Insights of project managers into the problems in project management

Peter Vincent Livesey

University of Technology Sydney, Australia

Abstract

A Delphi study using project managers who had managed projects in excess of $500 million was used to confirm the significance and frequency of problems resulting from the nature of projects. Using the results obtained from the Delphi study a ranking of the problems experienced in these projects was obtained by calculating a Relative Importance Index. Additionally, the Delphi panel members were asked their views concerning the need for traditional project management skills (hard skills) and team management skills (soft skills) as project size increased from below $50 million to over $500 million. A substantial increase in the need for both skills was indicated with the increase in the need for soft skills being the most significant.

Keywords: Project management, Delphi study, project managers.

Paper type: Viewpoint

Introduction

A common definition of a project is "a temporary endeavour undertaken to create a unique product, service or result" (Project Management Project Management Institute (2013)). An alternative definition is "a set of diversely skilled people working together on a complex task over a limited time period" (Goodman and Goodman 1976, p.494). This latter definition has the advantage of emphasising that a team of individuals is involved in the joint endeavour. In addition to their temporary nature project teams are often geographically dispersed with teams involved in the design, management, procurement and construction functions in different locations. Furthermore, suppliers of key components are also often located in different countries or continents. This geographic dispersion can introduce its own problems.

The objective of this research was to deal with the process problems in project management rather than the outcomes such as cost and time overruns. To achieve this objective, it draws on the practical experience of project managers to confirm the magnitude and frequency of the project management problems identified from a consideration of the nature of projects, and to establish if the need for the various skill-sets changes with project size.

A literature review was therefore conducted with the aim of identifying the problems in project management literature that considered the nature of projects, i.e. their temporariness and potential geographic dispersion. The problems identified were then put to a panel consisting of project managers, for verification. The panel included project managers, 90% of whom had managed projects in the mining and infrastructure industries in excess of $1.0 billion and all of

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Corresponding author: Peter Vincent Livesey; Email - petervincent.livesey@student.uts.edu.au

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whom had managed projects over $0.5 billion. Projects in the mining and infrastructure industries over $1 billion in size are generally regarded as Mega projects (Flyvbjerg, 2014).

As indicated in the second definition above, projects involve a joint endeavour of people, and managing people involves a set of soft skills different from those more technical project management skills often referred to as PMBoK type skills (Bourne and Walker, 2004; Du, Johnson and Keil, 2004; Gonzalez, 2012; Pant and Baroudi, 2008; Thomas, George and Henning, 2012). The Delphi panel was also asked if, in their opinion, the need for these types of skills varied as project size increased.

Literature review

The need to recognise projects as temporary organisations was discussed by Packendorff (1995) and Lundin and Söderholm (1995). Turner and Müller (2003) also reviewed the nature of projects as a temporary organisation and found that this nature resulted in them being unique, having a high degree of uncertainty and requiring considerable flexibility by the project team having to deal with the various problems as they arose. They also identified that the requirement to progress the project in a specific timeframe would inevitably result in conflict with the various stakeholders and that these have to be resolved quickly in order for the project to move forward.

The uncertainty in projects is emphasised by Anantatmula (2010) who states "It is reasonable to assume that in project management, it is not if the plans will change, it is what will change, when, and by how much" (Anantatmula, 2010, p.19). This view is echoed by Sankaran and Agarwal (2013, p.6) who make the point "No two projects are identical. This implies that there is variability as well as variety in projects". Yeo (1993) also identified problems in project decision-making caused by the degree of uncertainty and ambiguity resulting from a lack of experience associated with the particular project's problems. Such problems can be due to organisational politics and/or the lack of relevant competencies to deal with the problems in the project team.

Druskat and Druskat (2012) argue that projects are: unique, temporary, progressively developed and involve team members who may come from different organisations, disciplines, cultures and remain together for a relatively short time. The authors suggest that the time element results in projects having a high degree of ambiguity, change, misunderstandings and miscommunications. The authors argue that these characteristics result in a need for rapid development of trust and that this need is increased when the background of the various stakeholder groups is considered. The importance of trust in contracting, particularly where contextual trust is prevalent, was also discussed by Winch (2010, p.96).

The impact of the uncertain and temporary nature of projects on the need to build trust was also a major finding in a study by Vierimaa (2013). Pryke and Smyth (2006) emphasised that the temporary nature of projects results in work being performed by team members who may or may not have worked together before and have different cultures, goals, beliefs and professional backgrounds. In a recent review Tyssen, Wald and Spieth (2013) identified the characteristics of temporary organisations presented in Table 1.

Hanisch and Wald (2014) considered the effect of complexity on temporary organisations by simplifying the Geraldi, Maylor and Williams (2011) model from five dimensions down to three. This model is summarised in Table 2.

The impact of geographic location on the nature of projects

As discussed, the different geographical locations of the teams involved in design, management, procurement and construction introduce additional problems in managing projects. Verburg, Bosch-Sijtsema and Vartiainen (2013) concluded that with geographically dispersed projects human factors were important. These factors included:

- Project management style and competence
- Clarity of communication,
- Organisational support and
- The ability to develop trust.

Similar findings have been made by among others (Cramton and Webber, 2005; Hertel, Geister and Konradt, 2005; Lee-Kelley and Sankey, 2008; MacGregor, 2005; Montoya et al., 2009).

Table 1: Characteristics of temporary organisations developed from Tyssen, Wald and Spieth (2013)

Characteristic	**Potential consequences/challenges**
Temporariness	Hampers development of positive relations (i.e. trust) and shared values/norms. Little or no experience of working with team members.
Missing/ambiguous hierarchies	Team members also report to line function manager, potential "authority gap" of the project leader. Inter-divisional and hierarchical collaboration hamper the team building processes. Team has to develop its own culture
Changing work teams	Frequent changes allow for less time for beneficial group processes. Difficulties in developing group cohesiveness and commitment. Loss of trust previously developed between team members.
Heterogeneity of members	Coordination and communication across disciplinary boundaries may be difficult. Individual knowledge not sufficient. Limited recourse on experiences and routines. Different professional backgrounds and cultures. Competition for team members' time from other projects.
Unique project-outcome	Higher uncertainty and risk involved, creativity and autonomous decision making required. Unable to fall back on past experience, novel approaches often required. Coordination of professionals with different backgrounds.

Table 2: Effect of complexity on temporary organisations

Dimension	**Region of influence**	**Resulting needs and impacts**
Structural complexity including socio-political complexity.	Related to the number of project teams and stakeholders involved in the project.	Need for greater co-ordination and impacts on the development of trust, group norms and knowledge transfer.
Task complexity (including uncertainty).	Relates to the uniqueness of the task involved in the project.	Results in a high need for coordination requiring the sharing of information and the processing of knowledge.
Temporal complexity/dynamics (including pace).	Considers the interdependence of tasks, and the rate the task must be accomplished together with the possible changes in the task and team members.	Results in a high need for coordination requiring the sharing of information and the processing of knowledge.

Summary of the problems resulting from the nature of projects

If the above works concerning the nature of projects are combined, the following resultant project characteristics can be identified:

1. Limited time duration for building a team, developing rapport with stakeholders, obtaining organisational support and building a working control system.
2. The temporary nature of the project team formed within time constraints results in the need to blend team members from different professional and social backgrounds, and understand and develop relationships with stakeholders who are also from different backgrounds. All of whom may be in different geographic locations.
3. The unique nature of the project requiring a solution in a condensed time frame puts pressure on the team to understand a particular project's requirements.
4. The frequent lack of definition, often due to time constraints, results in considerable ambiguity and changes to scope coupled with changes to team membership. This problem can be exacerbated by changes in the external environment.
5. Team structure and stakeholder organisation may change as the project progresses due to a variety of forces including: pressure from competing projects, identification of additional or redundant skill sets and natural attrition. All resulting issues must be solved within the given timeframe for the particular project.
6. Conflict results from communication problems, scope and personnel changes.

Research method

The original promoters of the Delphi technique (Dalkey and Helmer, 1963, p.458) defined the method as "a method used to obtain the most reliable consensus of opinion of a group of experts by a series of intensive questionnaires interspaced with controlled feedback". It, therefore, uses as its basis the assumption that a group opinion is superior to an individual opinion. The Delphi technique is described by Linstone and Turoff (1979). Its use as a research tool is discussed by Skulmoski, Hartman and Krahn (2007), its accuracy by Parente et al. (1984) and construction of the survey by Fink (2009). A comprehensive review of its history, alternative approaches, strengths and weaknesses is provided by Keeney, McKenna and Hasson (2010). It should be remembered that achieving consensus does not mean that the correct answers has been found, and should not be regarded as a replacement for a rigorous review of published literature or for original research.

A pilot Delphi study was based on the problems identified in the literature review. Results from this pilot study were used to develop an E-Delphi (SurveyMonkey). Selection of the panel was based on the following criteria:

Over twenty years of experience in the management of mining and infrastructure projects greater in size than $0.5 billion. In practice, 90% of the panel members had managed projects in excess of $1 billion. Participants had worked on projects acting either for the client or for contractors. The type of contract, EPCM, Lump, etc. on which the potential panel member had worked was not used as a selection criteria.

The above criteria resulted in the selection of a panel size of 25 members of which 22 responded to the issues raised in this study. The study was limited to 6 rounds to ensure maximum panel participation. To ensure anonymity the panel members were unaware of the identity of the other panel members or the author of any of the comments received during the course of the study.

The first question put to the panel was the study members' views on the importance of soft skills and PMBoK skills as the project size increased. The size selected for analysis was <$50 million, >$50 million and <$500 million and >$500 million. These size selections were based on the author's experience of the changes in the nature of the team work required for management as

size changed[i]. The panel was given the opportunity to comment and no adverse comments were received concerning these size selections.

The second set of questions was based on the literature review and asked the panel members to indicate their views on the impact of the following issues:

1. The limited time frame (i.e. having a set time period to achieve a set of defined objectives) of a project causes problems resulting from a need to quickly achieve the following:
    a. Build a cohesive team.
    b. Build trust within the team.
    c. Develop rapport with stakeholders.
    d. Develop a working control system.
    e. Obtain organisational support.
2. Team members' diverse backgrounds (ethnic and experiential) and locations (e.g. concept design in Australia, detailed design in India, manufacturing in China, procurement run from Brisbane and a construction site in remote Australia) causes problems for team member management as a result of differences in:
    a. Team members' personal goals and resultant personal agendas.
    b. Team members' cultural backgrounds.
    c. Team members' professional backgrounds.
    d. Team members' communication needs.
    e. Team members' different geographic locations.
    f. Team members' native language differences.
3. The diverse stakeholders' backgrounds and locations causes problems for stakeholder management as a result of differences in:
    a. Stakeholders' personal goals and resultant personal agendas.
    b. Stakeholders 'cultural backgrounds.
    c. Stakeholders' professional backgrounds.
    d. Stakeholders' communication needs.
    e. Stakeholders' different geographic locations.
    f. Stakeholders' native language differences
4. The unique nature of each project (e.g. moving from a rail car project to a desalination plant and then to a tunnel project. Alternatively, the different problems encountered on technically similar projects such as different special interest groups creating their own unique problems) results in the following problems:
    a. Understanding the issues involved in the particular project.
    b. Managing internal stakeholder expectations.
    c. Managing external stakeholder expectations.
    d. The belief that you and the project team can solve the project's problems.
5. Ambiguity and change arising from:
    a. Lack of a clearly defined project scope.
    b. Scope changes as the project progresses.
    c. Lack of information to make a fully informed decision.
    d. Team member changes.
    e. Unexpected and unforeseen events (e.g. subcontractor goes bankrupt).
    f. Changes in the external environment (legislative, economic).
6. Changes in project team and stakeholder personnel resulting in:
    a. Loss of a cohesive team
    b. Loss of trust between team members.

c. Loss of relationships with key stakeholders.

7. The conflicts (the disagreements that arise prior to a formal dispute) that arise during a project and their impact:
   a. Those arising internally to the team.
   b. Those arising externally to the team but internally to the parent organisation.
   c. Those arising with subcontractors.
   d. Those arising with other stakeholders

Whilst it is accepted that team members are, by definition, also stakeholders, it was decided to analyse them as a subset of stakeholders on the grounds that they have different motivations and relationships with the project manager than other stakeholders. For example, it is possible to remove a disgruntled member of the team from a project but a disgruntled stakeholder, who is not a team member, has to be dealt with on a continuing basis.

The panel members were given the opportunity to comment on the selection of questions for review and no comments challenging their inclusion was received. The panel members were also asked to express their opinion on the above questions using a five-point Likert-type scale (Likert, 1932) consisting of: very significant, significant, neutral, little significance, insignificant. In ranking the panel members' responses based on the Likert scale, the Relative Importance Index, as reviewed by Holt (2013) and also used in construction projects by other researchers (Gündüz, Nielsen and Özdemir, 2012; Kometa, Olomolaiye and Harris, 1994; Sambasivan and Soon, 2007), was used. The Relative Importance Index is based on the following formula:

$$Relative\ Importance\ Index = \frac{Sum\ of\ the\ scores\ given\ to\ the\ problem\ by\ panel\ respondents}{The\ maximum\ score\ that\ a\ problem\ could\ have\ received}$$

The panel members were also asked to indicate their view on the frequency of the occurrence of the problems on projects they had managed. The mean frequency of the occurrence of each problem was calculated by assuming the data in each frequency interval was uniformly distributed across the frequency interval. As a result the mid-point of the frequency intervals could be used in estimating the mean. The frequency intervals that were given to the panel and resultant interval midpoints used are presented in Table 3.

Table 3: Frequency intervals and associated mid-points

Frequency interval	Interval midpoint
Very frequent occurrence (>90%)	95.0%
Frequent occurrence (<90% but >75%)	82.5%
Average occurrence (25% but <75%)	50.0%
Infrequent occurrence (<25% but >10%)	17.5%
Seldom occurrence (<10%)	5.0%

The mean frequency (MF) was then calculated using the following formula:

$$MF = \frac{Sum\ of\ results\ in\ each\ frequency\ interval\ X\ the\ interval\ mid-point}{The\ number\ of\ data\ points}$$

The panel members' demographics are summarised in Table 4 (note 15% of panel members chose not to respond to the demographic questions). Allowing for some overlap the minimum total number of projects managed by panel members was 50.

Table 4: Delphi panel members' demographics

Aspect	Percentage
Project involvement working for contractors	34%
Project involvement working for clients	37%
Project involvement working for consultants	29%
Degree qualified	91%
Certified in project management (all certified members were also degree qualified).	19%
Over 60 year of age	50%
50-60 years of age	40%
40-50 years of age	10%
Male	95%

Results and analysis

The relative importance of PMBoK and team management skills

The panel was asked to rate the relative importance of PMBoK skills and team management skills for various sizes of projects. The results are summarised in Figure 1. As can be seen in Figure 1 the percentage allocated to important and very important by the panel changes from 86% for projects less than $50 million to 100% for projects greater than $500 million. If only the percentage allocated to very important is considered, then the change is more significant. In this case, for projects greater than $500 million in size, 95% of the panel members rated team management skills as very important as opposed to 32% for projects less than $50 million.

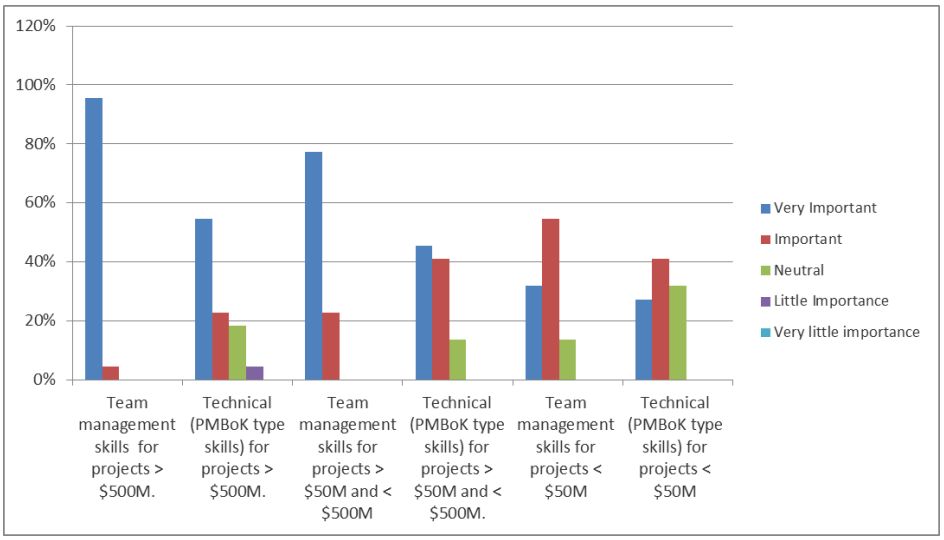

Figure 1: Panel members' views of the relative importance of team management skills and PMBoK type skills as project size increases.

In the case of PMBoK type skills, when important and very important are considered for projects in the same size range, the respective results were 77% for projects greater than $500 million and 68% for projects less than $50 million. If only the percentage allocated to very important is used, then for project less than $50 million a result of 27% was obtained and for project sizes greater than $500 million this percentage increased to 55%.

From the above results, it is obvious that the consensus view of the of panel members is that the need for both PMBoK skills and team management skills increases with project size. The increase in team management skills is significantly more than that of PMBoK skills. However,

for every size of project the need for team management skills is greater than the need for PMBoK skills. The change in the skill set needed is summarised in one of the respondent's comments.

> *With the different projects, the problems or specific skills are different. There is a need to learn. As an Engineer, the approach is to technically understand and solve. In a project leadership role, it is not possible to lead by doing and so using the skills, know-how and energies within the team is key - Respondent 1.*

The Delphi panel's view concerning the increased need for PMBoK type skills as project size increases confirms the work of other researchers (Gowan Jr. and Mathieu, 2005; Papke-Shields, Beise and Quan, 2010) who concluded that larger more complex projects were more likely to use more comprehensive control systems. This increased use is presumably because the managers of such projects rated the need for them as more important.

Panel members' view of the problems resulting from the unique nature of projects identified in the literature

The respondents' answers to the questions concerning the problems in project management were used to calculate their importance index and the results are presented in Table 6. The highest-ranking hard skill, development of a working control system, ranked thirteenth. When the twelve issues ranking higher than that of development of a working control system are considered, two out of the top three places were taken by problems relating to scope change with building a cohesive team being an equal second. Of the remaining nine issues, four relate to stakeholder management, four to team management and one to understanding the particular needs of a project.

When all 34 problems areas reported in Table 5 are analysed 64% of the question categories are found to relate to team management or stakeholder management. Based on this percentage (i.e. 64%) the expected number of problems in these categories ranked in the top 13 items of the Relative Importance Index would be 8 rather than 10. The Chi-Squared value with 1 degree of freedom for this result was 0.861 and the two-tailed p-value was 0.354, indicating that the difference between expected and actual results are not statistically significant.

To test the significance of the rankings of the top 11 items in the Relative Importance Index (there being a tie for 10th place) a Friedman test was performed. The results were: χ^2 (2) = 15.572 and p = 0.113. Based on this the null hypothesis was accepted leading to the conclusion that the order of the top 11 problems is not statically significant.

However, when the 11th ranked problem is compared to 24th ranked problem (11th from the bottom) using a Wilcoxon test a p-value of 0.036 is obtained leading to the rejection of the null hypothesis and to the conclusion that there is a statistically significant difference between the problems ranked in the top 11 items as compared to those problems ranked in the bottom 11 items. To establish the panels' overall view of the significance of the problems Table 5 was used.

Table 5: Significance ratings resulting from the relative importance index result.

Relative importance range	Result problem rating
0.8 to 1.0	Very significant
0.6 to < 0.8	Significant
0.4 to < 0.6	Neutral
0.2t o < 0.4	Little significance
0.0 to < 0.2	Very little significance

Table 6, concerning the Relative Importance Index, indicates that the top 10 problems were ranked as very significant. Indeed, it not until the 18th problem that a rating below very significant (and then by 0.01) is given. Based on these figures the panel has confirmed the

importance of the problems in project management identified from the review of the nature of projects.

Significant comments received from the panel concerning the top five items by Relative Importance Index were as below.

Firstly, with respect to change:

> *Change is the killer on most major projects. There is a lack of appetite and the mechanisms for change are heavy and readily exploited. I rank "change" as the biggest problem for project delivery. Change to correct technical specification issues, external factors, concessions, options. Usually small in comparison to the contract scope, but they consume us, creating frustration and mistrust. Often the change results from conflicting requirements; client preferential engineering. Contracts with high levels of risk transfer to the contractor increases ambiguity. - Respondent 2.*

Secondly, with respect to team building:

> *Trust and building a cohesive team is strongly influenced by the PMs freedom and ability to secure and empower team members. Often organizational factors, beyond the project have great influence. Also, project health engenders these qualities, but is quick to falter when times get tough. - Respondent 3.*

> *The question leans towards stakeholders being remote or with different cultural or languages. In the absence of good (and open) stakeholder management frameworks, these factors would be very significant. But by recognizing the need for effective management to build a bridge for engagement to overcome the remoteness, culture and language factors these factors can be much reduced. So for me the issue is not location, culture or language, but taking the time to recognize the need to actively manage and keep managing these relationships. It takes time to build relationships and that must be factored into project planning, together with demonstration of respect, collaboration and a less transactional approach. - Respondent 4.*

In addition, with respect to stakeholder management and communication:

> *The issues arise from poor facilitation and communication skills of those charged with the stakeholder management. The deeper communication issue is poor skills in seeking the real "agenda" or needs of stakeholders. Professional background issues are prevalent when Clients are investing in a sector they aren't familiar with and don't listen to their advisors. - Respondent 5.*

While only ranking 16th by Relative Importance Index the subject of team geographic locations was the subject of several comments, two of these comments are provided below. It is interesting to note that whilst these comments are primarily dealing with the problem of geographic locations they also emphasised the need for good communication:

> *The problems often arise due to mistaken belief that you can disaggregate the project and the people. I don't see it as cultural per se the designers and construction staff need to intermingle due to the close inseparable link between design and construction and need for both to feed off each other. Two separate teams means two separate project objectives and two different team cultures. A recipe for disaster. - Respondent 6*

> *People have a tendency to build teams within their own location, even their own floor or area in the office. Active effort is needed to bring the wider group together - Project culture, values and strong group communications. Local culture (e.g. different countries) and also different disciplines have cultural resistance. An example is the construction site office which becomes its own project, isolated from the wider project and project goals. - Respondent 7.*

Table 6: Relative Importance Index

Problem area	Relative importance index
Lack of a clearly defined project scope	0.93
Scope changes as the project progresses	0.92
Building a cohesive team	0.92
Loss of relationships with key stakeholders	0.90
Team members' communication needs	0.90
Understanding the issues involved in the particular project	0.88
Loss of trust between team members resulting from team changes	0.88
Stakeholders' personal goals and resultant personal agendas	0.87
Building trust within the team	0.85
Loss of a cohesive team	0.85
Developing rapport with stakeholders	0.85
Stakeholders' communication needs	0.83
Developing a working control system	0.82
Conflicts arising with other stakeholders	0.81
Obtaining organisational support	0.81
Team members' different geographic locations	0.81
Team member changes	0.80
Unexpected and unforeseen events (e.g. subcontractor goes bankrupt)	0.80
Managing external stakeholders' expectations	0.79
Belief that you and the project team can solve the project's problems	0.79
Conflicts arising with subcontractors	0.78
Lack of information to make a fully informed decision	0.77
Changes in the external environment (legislative, economic)	0.77
Managing internal stakeholders' expectations	0.76
Conflicts arising internal to the team	0.74
Conflicts arising external to the team but internal to the parent organisation	0.73
Team members' cultural backgrounds	0.72
Team members' personal goals and resultant personal agendas	0.70
Stakeholders' professional backgrounds	0.69
Stakeholders' different geographic locations	0.69
Team members' native language differences	0.67
Team members' professional backgrounds	0.65
Stakeholders' cultural backgrounds	0.65
Stakeholders' native language differences	0.59

Table 7 presents the mean frequency results. These results should be treated with caution, and rather than regarding the mean frequency of the problems as definitive, particularly those having a mean frequency below 75% (i.e. average occurrence), they should rather be regarded as establishing that in the panel's collective experience, all of the problems have a reasonable chance of occurring in any given project.

An interesting problem occurring in the top 5 results by mean frequency was that of "Belief that you and the project team can solve the project's problems" and its Relative Importance Index result of 0.79, placing it in the significant category. The high significance and frequency given to this issue would point to the need for the project manager to have considerable self-confidence (in order to overcome his own self-doubts) and inspirational skills in order to pass that belief on to team members so that they in turn can overcome their doubts.

Table 7: Problem areas by mean frequency

Problem area	Mean frequency	Problem frequency rating
Team members' communication needs	79%	Frequent Occurrence
Stakeholders" goals and resultant agendas	78%	Frequent Occurrence
Understanding the issues involved in the particular project	74%	Average Occurrence
Scope changes as the project progresses	73%	Average Occurrence
Belief that you and the project team can solve the project's problems	72%	Average Occurrence
Team members' different geographic locations	72%	Average Occurrence
Team member changes	71%	Average Occurrence
Building a cohesive team	71%	Average Occurrence
Develop rapport with stakeholders	71%	Average Occurrence
Managing external stakeholders' expectations	70%	Average Occurrence
Those arising with subcontractors	69%	Average Occurrence
Stakeholders' communication needs	69%	Average Occurrence
Lack of a clearly defined project scope	68%	Average Occurrence
Lack of information to make a fully informed decision	65%	Average Occurrence
Building trust within the team	64%	Average Occurrence
Managing internal stakeholders' expectations	61%	Average Occurrence
Develop a working control system	58%	Average Occurrence
Team members' personal goals and resultant personal agendas	57%	Average Occurrence
Obtain organisational support	56%	Average Occurrence
Stakeholders' different geographic locations	56%	Average Occurrence
Team members' cultural backgrounds	53%	Average Occurrence
Those arising with other stakeholders	52%	Average Occurrence
Stakeholders' cultural backgrounds	52%	Average Occurrence
Team members' professional backgrounds	51%	Average Occurrence
Team members' native language differences	47%	Average Occurrence
Loss of a cohesive team	46%	Average Occurrence
Stakeholders' professional backgrounds	45%	Average Occurrence
Stakeholders' native language differences	45%	Average Occurrence
Unexpected and unforeseen events	44%	Average Occurrence
Conflicts arising externally to the team but internally to the parent organisation	40%	Average Occurrence
Conflicts arising internally to the team	39%	Average Occurrence
Loss of trust between team members	36%	Average Occurrence
Loss of relationship with key stakeholders	35%	Average Occurrence
Changes in the external environment (legislative, economic)	29%	Average Occurrence

To reach a better understanding of the impact of the importance of a problem, coupled with its frequency, a Significance Index was used. The index was calculated in a similar manner to Assaf and Al-Hejji (2006) with the mean frequency being used to replace the authors' frequency index. The formula for the Significance Index thus becomes:

Item's Significance Index = Item's mean frequency X Item's Relative Importance Ranking

Table 8 compares results for top ten problems by Significance Index, rating the results of the same problems obtained using the Relative Importance Index

Table 8: Comparison of top significance index problems with their position using the relative importance index

Problem ranking	Problem area	Significance index	Retaliative importance index ranking
1	Team members' communication needs.	0.71	5
2	Stakeholders" goals and resultant agendas.	0.68	12
3	Scope changes as the project progresses.	0.67	2
4	Building a cohesive team	0.65	3
5	Lack of a clearly defined project scope.	0.63	1
6	Develop rapport with stakeholders.	0.61	9
7	Understanding the issues involved in the particular project.	0.59	6
8	Team members' differentgeographic locations.	0.58	14
9	Stakeholders' communication needs.	0.57	12
10	Team member changes.	0.56	14

As can be seen, when frequency is taken into account, the order of the top ten items in the Significance Index is different from that in the Relative Importance Index. The top five items in the Significant Index still contain 4 of the top five from the Relative Importance Index and in addition the top 10 items in the Significance Index are from the top 14 item in the Relative Importance Index. As has been discussed the exact order of items in the top 10 of the Relative Importance Index should not be regarded as statistically significant. It would appear therefore that adjusting for frequency does affect the ranking of the problems but not in any markedly significant way.

Conclusion

The results of the Delphi study show practising project managers regard the importance of team management skills (soft skills) and PMBoK skills (hard skills) increases as project size increases, and that the rise in the importance of the need for soft skills is more pronounced than the rise in the need for hard skills. All the problems were given a Relative Importance Index score which translates to significant or above (except the last item which fails by 0.01) In addition all the problems were rated by the panel as having at least an average likelihood of occurrence in any given project. Based on this, the importance of the problems in project management identified from a review of the nature of projects was regarded as having been confirmed by the panel. Additionally, but perhaps not surprisingly, the panel found the most significant problems in project management are associated with change resulting from lack of clarity in scope at the start of a project, or changes in scope as the project progresses.

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[i] The author has personally managed 3 projects over $0.5 billion in size and 2 projects over $ 1 billion. In the smaller type projects managers may effectively manage project on their own while for the larger projects there needs to be a high degree of devolution of decision making.