UNDERSTANDING PROJECT COST CONTINGENCY- A SURVEY

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ABSTRACT

Patrascu (1988) observed nearly two decades ago that "contingency is probably the most misunderstood, misinterpreted, and misapplied word in project execution." Since that time there has been little empirical research into project people's understanding of the concept of project cost contingency. This paper reports the results of a survey of 78 project practitioners' comprehension of issues pertaining to project cost contingency. Whilst there is consensus that cost contingency is a reserve of money which should be used for scope changes, a key finding is that there is a lack of appreciation that project cost contingency is a risk management notion. Consequently, the majority of practitioners (77%) continue to use a deterministic percentage approach for estimating project cost contingency. Furthermore, 46% of respondents work in organisations that do not have a policy on contingency and 36% do not manage the use of contingency. Overall, this suggests there is significant room for improvement in the understanding, estimation and management of project cost contingency.

Keywords: contingency, project risk management

INTRODUCTION

There are three basic types of contingencies in projects: tolerance in the specification; float in the schedule; and, money in the budget (CIRIA 1996). It is the latter – project cost contingency – that is the focus of the research reported in this paper.

The cost performance of building construction projects is a key success criterion for project sponsors. Projects require budgets to set the sponsor's financial commitment and provide the basis for cost control and measurement of cost performance. A key component of a project budget is cost contingency. Project cost contingency has been a part of projects and project management for at least fifty years (RICS 1948) and probably much longer. Most textbooks on project management and in particular project cost management invariably contain some reference to project cost contingency (eg PMI 2004). Despite the ubiquity of project cost contingency in the theory of project cost management, there has been little empirical research into project practitioners' understanding of the concept, its intended scope, methods of estimating or management.

Patrascu (1988) observed that "contingency is probably the most misunderstood, misinterpreted, and misapplied word in project execution. Contingency can and does mean different things to different people". It is important to investigate this understanding because contingency is a ubiquitous factor in projects and people's understanding of the concept will affect how contingency is managed.

RESEARCH DESIGN

A survey instrument was developed from the project cost contingency literature, containing open and closed questions.. The author presented a refereed conference paper on project cost contingency at a project management conference in Melbourne in August 2004. The conference participants attending the presentation were the research sample. Prior to the presentation of the paper the audience were requested to complete the questionnaire on project cost contingency and 78 responses were received and analysed.

Table 1 shows the demographic details for the research sample. Key observations are that construction/engineering and information technology industry industries represent 81% of the sample; both the private sector and private sector are well represented, and; project managers are predominant, representing 53% of the sample. This sample is considered appropriate because:

- respondents primarily come from two diverse project industries – construction/engineering and information technology - where experience of project cost contingency could be reasonably expected
- there is good representation from both the private and public sector
- The sample represents a range of project positions, particularly project managers, which one would reasonably expect to have some understanding and/or involvement in the application of project cost contingency.

Table 1. Sample: Industry, Sector, Position

Industry	Nr	%	Sector	Nr	%	Position	Nr	%
Construction/Engineering	33	42	Private	40	51	Project Manager	41	53
Information Technology	30	39	Public	17	22	Engineer	11	14
Finance	5	6	Both	21	27	IT Analyst/programmer	11	14
Others	10	13				Cost Engineer/QS	5	6
						Others	10	13
Total	78	100	Total	78	100	Total	78	100

RESULTS AND ANALYSIS

Project cost contingency - Concepts

An open question was set, “what is cost contingency”. Table 2 sets out the results.

Table 2. “What is cost contingency?”

Concepts	Nr	%
Provision/reserve/allowance	57	73
Unexpected/unforeseen	22	28
Risk	16	20
Unknown unknowns	13	17
Known unknowns	10	13
Underestimation	7	9
Undefined/insufficient scope	6	8
Cost overrun	6	8
Don’t know	5	6

[Note: concepts identified by two or less respondents not recorded; % does not total 100 as respondents stated more than one concept]

Reserve

The most strongly identified concept linked to project cost contingency is that it is a reserve of money (73% of respondents). This component is well acknowledged in the literature, where numerous definitions of project cost contingency refer to a reserve of money. For example, contingency has been defined as an amount of money added to the estimate to allow for changes that experience shows will likely be required (AACE 1992); and, a specific provision of money in an estimate for undefined items which statistical studies of historical data have shown will likely be required (Clark & Lorenzoni 1985). The strong support for the concept of project cost contingency being a reserve of money suggests it is widely accepted and perhaps the primary understanding for this concept.

Risk and Uncertainty

A range of concepts linked to risk and uncertainty were identified by the respondents:

- Unexpected/unforeseen - 28% of respondents identified the concept of project cost contingency being linked to factors that are uncertain. This perspective is well supported by the literature, which stated that contingency caters for events within the defined project scope that are unforeseen (Moselhi 1997, De Weaver 1997, Yeo 1990), unexpected (Mak et al 1998), or unidentified (Levine 1995)
- Risk - 20% of respondents used the word 'risk' when defining project cost contingency. This key aspect is also acknowledged in the literature (eg PMI 2004, Thompson & Perry 1992). Contingency has been described as an antidote to risk (Rosenau 1992).
- Unknowns - Respondents stated that project cost contingency catered for unknown unknowns (17%) and known unknowns (13%). These responses indicate a more sophisticated appreciation of the concept of project cost contingency. The literature proposes that contingency caters for two categories of types of unknowns - known unknowns and unknown unknowns (e.g. Carr 1989, Hillson 1999). Known unknowns are risks that have been identified, analysed, and it may be possible to plan for them (PMI 2004). Unknown unknowns cannot be managed, so project managers may address them by applying a general contingency (PMI 2004). So it is important to identify contingency associated with all significant individual risks (known unknowns), plus a residual allowance for other unidentified risks (Chapman 1994).

Specific Risks

Some respondents believe that concept of cost contingency caters for specific risks. Nine percent of respondents consider that contingency caters for underestimating or errors in estimating. However is generally advised that contingency should not to be used to avoid making an accurate assessment of expected costs (Lorance & Wendling 2001, Humphreys 1991). Furthermore, the responses set out later in this paper (Table 3) support this opposing view that errors in estimating are not within the scope of project cost contingency.

Nine percent of respondents considered that contingency caters for underestimation due to the incomplete scope definition at the time of estimating. This is strongly supported in the literature, which acknowledges that contingency caters for future

project definition so it is provided for this further increase in costs due to the present incomplete definition of the project. (e.g. Yeo 1990)

Effect

Eight percent (8%) of respondents defined project cost contingency in terms of the effects it is meant to cover for i.e. cost overruns. It may be implied that these respondents acknowledge that budgets invariably experience overruns and contingency is there to cater for these overruns. This perspective is overtly recognised in the literature in various ways, such as Mak & Picken's (2000) view that contingency should cater for contract variations; or the calculation of contingency based on a probabilistic level of cost overrun beyond a budget baseline typically derived through Monte Carlo simulation (eg Clark 2001, Wendling 2001).

In summary, the concept that project cost contingency is a reserve of money that should not be used for scope changes is well supported by the literature and the results from this research. Furthermore there is a strong consensus that contingency reflects a range of risk and uncertainty concepts. However it is worth emphasising that only 20% of responses used the word 'risk' in describing their understanding of the concept of project cost contingency. Risk is a key aspect of project cost contingency as evidenced by the *de facto* international standard for project management, *Project Management Body of Knowledge*, which defines cost contingency as a provision in the project management plan to mitigate cost risk (PMI 2004). This is a critical issue because perceiving contingency as a reflection of risk opens one's thinking to a deeper appreciation of the rationale for contingency and in particular approaches for its estimation. For example, a risk perspective could lead to consideration of quantitative risk analysis techniques to estimate project cost contingency, such as Monte Carlo simulation or artificial neural networks, rather than the deterministic percentage approaches commonly used (see later section Contingency – Calculation). A risk perspective leads to the realisation that contingency is just one risk management strategy that must be holistically considered in context with other risk strategies. For example, if a comprehensive range of risk strategies are put in place then this could reduce the amount of cost contingency required. Furthermore, the realisation that contingency is fundamentally created to deal with many risks may lead to a realisation that a non-risk perspective results in an inadequate contingency reserve. For example, the 18% of respondents that stated that contingency was for specific events (i.e. underestimation and undefined/insufficient scope) may widen their perspective if contingency was considered to be a risk management notion.

Contingency - Exclusions

The literature proposes that project cost contingency should not be expected to cater for all events that cause the cost of a project to increase. Respondents were asked to list any items that contingency should not be used to fund. Table 3 sets out the results.

Table 3. "List any items that contingency should not be used to fund"

Contingency Exclusions	Nr	%
Scope Change	43	55
Don't know	13	17
Estimating errors	10	13
Risks	10	13
Inflation/currency	6	8
Delay costs	5	6
Major risks	4	5
Transferred/Insured risks	3	4

[Note: concepts identified by two or less respondents not recorded; % does not total 100 as respondents stated more than one concept]

Table 3 clearly indicates strong consensus (55%) that contingency should not cater for scope changes i.e. what is now expected is materially different from what was previously reasonably expected (Healy 1997) This is strongly supported in the literature (Querns 1989, Moselhi 1997, De Weaver 1997, AACE 1992). Furthermore, it is commonly proposed that scope changes are accommodated by a project sponsor's own management reserve, sometimes referred to as client's contingency (HM Treasury 1993) or client-reserve (Rad 2002). So, contingency does not cater for scope changes but can cover for scope development i.e. scope remains constant even as the product characteristics are progressively elaborated (PMI 2004). This is reflected by the 8% of respondents in Table 1 who considered undefined scope to be catered for by contingency.

It is interesting to note that 17% of respondents could not suggest any item that contingency should not cater for. This is of some concern as it implies that a significant number of project people have limited understanding of the important concept of project cost contingency, or have never been required in their projects to reflect upon what contingency should include and exclude. This could lead to the inappropriate use of contingency, because any vagueness of what contingency is meant to cater for may tempt many to use it for other that it original intended purposes (Wideman 1992, Samid 1994).

Thirteen percent (13%) of respondents felt that contingency should not be expected to cater for human error in estimating. This is supported in the literature, which proposes contingency should not cater for human errors in estimating, due to negligence, unjustified conclusions from data, or miscaluations (e.g. Samid 1994; Rad 2002). The rationale is that poor estimating processes might be promoted if estimators know that their errors will be compensated by the use of contingency.

Thirteen percent (13%) of respondents felt that contingency should not be expected to cater for risks. This is of concern because it is now a well established principle in the project risk management literature that the key purpose of contingency is to cater for risks (e.g. Moselhi 1997, Yeo 1990, Thompson & Perry 1992). This suggests that a significant part of the project community does not appreciate that contingency is a risk management strategy and therefore does not apply risk management processes to its calculation and application.

Contingency - Calculation

Respondents were asked, 'is contingency typically calculated on a percentage basis?". Table 4sets out the results,

Table 4. "Is contingency typically calculated on a percentage basis?

Contingency – Calculation by %	Nr	%
Yes	59	77
No	16	21
Don't know	2	2
Total	78	100

Contingencies are often calculated as an across-the-board percentage addition on the base estimate, typically derived from intuition, past experience and historical data (Mak et al, 1998). Table 4 shows that the percentage approach is used by 77% of respondents, which is of concern because it has several critical weaknesses. It is considered an arbitrary method of contingency calculation that is difficult for the estimator to justify or defend (Yeo 1990, Newton 1992). Thompson & Perry (1992) claim that all too often risk is either ignored or dealt with in an arbitrary way and simply adding a percentage contingency onto the estimated cost of a project is typical. Furthermore, the percentage addition results in a single-figure prediction of estimated cost, which implies a degree of certainty that is not justified (Mak et al 1998). The percentage addition indicates the potential for downside risk and does not indicate any potential for cost saving opportunities and may therefore mask poor project management (Mak et al, 1998). It also does not encourage creativity in estimating practice, promoting a routine and mundane administrative approach requiring little investigation and decision making, which may propagate oversights (Yeo 1990, Mak et al 1998).

Contingency – Review

Respondents were asked, 'At project completion, is any review undertaken of the accuracy of project cost contingency". Table 5 sets out the results,

Table 5. "At project completion, is any review undertaken of the accuracy of project cost contingency?"

Contingency Review	Nr	%
Yes	28	36
No	48	62
Don't know	2	2
Total	78	100

Organisations need to review and continuously improve as part of their quality management processes. In order to improve the accuracy of the process of calculating project cost contingency – that is, the calculated contingency matches as closely a possible the actual costs incurred in a project for which contingency is meant to cater for - there is a need to undertake a post-project review. Therefore, it is disappointing that 62% of respondents state that they do not conduct reviews of the accuracy of project cost contingency at project completion. Without a review it is difficult to capture organisational knowledge that can lead to improved processes

Contingency – Policy & Management

Respondents were asked two linked questions, 'does your organisation have a formal policy for project cost contingency?"; and 'is project cost contingency formally managed throughout the project eg formally reported?" Table 6 sets out the results.

Table 6. "Does your organisation have a formal policy for project cost contingency?"; 'Is project cost contingency formally managed throughout the project eg formally reported?"

Contingency Policy	Nr	%	Contingency Management	Nr	%
Yes	38	49	Yes	46	59
No	36	46	No	28	36
Don't know	4	5	Don't know	4	5
Total	78	100	Total	78	100

As discussed previously (Tables 2 & 3), there is a range of understandings for the concept of project cost contingency. One way to ensure a consistent is to establish guidelines to define and control the scope, estimation and management of contingencies (Hamburger 1994, Avots 1989). Interestingly, 46% of respondents stated that their organisation does not have a formal policy for project cost contingency. This suggests there is a significant room for improvement in organisation's whole approach to project cost contingency.

Clearly it is good management practice that once a contingency reserve has been established, its use must be constantly monitored and controlled, and trends scrutinised and reassessed throughout the project life cycle (CIRIA 1996, Lorance 1992). The fact that 36% of respondents do not formally manage project cost contingency throughout the project highlights an area of poor management practice. Importantly, cost contingency must be used for their intended purpose and not incorrectly used for poor performance (Levine 1995). The responses suggest significant room for improvement in the management of project cost contingency.

CONCLUSION

The cost performance of building construction projects is a key success criterion for project sponsors. A key component of a project budget is cost contingency. Despite the ubiquity of project cost contingency in the theory of project management, there has been little empirical research into the concept of project cost contingency in particular project practitioners' understanding of the concept, its intended scope, methods of estimating contingency or the management process for contingency.

The research highlighted several shortcomings in the understanding of the concept of project cost contingency that can have significant repercussions for effective project management. Fundamentally, there seems to be absence of awareness that project cost contingency is a risk management concept. This perhaps explains the prevalence of a deterministic approach to estimating contingency, that is, an across-the-board percentage addition on the base estimate. An appreciation of risk aspect of contingency may encourage greater use of quantitative risk analysis techniques for its estimation. In fact, there a recent resurgence into researching cost contingency, (e.g. Mak et al 1998, Aibinu & Jagboro 2002, Williams 2003) may be a reflection of

growing interest in project risk management over the past decade and the realisation that cost contingency is in fact an important risk management notion.

This lack of sophistication in the estimation of project cost contingency by practitioners is reinforced by poor management practices in term of reviewing the accuracy of contingency and the limited existence of policy and good management practices. Overall, this suggests there is significant room for improvement in the understanding, estimation and management of project cost contingency.

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