

Contributing factors in optimal project portfolio selection

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Abstract

The selection of projects and programs of work is a key function of both public and private sector organisations. Ideally, projects and programs that are selected to be undertaken are consistent with strategic objectives for the organisation; will provide value for money and return on investment; will be adequately resourced and prioritised; will not compete with general operations for resources and not restrict the ability of operations to provide income to the organisation; will match the capacity and capability of the organisation to deliver; and will produce outputs that are willingly accepted by end users and customers.

A modified Delphi approach has been applied in this study to investigate best practice and to determine the factors that contribute to optimal selection of projects, and the associated strategic level decision making.

There are various standards and practices that some may recognise as representing best practice in this area. Many of these have similar characteristics and this study has found no single best practice. Each of the participants in the study related to practices that are appropriate to the organisation, the size and nature of the candidate projects, the regulatory environment, its stakeholders, and the experience and capability of its personnel.

The study identified the factors that contribute to the optimal selection of projects as: culture, process, knowledge of the business, knowledge of the work, education, experience, governance, risk awareness, selection of players, preconceptions, and time pressures. All these factors were found to be significant; to be appropriate to public sector organisations, private sector organisations and government owned corporations; and to have a strong linkage to research on strategic decision making. These factors can be consolidated into two underlying factors of organisation culture and leadership.

The significance of the conclusions from this research is that organisations that do not give due consideration to the underlying drivers of organisation culture and leadership, will continue to make sub-optimal decisions on the billions of dollars they invest in projects each year.

Keywords: Project selection, portfolio management, project portfolio management, strategic decision making, organisational culture

1. Introduction

All organisations, whether public sector, private sector or 'not for profit' undertake projects to support their operations; meet strategic objectives; respond to a need; solve a problem; develop an idea; or realise investment opportunities.

These projects can be selected in an ad hoc manner, at the whim of a Government Minister, in response to a need or public pressure, or as a 'sacred cow' (Meridith and Mantel 2009). These projects draw on funds that other projects, which will have to undergo much more scrutiny, will have to compete for. It has also been commented that "there are usually more projects available for selection than can be undertaken within the physical and financial constraints of a firm, so choices must be made in making up a suitable project portfolio (Archer and Ghasemzadeh 1999)".

There are many different approaches or models for the qualitative and quantitative evaluation and prioritisation of projects involving numerical and non-numerical methods. There are well over 100 different techniques (Cooper 1993).

Project portfolio selection is essentially about decision making by individuals and organisations. The effectiveness of this decision making can be influenced by human psychological factors, as

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espoused in the field of behavioural economics (Reeson and Dunstall 2009); organisational and cultural considerations (Brooks 1994); the quantum (too much and too little) and timeliness of information to assist the decision making (Katopol 2007); and the experience of the decision makers (Brockmann and Anthony 2002).

The problem is that there appears to be little consistency in approach to the selection of projects and that there are many factors that contribute to optimal project portfolio selection, and decision making in this environment.

The aim of this research was to focus on the selection of investment projects and the prioritisation and balancing of resources as these involve similar high level decision makers in organisations. The particular aims were to study the gap between current practice and best practice, and the contributors to the application of appropriate project selection practices and decision making, by managers and organisations, in order to achieve optimal project portfolio selection. This paper is primarily focussed on Phase 2 of the study which addresses the contributing factors.

2. Literature review

Project selection criteria

The Standard for Portfolio Management (Project Management Institute 2013) represents a significant revision of earlier editions and includes a substantial and broad list of some examples of evaluation criteria. They include: organisational strategy alignment; goals and objectives; benefits, financial and nonfinancial; market share, market growth, or new markets; costs (lost opportunity costs); dependencies, internal and external; risks, internal and external; legal/ regulatory compliance; human resources capabilities and capacities; technology capabilities and capacities; and urgency.

It states that it is important to select evaluation criteria which best support the achievement of organisational strategy and objectives. Such criteria will allow measuring the benefits contribution of a portfolio component.

Jiang and Klein (1999) in their research into selection criteria for information systems (IS) projects have generated six sub-categories of evaluation criteria for these types of projects: (1) financial; (2) organisational; (3) competing environment; (4) technical; (5) risk; and (6) management. Each of these is broken down into between four and seven criteria.

It has been suggested by Turner (2009, 45) that there are "insufficient resources, money, people and materials to fund all projects so the organisation must align priorities to select projects that are most beneficial" (Turner 2009). This again brings in the linkage to organisational benefits. He suggests that the two major criteria are benefit and risk but the others that may be included are strategic importance, opportunity for learning, and stakeholder acceptance.

The consideration of critical resources (De Maio, Verganti et al. 1994) is proposed in conjunction with risk and project relevance. This acknowledges the fact that there are key people in an organisation who have involvement in most projects, and their availability will represent critical path for those projects. Therefore, their availability will be a major determinant to the projects that can be selected. An advancement on this approach is the consideration of organisational and individual competency as a criteria in project selection as well as the economic benefits that come from competence development (Gutjahr, Katzensteiner et al. 2008).

The strategic orientation of projects is considered as important (Jiang and Klein 1999) and this is inherent in an 'integrative' approach (Kester, Hultink et al. 2009) which includes both quantitative and qualitative methods. Strategic alignment is aligned with requirements analysis (Bergman and Mark 2002) which helps define the initial project choices. Choosing the wrong projects or poorly defined requirements (or need) can lead to project failure or costly change management to these projects during implementation. Either way, the realisation of benefits can be severely impacted. An empirical study on 13 organisations showed that successful organisations have an organisation-level practice of selecting and prioritising projects in line with strategy (Müller, Martinsuo et al. 2008). The importance of strategic alignment and defined need are also

emphasised by Murray, Burger et al. (2009) but for the public sector based public private partnership projects they studied, they also stress the inclusion of quality-of-life to the criteria in project selection.

Tools and techniques

The Standard for Portfolio Management (Project Management Institute 2013) suggests a range of tools and techniques to optimise the portfolio i.e. create a list of portfolio components that will be considered for prioritisation. They include the use of scoring models such as multi-criteria analysis, to eliminate those candidate component projects not meeting threshold scores with respect pre-determined criteria and indicators. This process is not limited to the ‘value’ of individual components as they may be constrained by organisational capacity constraints.

It also suggests that the quantitative and qualitative analyses may include: cost-benefit analysis; quantitative analysis (use of spread-sheets or other tools); scenario analysis; probability analysis; SWOT analysis; market/ competitor analysis; or business value analysis. The standard suggests the use of techniques for weighting and ranking portfolio components such as the single-criterion prioritisation model and multiple-criteria weighting ranking, and the multi-criteria scoring model.

A framework for project portfolio selection was developed by Archer and Ghasemzadeh (1999). This framework separates the work into distinct stages. Each stage accomplishes a particular objective and creates inputs to the next stage (Archer and Ghasemzadeh 1999). The framework is depicted in Figure 1 where the major stages are represented by the heavy outlined boxes, the ovals represent pre-process activities, and post-process stages are shown in the lightly outlined boxes.

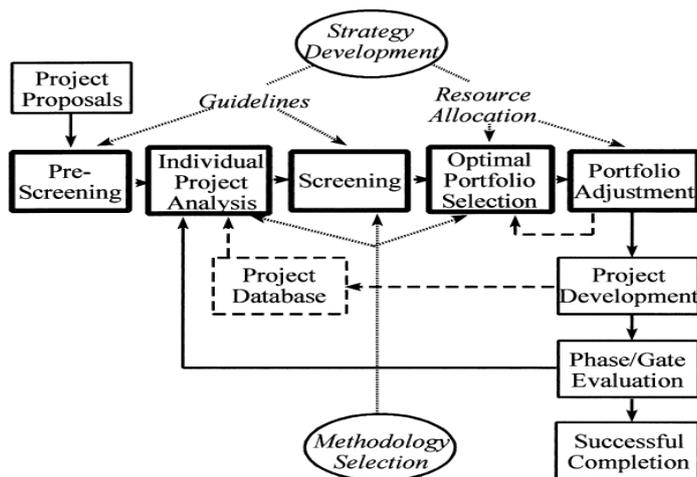


Figure 1 – Framework for project portfolio selection (Archer and Ghasemzadeh 1999)

De Maio et.al. (1994) in studying product development projects, has divided the methods for project selection into three groups: *financial*; *operations research*; and *strategic*. The aim of the *financial* techniques is to appraise the economic effectiveness of a project, evaluating incremental discounted cash flow deriving from the investment. The *operations* methods aim at expressing variables, relations between variables, constraints and utility functions analytically. Risk minimisation, therefore, can be viewed as an additional goal to achieve greater utility. The *strategic* methods are aimed at evaluating the impact of the project on the position of the firm in the competitive context (De Maio, Verganti et al. 1994).

The utilisation of a consistent approach or method to project portfolio selection appears to be supported along with the inclusion of both qualitative and quantitative criteria into some form of multi-criteria decision making that incorporates all criteria. However, an emphasis on subjective data can be seen as “a catchall method for lack of method” and be used to justify projects that are considered to be required and may be considered differently under objective scrutiny (Rosacker and Olson 2008), or the ‘sacred cow’ projects (Meridith and Mantel 2009). It should also be borne in mind that numerical financial analysis may appear objective, but it is based on assumptions and

therefore has a subjective component. (Wenyi 2008) proposes the inclusion of sensitivity analysis into the models used for project portfolio selection.

A multi-criteria decision analysis (MCDA) process is consistent with the analytic hierarchy process (AHP) (Saaty 1980). Both comprise the three steps: (1) Identify and select criteria; (2) Weight the criteria and build consensus about their importance; and (3) Evaluate the project proposals using the weighted criteria.

While some form of the use of MCDA and the inclusion of both qualitative and quantitative criteria is a common thread from the literature review, the method used for analysis can become quite complex. In their discussion on project selection methods DeMaio et al (1994, 184) suggests that “there is no optimal method: techniques must be evaluated and chosen according to the specific application; moreover, these methods should not be considered mutually exclusive but rather as complimentary techniques”.

Contributing factors to effective application

The application of effective project portfolio management in organisations is a complex area because it is dealing with “situational idiosyncrasies of internal and external dynamics, industries, governance types, and geographical location” (Müller, Martinsuo et al. 2008). This complexity is also exemplified by the political imperatives and drivers that can influence project prioritisation in public sector organisations, the ‘sacred cow’ projects (Meridith and Mantel 2009) and the ‘projects that are required will obviously be adopted’ (Rosacker and Olson 2008).

Organisational context

This complexity could be partly explained by the three different types of responses based on organisation type (Kester, Hultink et al. 2009): formalist-reactive firms (quantitative); intuitive firms (qualitative); and integrated (qualitative and quantitative), and the importance of effective executive and project sponsorship (Crawford, Cooke-Davies et al. 2008). The sponsor may need to emphasise a more governance perspective, or a support perspective, depending upon the situation.

While these comments are directed at the management of projects and programs, because of the iterative nature of optimal project portfolio selection, they are equally relevant to project portfolio selection. For example, Rosacker and Olson (2008) state that many IT projects will not proceed without the presence of a project champion who is generally a member of top management, and “has the influence to ensure that the project has sufficient priority to enable success” (Rosacker and Olson 2008).

It has also been demonstrated that successful organisations firstly, have an organisation-level practice of selecting and prioritising projects in line with strategy. Secondly, they have a shared reporting approach to channel information flows from projects to the portfolio level. Thirdly, they share responsibility for decisions at the portfolio level (Müller, Martinsuo et al. 2008).

Human factors in decision making

It has been suggested that the field of psychology, already very present in organisational psychology and decision-making, is slowly opening up applications in corporate financial decisions and more specifically in corporate finance techniques. Among these corporate financial decisions is the project evaluation decision or the investment decision (Ashta 2009). Ashta (2009) found that a wide range of human factors can influence the calculation of subjective risk estimates. Therefore, quantitative financial evaluation of projects which may be expected to be objective in nature, are actually subjective due to all the human factors and behavioural biases that affect individual players and the organisation.

These influences have relevance in the field of behavioural economics. Neo-classical economists use a normative theory about perfect rationality in human behaviour. They base their models on the way rational people are expected or should behave according to economists’ models of rationality. However, human beings do not think and act in a purely rational way. We have emotions, prejudices and biases that determine our behaviour in fundamental ways (Sylvan 2010).

Satisficing, is about searching for satisfactory-looking solutions to past or anticipated failures to meet performance targets or aspirational levels. The rational view would be that an organisation

that uses simple decision rules would be expected to be wiped out by a rival with more sophisticated processes. However, organisations with simple rules and procedures for dealing with changes in their environments or internal difficulties may respond very quickly, whereas organisations that gather as much information as possible and then carefully process it may achieve inferior performances since, by the time they have worked out the best response to the original problem, further changes could have taken place (Earl 2012).

A rational view when faced with ambiguity (not having a conceptual framework for interpreting information) or equivocality (having several competing or contradictory conceptual frameworks) is to gather more information. However, when faced with knowledge based indeterminism, interpretation and/ or knowledge acquisition is required. It is argued that human contact is best in situations where knowledge is the issue: *“Ambiguity is not resolved by gathering more facts. It typically requires cycles of interpretation, explanation and social ratification ... Ambiguity and equivocality are best managed by face to face communication among a network of personal contacts that serves as a source of knowledge and expertise...”* (Zack 2007).

3. Research method

Research framework

The two specific aims of this research project were to: (1) study the gap between current practice and best practice in relation to the selection, analysis, prioritisation and balancing of project portfolios; and (2) identify the common contributors to the application of appropriate project selection practices and decision making, by managers and organisations, in order to achieve optimal project portfolio selection.

In relation to the first aim, in the introduction and in the literature review it has been highlighted that there are a very large number of methods, tools and techniques available for use in project portfolio selection. Some people may regard the processes set out in documents such as the Portfolio Management Standard (Project Management Institute 2013), as well as government and international banking frameworks would represent best practice. For those operating in those environments, it probably does. However, while the principles and the general approach may have some similarities, their appropriateness to any organisational context (complexity and cost), the knowledge and experience of the players, and how it is applied can vary widely.

This discussion generates the first three research questions, which form the phase 1 of the study:
RQ1 – *Do leading practitioners have a view on what represents best practice?*
RQ2 – *Is there a difference between their current practice and what they regard as best practice?*
RQ3 – *How does this view compare with what is generally regarded as best practice?*

In relation to the second aim, financial models, quantitative risk analysis and other tools and techniques can assist in numerical analysis in an apparent rational way, providing numbers and scores that can provide the appearance of reliability. However, the research on the human psychological factors such as risk aversion, loss aversion, mental accounting, status quo bias, anchoring, optimising vs satisfying, choices overload (Reeson and Dunstall 2009), as well as politics (Eisenhart 1999), indicate that there are other factors that contribute to decision making in the project portfolio selection context.

This generates the fourth research question:

RQ4 – *Are there common contributors to the achievement of optimal project portfolio selection?*

This paper primarily focuses on the second aim, which is related to phase 2 of the study.

Selected method

A modified Delphi technique was adopted. The research method utilised two phases with the first being ‘qualitative’ and involving in-depth interviews with experienced practitioners. Subsequent thematic analysis of the interview content allowed research questions RQ1 to RQ3 to be addressed, and identification of factors (research question RQ4) for further study in phase 2.

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The second phase utilised a questionnaire which was completed by the same participants as in the first phase, therefore exhibiting similarities to the Delphi technique. Analysis of the data from the questionnaires allowed research question RQ4 to be addressed.

4. Findings

Overview of Phase 1

This phase primarily involved the undertaking of detail interviews with nine leading practitioners to examine their experiences in project portfolio selection and decision making; ascertain their views on what may represent best practice; and what they consider are the major contributors to effective project selection and decision making.

The nine participants were selected based upon their experience, recognition in their fields, and that they presented no conflict of interest with the researcher or the research project.

The profile of the participants is summarised in Table 1.

Table 1 Profile of research participants

Item	Comment
Gender	All male
Median years of experience	21-25 years
Current industry sector	Private (5); Public (2); Government owned corporation GOC (2)
Range of industries	Oil and gas; energy (power stations); consulting (to all sectors); medicine; IT; public utilities (water, waste water and electricity distribution).

A thematic analysis of the comments from the interviews was undertaken in order to develop a list of factors that have a bearing on project selection and critical decision making. These factors were refined to eleven. They are considered to comprehensively represent the range of comments but of a number that could be managed in the second phase.

Identification of factors for the phase 2 of the study

After detail thematic analysis of all the comments a list of eleven factors was developed: (1) culture; (2) process; (3) knowledge of the business; (4) knowledge of the work; (5) education; (6) experience; (7) governance; (8) risk awareness; (9) selection of players; (10) preconceptions; and (11) time pressures.

Phase 2 analysis and findings

A five point Likert scale was adopted. The mean rated importance and standard deviation for each of the factors across all industry sectors, are set out in Table 2, and in graphical form in Figure 2.

With the lowest mean being 3.33, these results indicate that all the factors are significant. While the range is not large, these results indicate that the most significant factors are *culture, knowledge of the business, knowledge of the work, selection of players, and process*. However, the means for *experience and governance* are only 0.11 lower. The least significant factors are *preconceptions and time pressures*. Interestingly, the standard deviations are lowest for the most important factors indicating a consistency in opinion.

Table 2 Mean rated importance and standard deviation (all sectors)

Factor	Mean rating	Standard Deviation
<i>Culture</i>	5	0
<i>Process</i>	4.33	0.47
<i>Knowledge of the business</i>	4.44	0.5
<i>Knowledge of the work</i>	4.38	0.48
<i>Education</i>	3.89	0.74
<i>Experience</i>	4.22	0.42
<i>Risk awareness</i>	3.89	0.74
<i>Governance</i>	4.22	0.92

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<i>Selection of players</i>	4.44	0.68
<i>Preconceptions</i>	3.33	0.82
<i>Time pressures</i>	3.78	0.92

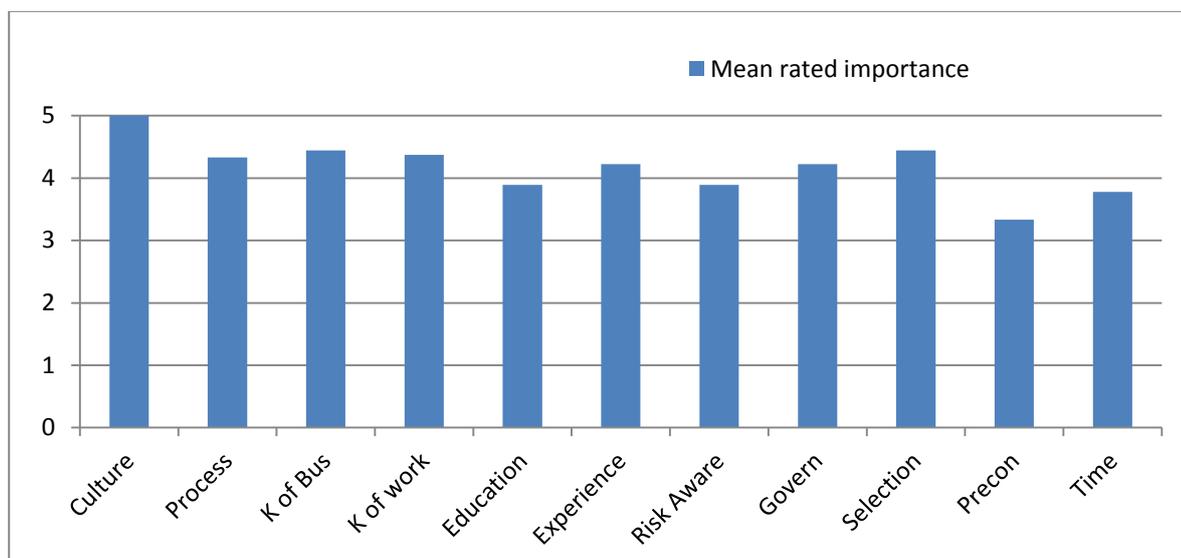


Figure 2 Mean rated importance (all sectors)

Table 3 breaks down the mean ratings into each sector (private, public and GOC), and Figure 3 represents the ratings graphically. As indicated by the standard deviations, there is strong consistency across the sectors for those factors with a mean importance rating of greater than 4 (*culture, process, knowledge of the business, knowledge of the work, and experience*) with the exception of *governance* and *selection of players*. Due to the small sample sizes for the public (2) and GOC (2) sectors (see Table 1) it is difficult to determine strong trends just from the analysis of the data. However, the small standard deviation for the more important factors (mean > 4), and the greater standard deviation for the four factors with an mean importance rating of less than 4, are consistent with the findings from the interviews with the participants as they discussed their experiences and observations across the sectors. Based upon these comments, it is not surprising that: *experience* is rated slightly higher than *education* and that the private sector puts a greater emphasis on *education*; *risk awareness* is rated higher in the public and GOC sectors due to propensity to be more risk averse in these sectors; *governance* is rated higher in the public sector due to the stronger emphasis on probity in response to public, political and media scrutiny; *selection of the right players* is rated higher in the public and GOC sectors because of the difficulty in managing the demanding, risk averse environment whilst managing multiple interfaces and stakeholders and milestones; *preconception* is a factor but less important at this level of decision making because they involve critical and strategic decision making that can have catastrophic consequences for organisations and individuals; and *timing* or urgency is a more important factor for the public and GOC sectors because the actions players are often driven by community and political timing expectations (even if unrealistic), whereas the private sector is more driven by value which allows time to sometimes be varied.

Table 3 Mean ratings for each sector

Factor	Mean rating (All sectors)	Mean rating (Private)	Mean rating (Public)	Mean rating (GOC)
<i>Culture</i>	5	5	5	5
<i>Process</i>	4.33	4.4	4.4	4.25
<i>Knowledge of the business</i>	4.44	4.4	4.6	4.25
<i>Knowledge of the work</i>	4.38	4.5	4.25	4.5
<i>Education</i>	3.89	4.2	3.8	4
<i>Experience</i>	4.22	4.2	4.2	4.25
<i>Risk awareness</i>	3.89	3.6	3.8	4
<i>Governance</i>	4.22	4	4.4	4

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<i>Selection of players</i>	4.44	4	4.2	4.75
<i>Preconceptions</i>	3.33	3.2	3.6	3
<i>Time pressures</i>	3.78	3.2	3.4	4.25

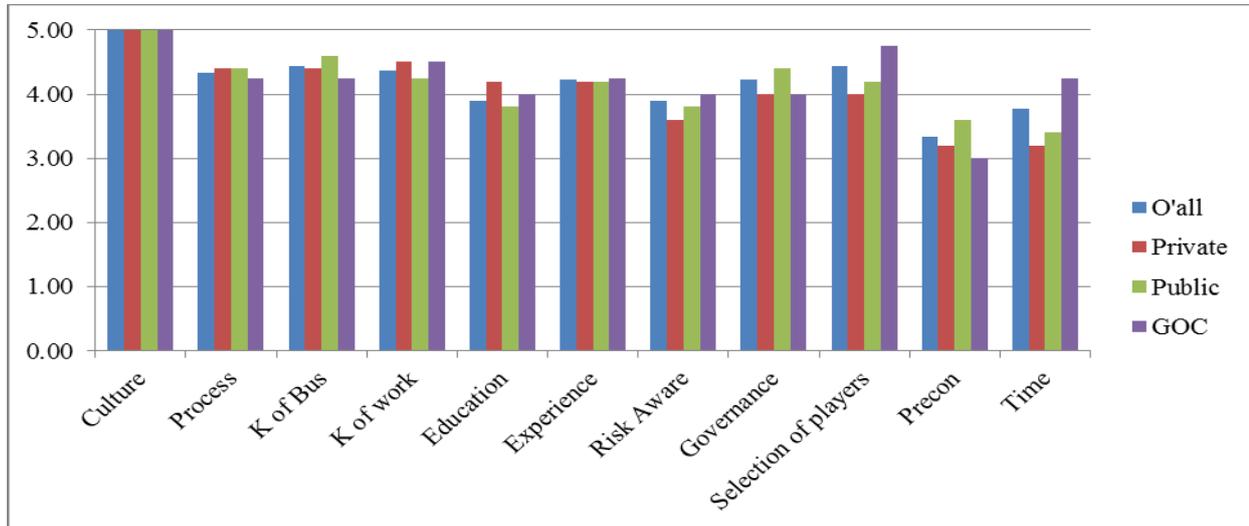


Figure 3 Mean ratings for each sector

The data was analysed further in order to discover any causation factors. This included analysis of the mean importance factors for experience (< 26 years and > 26 years), and by ranking of the factors for importance across the sectors. While there are some small variances for the factors, the overall mean rating for the (< 26 years) group was 4.15 and for the (>26 years) group, 4.20. The results were further investigated for any correlation between the experience groups and sector, and none was found. This indicates that there is no significance of experience to the findings. However, the participants are all experienced practitioners.

5. Discussion

Best practice in project portfolio selection

Based upon the literature review and findings, there does not appear to be one best practice but rather a range of practices that can be utilised and adapted appropriate to the context and the organisation. Two exceptions were two participants (economist backgrounds) who have developed and guided the use of project portfolio selection for large scale public sector projects. They made reference to the Australian Transport Council Guidelines and the Queensland Government Project Assurance Framework as representing possible best practice. However, their comments on the application of these practices, particularly in the public sector, supports the broader view that there is no one best practice.

This is consistent with the findings of DeMaio et al (1994, 184) on project selection methods: "there is no optimal method: techniques must be evaluated and chosen according to the specific application; moreover, these methods should not be considered mutually exclusive but rather as complimentary techniques".

The participants generally considered that the practices they followed were appropriate to the organisations, the organisational and individual maturity, and the context of the candidate projects and programs. However, they acknowledged that there are other practices, tools and techniques that could be used, and that these may be considered in the future or in different contexts. Therefore, there is a difference between current and what could be regarded as best practice.

Some may regard the PMI Portfolio Standard as representing best practice. However, the Third edition of this (Project Management Institute 2013), does not use the term 'best practice'. Section 1.1 of the document states: "...Third Edition identifies portfolio management processes generally recognised as good practices. "Good practice" means there is general agreement that the application of the skills, tools, and techniques can enhance the changes of success over a wide

range of portfolios. Good practice does not mean the knowledge described should always be applied uniformly to all portfolios; the organisation and portfolio manager are responsible for determining what is appropriate for any given portfolio.”

The view of the participants as to what is best practice is framed by their knowledge and experiences, as well as the practices of the organisations they have worked in. Only two of the participants have had exposure to what some may regard as ‘best’ or ‘good’ practice and their view of what is best practice aligned with such practices and frameworks. However, the other seven participants had a view of best practice that is less sophisticated and less inclusive (in range of criteria and methods) than the other two. Therefore, with some exceptions, there appears to be a gap between current and best practice.

Contributing factors

The contributing factors were analysed in relation to the three industry sectors represented by the participants namely, private, public and government owned corporations. Seven of the nine participants believed that there is a difference in the ratings for other sectors.

The analysis of the ratings indicated that for most of the factors, particularly for the more important ones, there was very little difference between the sectors. However, the sample size was very small.

Even though all eleven factors are significant, there is a strong interrelationship between them. These interrelationships are mapped in Figure 4.

Contributors to project portfolio selection such as: the development and use of processes and frameworks; the application of governance practices; the provision of effective sponsorship; the development and socialisation of organisational knowledge; the selection of people with the experience, education and behaviours; support and development of these players; the support for participation and collaboration; and appropriate pacing are all dependent upon the culture of the organisation.

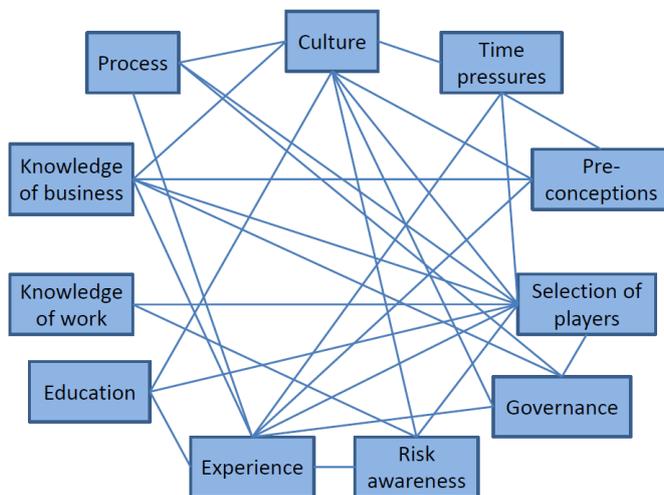


Figure 4 Contributing factors mapping

Similarly, leadership by senior management, executives and key decision makers is needed to provide the environment within which people are encouraged, and not afraid, to: participate in decision making processes; enter into positive ‘quick’ conflict; utilise their intuition to draw on tacit knowledge; collaborate and socialise knowledge; effectively communicate; apply pace rather than react to urgency with speed. Effective leadership will also support: selection of the right players who possess the desired knowledge, experience and people skills; an increased awareness of project, program and organisational level risks and appropriate application of risk and opportunity management techniques; the appropriate use of processes and frameworks for project portfolio selection; the appropriate application of governance; and enhance the performance and happiness of people.

From the strong interrelationship between these factors and the underlying determinants of the organisation and people in the adoption and application of any project portfolio selection framework, and the effective utilisation of both rational analysis (explicit knowledge of the organisational and individual) and intuition (individual tacit knowledge) in this level of decision making, the eleven contributing factors can be consolidated into two underlying driving factors of: (1) organisational culture; and (2) leadership.

The identification of these two underlying drivers is consistent with the findings of Human Synergistics International Ltd in their work on organisations, where their conclusion is that leadership drives culture, culture drives leadership, and they both drive performance (McCarthy 2011). This is represented in Figure 5.

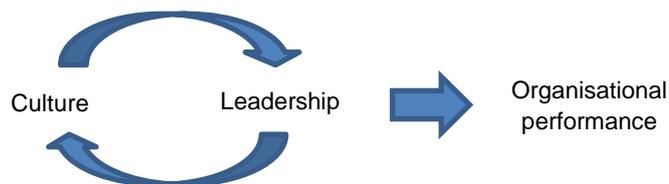


Figure 5 The culture leadership loop (adapted from McCarthy, 2011)

There is a strong connection between project portfolio selection and strategic decision making. The identified contributing factors are appropriate to this level of decision making where there is more ambiguity and equivocality (Zack 2007). However, more routine decision making does not have the same amount of rigour and comparatively lessor consequences for the organisation. This type of decision making is more likely to be influenced by the factors associated with behavioural economics such as: risk aversion; loss aversion; mental accounting; hyperbolic accounting; and anchoring (Reeson and Dunstall 2009).

6. Conclusions

Conclusions on research

The aims of the research project were to: (1) study the gap between current practice and best practice in relation to the selection, analysis, prioritisation and balancing of project portfolios; and (2) identify the common contributors to the application of appropriate project selection practices and decision making, by managers and organisations, in order to achieve optimal project portfolio selection.

Conclusion 1

There is no single recognised best practice in project portfolio selection, as it needs to match the culture of the organisation, its environment, the context of the projects, the programs and its players. However, there is a gap between the current practice of practitioners and organisations, and what would be regarded as appropriate good practice for the organisation.

Conclusion 2

Eleven contributing factors to optimal project portfolio selection were identified and found to be significant: (1) culture; (2) process; (3) knowledge of the business; (4) knowledge of the work; (5) education; (6) experience; (7) governance; (8) risk awareness; (9) selection of players; (10) preconceptions; and (11) time pressures. These factors are significant for all three studied industry sectors of private, public and government owned corporations.

Conclusion 3

There is difference in the relative importance of these factors for the three industry sectors (private, public and government owned corporations). Based upon the survey, this was less significant for the more important factors of culture, selection of players, knowledge of the work, knowledge of the business, process and experience but the reliability of this part of the conclusion is limited by the small sample.

Conclusion 4

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There are different contributing factors for routine (minor) decision making, and strategic level decision making which is associated with project portfolio selection. There is a strong connection between project portfolio selection and the strategic level of decision making, and therefore the associated contributing factors to optimal decision making. These factors do not apply to more routine decision making where the frequency is greater but the consequences much less.

Limitations of research

The most significant limitation of this research project was the number of participants in the quantitative phase of the analysis. This does not affect the reliability of Conclusions 1 and 2.

This research has been limited to investment type projects.

Future research

Opportunities for further research include: (1) extended quantitative research into the relative of importance of the contributing factors for each industry sector, utilising a larger sample size; (2) study into the differences between strategic and routine decision making; and (3) study into the contributing factors for bidding and other types of strategic level decision making involving selection of options.

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