all the stakeholders, it is the key activity to develop functional teams, build client relationship and play project politics.

Interview Section2.3

Section 2.3 was specifically concerned with the tools, techniques and methods used by the project managers. This area is not covered by the literature which is focused on success factors rather than the means of managing the process. Hardware and software formed the basis for the techniques and processes used in managing their projects. All the common hard skills like scope, budget, risk analysis and schedules are generated, monitored and communicated by this method. Many of the soft skill activities i.e. communication and stakeholders, are also covered in this way. Most of the other activities like meetings and site activities are covered trough personal dialogue.

The answers to the question why the tools, techniques and methods were important can be summed up as, efficiency in managing information and communication.

Interview Section 3. (10 factor model)

Despite some differences between the critical success factors identified in questionnaire section 2.1 and the 10 factor model discussed above, the response to this section produced a great deal of consensus on the importance of the 10 success factors listed in the model. All the interviewees thought that the 10 factors listed in the 10 factor model were to a more or lesser degree important. The acknowledgement of the importance of the additional factors in the 10 factor model by the respondents highlights the fact that project success is made up of a great number of factors that need to be attended to in order to produce success. A summary of the response is tabulated in Table 4.

Interview Section 4   (soft skills)

Team motivation and development was seen as very important or at least important by the majority of the participants. Some of the reasons were having a good, harmonious relationship will make working together significantly easier especially on bigger more complex projects. Some did acknowledge that the project manager does not always have that amount of control over the team. The literature agrees that well performing teams are a key factor in project success. This is particularly important in functional or matrix organisations where team members are usually from different department in the company. The literature mentions the recent popularity of cross functional teams and the importance of team development to produce successful projects.

Stakeholder management is considered a key activity and the PMBoK® Guide (PMI, 2004) links stakeholders with project success. The project manager must identify the stakeholders, determine what their needs and expectations are, and then manage and influence those expectations to insure a successful project. The interview respondents rated stakeholder management as either important or very important to keep stakeholders informed and involvement in the project. The benefits were seen as increase in efficiency, less barriers and better understanding. The literature acknowledges that dealing with stakeholders can be difficult and that getting a consensus on project success or success criteria

is unrealistic. Skilful influencing the perception by the project manager can greatly improve the chance of project success.

Emotional intelligence covers many of the soft skills needed for success and despite the fact that emotional intelligence is a relatively new concept in project management, the response was positive and the respondents generally considered emotional intelligence to be an important part of project management. Emotional intelligence was not specifically covered in the literature as a topic on its own, but rather as part of the many soft skills covered in the literature and specifically literature topics relating to team dynamics and management. Both the respondents and the literature see this area as an important success factor.

Also considered part of project success is leadership. Leadership at the project level and at the team leader level are important. Leaders perform a key function and there was consensus among the respondents that the project manager needs to provide leadership to the project and the team. One respondent said " I prefer to lead a project and only manage the part that needs to be managed". Others mentioned that leaders need to know others skills, attributes and attitudes and be involved and care about the project. Benefits or effects of good leadership included increased performance, respect from the team, motivation and subcontractors confidence. Interestingly the 10 factor model does not list leadership as a key factor but the literature support the notion that Leadership for project and teams is critical, especially in cross functional teams.

The 10 factor model listed technical tasks as number 6 but it does not specify say that the technical expertise has to come from the project manager. This view is shared by the respondents and while there seem to be agreement that the project managers needed to have some technical knowledge and understanding of the technical aspect of the project, there are other skills that are more important. The literature supports this view with a study in 1993 by Morris that clearly identified that behavioural and organisational factors far outweigh technical issues in terms of importance for success. Rather than

focusing undue concern on technical issues, it was far more important to pay attention to the human side of the process.

Some of the reasons way it was important to have technical understanding by the interviewees was the need to understand the discussions, recognise potential problems and gain stakeholders trust.

Interview section 5

The two questions in section 5 were to establish if there were some factors that in their experience contributed to project failure and what the difference was between successful and un-successful projects. The purpose of these questions was to find out if the respondents thought that failure was caused by the same factors that on the other hand, aid project success in question 2.1.

Many of the responses did line up with the factors that can aid success, but there were some different factors as well. The hard factors listed were lack of scope, time, cost definition, technical knowledge, poor workmanship, no risk assessment, no defined outcome and strategic alignment. The soft skills covered lack of people skills, poor management, poor communication and information, poor client relationship, expecting too much of people, changing people during project.

As can be seen from the listing above, soft and hard factors are about evenly represented and in line with earlier responses in the survey and the thinking in the literature. Client interference, incompetent subcontractors and selling something that can not be delivered, were responses that were different from earlier factors. Client relationship is generally high on the list of success factors but there can obviously be a negative aspect if the client is interfering in a way that has a negative impact on the project.

The Factors in question 5.2 about the difference between successful and unsuccessful projects showed some similar soft and hard factors to the previous question with some variations. Lack of governance, vision, people's ability to do the job, approval of resources, mix of people and team dynamics and dealing trough intermediary persons were the main factor that were different from the success factors. Apart from governance and vision, the other factors fit into the resource and team related category and as such are part the success factors.

Summary

While most of the respondents listed hard and soft skill as success factors, some also talked about the project outcomes, client satisfaction and customer needs. They did consider all these elements to be part of the project approach for delivering successful outcomes, rather than the two part approach of project success and product success. This is despite the fact that many of their projects are contract based and in some cases involves little interaction between the project manager and the client.

There is some alignment between the "success factors" as presented in Table 1 and 5, and the findings presented in general research literature. Hard factors like tools, techniques, processes and methods are generally accepted as essential for project management success.

While it is a given that communication is important for project success, it was surprising the number of time communication was mentioned during the interview. Most of the interviewees mentioned communication as part of the answers to the first question 2.1 and 3 of them considered this to be the number one success factor in Table 5. While subsequent questions revealed that scope, cost, schedule, quality and risk analysis were key factors and a given in any project, the reason why they chose communication was that all the project information and key factors were useless unless they were communicated to all the relevant people (stakeholders) involved in the project. Communication was also considered the key to knowing what is happening in and around the project and specific emphases was placed on communication with the customer. Considering that communication lists as number 9 in the 10 factor list (Table 1) by Pinto and Rouhiainen (2001), the interview response was somewhat surprising. It is clear that soft and hard skills are intimately intertwined and complementary. Either of the skill set can not produce project success on its own, which can only be done by a substantial effort involving a holistic approach to achieve a project conclusion that satisfies the customer.

6.   Conclusions and Recommendations

6.1 Conclusions

This dissertation explores the question:

What are the critical success factors that provide a focus to assist project managers in New Zealand deliver successful process engineering projects?

The following definition of critical success factors (CSFs) has been adopted.

"Those factors which, if addressed, will significantly improve the chances for successful implementation" (Pinto & Rouhiainen, 2001).

Process engineering projects are often large and complex. The management of them is necessarily complex and multi dimensional, ranging from the management of client relationships to ensuring that small components are delivered to specification, when required, to budget, schedule and quality. In identifying CSFs one is inevitably oversimplify complex actions in an attempt to highlight where the manager should place emphasis rather than say that other actions are unimportant or need not be done.

The literature review highlighted that project success is multi-dimensional and perceptions of it vary between the various stakeholders to the project (project owner, users, those impacted by the project and the project team itself). The multi-dimensional nature included differences between project process success and product success. It also included a time dimension within which regard for project process success faded after completion of the project and regard for project product success became dominant. Even during the project, definitions of project product success (what it is required to do) may change over time. Given the above, project management may be viewed as an ongoing struggle to deliver against a moving target within which perception is as important as fact. This struggle can be seen both in the literature and the empirical data collected in the interviews. Considerable emphasis is placed on matters such as project mission, project definition, scope definition, scope control etc. This can be

viewed as an expression of the project manager's attempts to get clarity on what the target is and then to stop it moving. Processes such as LFM can be seen as much needed tools to help in this process. At the same time there is also emphasis both in the literature and empirical data on ongoing communication with the stakeholders particularly the project owners and users. The explanations as to why this is important suggest that it is substantially a process of aligning the stakeholders' expectations and perceptions to accord with the realities of project delivery. If the project as delivered aligns with expectations and this is perceived as good, then the project is a success whether or not it has been delivered in accordance with the scope, time and budget as defined at the outset of the project.

A first CSF may therefore be defined as;
Managing client expectations and perceptions in an ongoing manner such that the project, as delivered, meets those expectations and is perceived as a success.
This process starts at the project initiation stage and is continued throughout the project. However, there is a second dimension to this issue of project definition in that if the project team is not clear what it is they are doing, it is difficult for them to perform well. Pinto and Slevin (1988) define this as "Project Mission" (clearly defined goals and general directions). Murray (2002) sees it as "a well done set of project requirements and specifications". In the empirical data interviews it was frequently mentioned that scope "has to be correct and complete", and included in the factors associated with project failure issues such as "lack of scope definition", "lack of agreed project brief", "lack of --- scope and direction" were common.

Clear scope definition (that aligns with client expectations), may therefore be regarded as a second CSF. Whilst this may be difficult with some types of projects (R&D project for instance) this should normally be possible for process engineering projects.

The success factors models identified in the literature do not place emphasis on the need for adequate resources with the correct skills to execute the project.

However, in the interviews particularly when asked to identify factors in project failure along with the above factors of project definitions and client expectations, the issues of inadequate resources were highlighted. The skills of people within the project team and poor or inadequate sub-contractors were both viewed as sources of difficulty along with inadequate budget.

The ability to assemble the required resources within the budget may therefore be seen as a CSF.

Managing the process of creating the product of the project could be considered another CSF. Rather than picking on many of the individual factors needed to manage the process, it seems appropriate to select the hard skill of project process management as a CSF.

The interviewees placed considerable emphasis on the management of scope, time and budget to satisfy the contractual obligations and the client requirement. Other critical processes were, change management, document and information management systems, common tools to manage process and monitor progress. Again this CSF is also partly represented in the 10 factor model by Pinto and Slevin (1988) and is defined as "Monitoring and feedback" (Timely provision of comprehensive control information at each stage)

People management (soft skills) also involves many individual key factors. However, no individual soft skill factor stood out as a single CSF. A common, all rounded and flexible approach is required to manage the many soft aspects of a project. While communication was the most frequently mentioned soft skill, communication is an essential part of all project activities. The response to interview section 4.0 (soft Skills) clearly showed support for all five areas. Factors associated with failure such as, "poor relationship with client", "lack of information", "lack of people skills", support the importance of soft skills as a CSF. Different soft skills may be required to manage the many different situations arising during the project life cycle. Pinto and Slevin's (1988) model only lists 4 individual skills that cover some of the soft skills. Therefore it could be considered that the soft skills of people management is a CSF

It is therefore concluded that the "the critical success factors that provide a focus to assist project managers in New Zealand deliver successful process engineering projects" are:

- Managing client expectations and perceptions in an ongoing manner such that the project, as delivered, meets those expectations and is perceived as a success.
- Clear scope definition (that aligns with client expectations).
- The ability to assemble the required resources within the budget.
- The generic hard skill of project process management.
- The generic soft skills of people management

6.2 Limitations

Most of the information in the literature was based on research that was looking at what Project Managers retrospectively considered "success factors" that contributed to the success of their projects. This means that the findings are most likely biased towards project management success and less on product success. The same is true for the survey conducted with the project managers in New Zealand. While the comparison between the New Zealand survey and the literature will be a fair comparison, it will not necessarily represent product success or the client's view on success factors.

There is little in the way of guidelines on how to approach a new project and which factors to focus on to insure, or at least improve project success, other than the option of using the factors that historically have proven to aid project success. Further to that there is no agreement across the industry or profession, on what success in the project sense means nor is there an agreed definition. There is no evidence that the research that produced the lists of success factors, was based on an agreed, common definition of project success. No evidence was found of project managers using a set of success factors that produced repeated project success over a period of time. Research to date has largely involved large private and government organisations and the participants have largely been professional full time project managers, which may limit the application of the research results to smaller and different types of

projects. The New Zealand research was based on a small sample of 9 project managers and conclusions can not be generalised.

6.3 Recommendations

The research has highlighted several areas for further research in the New Zealand process engineering industry and success factors in the project management industry as a whole.

The following research opportunities have been identified:

- Further research is needed in the process engineering industry in New Zealand. The research should be based on a larger sample to provide more accurate information on project success factor in the industry, how to apply them and the development of suitable training material.

- Research into Project success factors in other industries sector in New Zealand would provide a broader perspective and comparisons.

- Research on success factors from the client/user's perspective and how their project objectives can successfully be incorporated in projects and the management thereof. Additional information could be gained from the end user on past projects and the degree of success achieved in respect of the corporate objective.

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8. Appendices

8.1 Sample of Questionnaire

Interview Question Sheet

1. Interviewee's Demographics

1.1 Just for my record, your full Name is (Name)

1.2 What is your current Position?

1.3 And what is the general Industry group?

1.4 How many years have you been involved in managing projects?

1.5 Do you have any formal training or attended courses in project management and of so, what did it cover?

1.6 Other than the above training (if any) where did you learn your PM skills?

1.7 Have you done any self study or reading on project management related topics and if so, what was it relating to i.e. topic, T&T, methodology or processes?

2. Critical Success Factors

2.1 What do you see as the critical success factors in project management in the process engineering industry projects?

2.2 Why do you see the success factors from the previous question (2.1) as critical for project success?
(Repeat for each factor)

2.3 Do you use any specific methodologies that you think are critical to project success? (tool and techniques? processes? or methods?)

2.4 Why do you think the methodologies, T&T and processes from the previous question are critical to project success?

3. Now, I am going to ask you some questions about factors that were not covered above and how important you think they are.

3.1 Project mission - Clearly defined goals and general directions.

3.2 Top management support - Willingness of top management to provide the necessary resources and authority/power for implementation.

3.3 Schedule/plans - Detailed specifications of individual action steps for implementation.

3.4 Trouble Shooting - Ability to handle unexpected crisis and deviate from plan.

3.5 Monitoring and feedback - Timely provision of comprehensive control information at each stage.

3.6 Technical tasks - Availability of technology and expertise to accomplish specific technical steps.

3.7 Client consultation - Communication, consultation and active listening to all parties.

3.8 Personnel - Recruitment, selection and training of the necessary personnel for implementation.

3.9 Client Acceptance - Selling the final product to its ultimate intended user.

3.10 Communication - Provision of an appropriate network and necessary date to all key stakeholders.

4. Questions relating to the project Manager's people skills (soft skills):

4.1 How important do you think motivation and team development is, and what difference does it make to project success?

4.2 How important do you think stakeholder management is, and what difference does it make to project success?

4.3 How important do you think the project manager's emotional intelligence is, and what difference does it make to the project?

4.4 How important do you think leadership is and how does it affects the project?

4.5 How important do you think the project manager's project related technical knowledge is?

5. Questions relating to associate factors to the success of projects:

5.1 Now looking on the other side of the coin, are there some factors that you think are synonymous with project failure?

5.2 Thinking about projects you have been involved with that were successful and those that were not successful – what were the key differences?"

6. Thinking about all the factors we have talked about, which would you regard as the top five factors contributed to the success of projects in the process engineering industry, and how would you rank them on a scale from 1 to 5, with 1 being the most important

Factor _____Ranking (   )

Factor _____Ranking (   )

Factor _____Ranking (   )

Factor _____Ranking (   )

Factor _____Ranking (   )