# PROJECT COST OVERRUNS AND RISK MANAGEMENT

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The construction industry has a reputation for delivering projects over budget. This research identifies actual project examples illustrating the problem of cost overruns. Results of a questionnaire survey present perceptions of the main reasons why building construction projects sometimes exceed the initial budget estimate. The paper reviews how the construction industry is responding to the challenge of accurate budgeting. In the domain of facility capital cost budgets and risk management, two key conclusions are made. Firstly, that complete design information leads to more accurate budget estimates. Secondly, that client driven design change is the greatest risk. Clients are the key drivers of change and they must therefore take a look at themselves before blaming the industry for being inefficient.

Keywords: design changes, design information, cost overruns, risk management.

## INTRODUCTION

All too often construction projects make the national headlines for being financial disasters – rather than significant engineering achievements that contribute to the improvement of our built environment. In the mid-1990s a government investigation revealed that more than one quarter of construction schemes finished over their capital cost limit (HM Treasury, 1995). Further to this, a survey of construction industry clients found that nearly one third complained that their projects generally overran budget (Barrick, 1995). This problem continued through the latter part of the decade with the Construction Clients Forum (1997) reporting that sixty per cent of clients said that cost targets were not being met. At the start of this new decade only forty-five per cent of projects are being completed within budget (DETR, 2000a). The construction industry has therefore acquired a poor reputation for delivering facilities over budget. This research investigates the problem of construction project cost overruns.

## RESEARCH METHOD

Examples of actual construction project cost overruns were identified and investigated. Due to the small sample size of relevant published data on such projects, it proved difficult to draw any consistent findings from the study. It was therefore decided to gather a large number of perceptions from experienced cost estimating professionals about the reasons for cost overruns. A questionnaire survey was carried out. The research then proceeded to view how the construction industry is responding to the challenge of accurate budgeting.

## ACTUAL PROJECT COST OVERRUNS

The government's National Audit Office (NAO) has investigated the problem of construction project cost overruns on numerous occasions. Three examples of building projects include the British Library, Guy's House and Portcullis House. The British Library officially opened in 1998 and is one of the largest public buildings ever erected in Britain. At £511m it was three times over the original budget (Harlow and Syal, 1995). Blame was directed towards politicians and the government agency management team who continuously changed the project's personnel and the responsibilities of individuals (Spring, 1997). There was also criticism of the contractual arrangement used which adopted a cost-reimbursement approach, meaning that the consultants and contractors had little financial incentives to keep within the cost limits.

The second example concerns the third phase of a hospital redevelopment project. At £152m, Guys House doubled its original budget (NAO, 1998). Some cost increases were reported as being unavoidable due to changes in the health service's statutory requirements, building regulations and a new liability for tax, but other increases might have been avoided. These include increases due to failure to freeze design, significant design changes, delays to the building works, a large number of disputes and claims and the insolvency of major works package contractors. The NAO's recommendations included the need to have complete and realistic costings backed up by a full risk analysis, and to identify the risks involved in using a particular contract strategy and to take appropriate action to minimise them.

The third example of the problem is the new parliamentary office building that stands opposite the Houses of Parliament in London (Barrie, 1999a). At £250m Portcullis House's budget doubled (Wheeler, 1998). Built on a difficult site with a unique project brief, these factors have led to this becoming one of the most expensive building ever constructed in Britain (Barrie, 1999b). The original budget estimate was first revised after the cladding works package tender came in well over budget, and the budget had to be increased again when problems were caused by complications with an underground station sitting directly below the site (Barrie, 1997a). A statement from a Member of Parliament set out justification for the increased costs as attributed to inflation, delay in handing over the site and for approved additional design costs (Baldock, 1999). The latter includes bronze cladding to extend the life of the building, electronic door locks, internal security measures, the inclusion of the parliamentary information systems network and increased health, safety and fire regulations.

## THE CURRENT POSITION

At the start of a new decade history is repeating itself with another new parliamentary building grossly exceeding its original budget limit. The Holyrood project in Glasgow will not be complete until 2003 but, since the original 1998 feasibility cost estimate of £90m, it is now expected to cost £230m (Scottish Parliamentary Corporate Body, 2000; Fairs, 2001). The main reason for the addition was the need for extra space requirements, which almost doubled, and therefore led to knock-on effects of increased contingency, fees, VAT, fitting-out and programme delays. Last year the project director resigned after failing to control costs and prevent further design changes. In addition to this project, the new Welsh assembly building is also reported

to be in "*chaos*" (Leftly, 2001). Due to be complete in 2004, a year later than planned, the project is reported to cost upwards of £40m, at least £13m over budget. This has led to the project's design contract, with one of the biggest names in architecture, to be terminated. Farther a field in Europe, the European Commission are having problems with their new headquarters in Brussels (Building, 2002). It could become one of the world's most expensive buildings as costs could reach £900m – that's £800m more than the original estimate.

Concerning this problem of budget risk, a Chief Executive of a construction company said "*As long as you are capable of assessing the risk, the margins you can achieve by working in construction are ok*" (Barrie, 1997b). This view was reinforced by another head of a construction firm who stated that "*If you're not going to be a risk taker in construction, you should leave the industry*" (Barrie, 1997c). However, although the industry has been enjoying busy times, there are headlines about well-established contractors going into receivership (Allen, 2000). One builder said, "*Banks on the whole don't like construction because it always involves too much risk*" (Jones, 2000). Very recently a director of a major construction company believed that where the industry most often runs into problems is when it fails to identify a risk (Ernst & Young, 2002). Therefore, although risk is inherent in construction, it appears that it is not easy to manage. There is a need for a better understanding of the concept of the formal risk management.

## QUESTIONNAIRE SURVEY FINDINGS

The postal questionnaire method was used for industrial investigations concerning the problem of project cost overruns. Quantity surveyors are the industry's professional cost estimators. Questionnaires were therefore mailed to quantity surveying practices accompanied by a cover letter. Practices were selected from the Royal Institution of Chartered Surveyors geographical directory. The largest town in each of the ten UK regions was selected and the questionnaire was sent to five hundred practices. An open style question was put to surveyors asking them to list up to five main reasons why they think building project costs sometimes exceed the initial budget estimate. From the 114 successful responses, 341 reasons for cost overruns were given – an average of approximately three answers per respondent. The analysis of the results defined fifteen categories of reasons. These are ranked in Table 1, together with percentage breakdowns.

From Table 1 it is possible to observe that design changes to the project is the key reason for cost overruns. Flanagan and Tate (1997) have discussed how the process of change now seems to be never ending and hectic. However, they clearly state that what has not changed is the importance of effective cost control from the early stages of design through to project completion, and that clients want certainty of price and projects constructed within budget. Interestingly, the survey results show that clients are often the main source driving the change that leads to increased cost. It should also be noted that it is possible for change to sometimes reduce costs.

**Table 1**: Perceived reasons for causing building construction projects to finish over budget

| Rank | Reason | Number of responses | Examples (percentage of responses in category) |
|---|---|---|---|
| 1 | Design change | 52 | client driven (76%); design variations (24%) |
| 2 | Design development | 36 | incomplete design at tender (38%); too much generally (33%); initial design inadequate or lacks detail (28%) |
| 3 | Information availability | 32 | general lack of information (44%); lack of information at tender stage (38%); lack of information at briefing (19%) |
| 4 | Design brief | 31 | lack of detail and definition, badly developed, incomplete, or incorrect (84%); client not know what they want (16%) |
| 5 | Estimating method | 29 | poor cost advice (31%); inadequate contingency allowance or assessment of risks (31%); base method used for calculation (21%); stubborn client attitude (17%) |
| 6 | Design team performance | 26 | designers attitude, input, whims, understanding of cost and value (46%); M&E estimates (25%); inadequate cost control (21%); designers awareness as to areas of cost risk and subsequent risk management (7%) |
| 7 | Project management | 24 | design management (21%); contract and site management (17%); control (13%); communication routes (13%); sub contractor and supplier interface and management (8%); leadership (8%); lack of value management (8%); management approach (4%); decision-making (4%) |
| =8 | Time limits | 19 | unrealistic design development periods (47%); delays by employer and client driven speed (32%); no time to carry out realistic budgets or cost control (11%); unrealistic construction periods (11%) |
| =8 | Site conditions | 19 | ground works (53%); unforeseen site conditions, constraints, restrictions, Murphy's Law - basically things go wrong (37%); dry rot or asbestos in refurbishment's (11%) |
| 10 | Organisation | 15 | general poor preparation and planning (40%); pre tender (33%); inadequate surveys and investigation of existing site conditions (27%) |
| 11 | Claims | 14 | aggressive or claims conscious contractors, contractors risk pressure, late information release (100%) |
| =12 | Commercial pressures | 13 | fee competition (46%); tight bidding conditions (31%); confrontational approach of industry (15%); corner cutting clients (8%) |
| =12 | People | 13 | inexperience, too optimistic, intuition, knowledge, qualifications, team, personal or practical skills (70%); consultants (23%), contractor (7%) |
| 14 | Procurement route | 10 | wrong contract used, inappropriate allocation of risk in contract document (100%) |
| 15 | External factors | 8 | changes in pricing conditions, indices, inflation, statutory factors, market trends (100%) |

With change there is sometimes a vicious circle where innovations attempt to improve the value for money of facilities but this is then followed by increased complexity and an increased degree of uncertainty. However, when methods of mitigating this risk have been developed then further innovation again leads to new complexity and uncertainty. No matter how many times professionals look back and try to learn from the problems that have been overcome in the past, this will always be a challenge that the construction industry faces. Clients are also continuously changing the game and new means of procuring facilities are being created at an ever-increasing rate (Ernst & Young, 2002).

Another key observation that can be drawn from Table 1 is the problem of incomplete design information when estimating. Design development is always going to follow an estimate but, the more complete the information is on the existing site conditions and design definition, then the more accurate an estimate will be. Clients need to invest the time to determine the needs of the proposed facility in a firm brief at the very early appraisal stages when the key design decisions are being made and the framework is set to measure the projects progress.

The importance of suitably qualified and experienced design and construction teams is also highlighted by the survey findings. Attitudes, team working, knowledge and both practical and personals skills are critical to the success of a project. This requires organisation and management control to lead the various parties to communicate and make effective decisions. The project manager must help the client set realistic programme time for appraisal, design and construction to ensure that information is released in a timely fashion. Lack of time is a significant reason for cost overruns, with late delivery of information leading to claims from contractors. Although external factors are cited as a reason, it is the project specific issues that need the greatest attention when managing the risk of cost overruns.

## MANAGING RISK

The challenge facing the construction industry is to manage the risk of cost overruns and deliver projects within budget. At the beginning of the last decade, Brandon (1990) stated that in construction the new orthodoxy is to accept risk and uncertainty. He explained that it has been recognised that the key decisions are made in the very early stages of the design process, and the task is to discover techniques, procedures and information support that will improve decision-making at this critical point. Ten years later, Brandon (2000) said *"... we realise that we cannot actually forecast the future particularly well" ... "our job is to assess what the risks might be in the future but, at the same time, bring in management processes that allow us to minimise the risk or adapt to changing circumstances" ... "there is a world of difference between predicting the future and thinking intelligently about it, and I wonder whether sometimes we place too much emphasis on trying to get tools which will predict (sometimes you have to do that), but what we should be doing is thinking intelligently about it and creating the paradigms that will allow us to have an improved society in the future."*

Attempts are being made to improve the construction industry's poor reputation. In 1994 Sir Michael Latham set out an agenda for action that demanded changes in culture, attitude and procedures with the objective of ensuring value for money and certainty of outcome (Latham, 1994). Latham said that *"No construction project is*

*risk free. Risk can be managed, minimised, shared, transferred, or accepted. It cannot be ignored".* This work was followed in 1998 with a report by Sir John Egan, "Rethinking Construction" (DETR, 2000b), and the Construction Best Practice Programme was subsequently set up supported the Construction Industry Board (CIB). The aim is to raise awareness of the benefits of best practice and provide guidance and advice construction and client organisations so that they have the knowledge and skills required to improve the ways that they work (CIB, 2000). The main focus is transformation of outdated management practices and business cultures. Risk management is one of fifteen business improvement themes.

In addition to the above initiatives, under a corporate governance code directors of listed firms must now carry out an assessment of the way they handle risk (King, 1999). This means that they have to take a systematic look at the risks that their company faces and provide a full description of how they do this to satisfy auditors and shareholders requirements. The issues include health and safety, financial procedures, environmental risks and regulatory compliance. The code means that, for the first time, directors will have to comment on what they are doing about risk in their annual reports. A finance director of a construction company said that *"the code is a heavy compliance burden for contractors in a high-risk industry"*, but welcomed the idea that businesses would be more transparent and it is a good opportunity to show that the industry is *"trying to put its house in order"* (King, 1999).

In an attempt to avoid bidding for loss-making jobs and also to examine their financial and operating controls, a major contractor has hired management consultants to examine its risk management strategy (White, 2000a). The Chief Executive said "*It could well be that spending half a million pounds on a soil investigation is worth it in order to avoid a major delay at a later date*". White (2000b) also reported on how a major contractor is to invest in an Internet based knowledge management system to allow staff access to detailed information on past projects. This will contain information about where projects went well, and how problems were overcome or could have been avoided. If a company invests in risk and knowledge management systems and processes it becomes less dependent on the skills of individuals, due to a body that may be shared by the entire company (Ernst & Young, 2002).

## EFFORTS BY COST ESTIMATING PROFESSIONALS

Seeley (1996) explained that cost management has become the most important single facet of the work undertaken by the quantity surveyor, with the prime objective of controlling construction costs and obtaining value for money set against perceived performance expectations. Recently, Chartered Surveyors have been asked by the government to provide information for construction Key Performance Indicators (KPIs) for cost predictability (Martin, 2000). This is one of ten headline KPIs that were produced by the DETR in response to Sir John Egan report (DETR, 2000c). The survey provides cost predictability both from inception (commitment to invest), and start on site (commit to construct) to final completion (available for use).

In the early nineteen-nineties the Royal Institution of Chartered Surveyors (RICS) produced a report concerning the future role of the Chartered Quantity Surveyor (RICS, 1991). It emphasised the need to provide more accurate and robust forecasts of construction costs. Particularly, new services were needed in the areas of early cost advice, cost control and the market forecasting which will add value to the client's

business and, in doing so, raise the profession's profile. Three years after this report was published a surveying practice carried out a survey and found that clients believed that they would get a more effective service from quantity surveyors with risk analysis, rather than with traditional cost control methods (Crosher & James, 1994). Several clients said that the consultants should draw attention to areas of risk at the earliest possible date. A couple of years later, the (former) Chief Executive of the RICS warned *"No construction project is risk free and the industry cannot afford not to manage risk" ... "The range of construction risk - contractual, design, health and safety, site, phasing, along with political, environmental and social considerations - are potentially overwhelming" ... "No major capital project should be undertaken without a full risk assessment."* (Makin, 1996). Fortune and Lees (1996) surveyed the use of early cost advice techniques for construction cost forecasting. Within their conclusions they stated that the research did not fully identify all the risk analysis models used by practitioners. They recommended that future work in this area should address the establishment and evaluation of risk analysis strategic cost advice models currently used by practitioners – a survey was subsequently undertaken by Jackson et al (1997).

Towards the end of the last decade a "QS think tank" was set up (RICS, 1998). The objective was to look forward and develop a vision of where Chartered Surveyors working in construction would be in five to ten years time. The findings identified forces driving change, looking ahead to the needs of the customers and pointing to the professional skills that must be acquired to successfully serve the market after 2000. Factors driving change included the global economy, the market and the IT revolution. When considering the needs of the customer, clients said that the things that matter to them most include, among others, setting the budget, cost certainty and risk management – which should be more than just inserting a contingency! The report concluded that if the quantity surveyor is to add value to clients projects then the skills of the profession must be re-addressed, and growth areas included initial cost advice, detailed cost planning, cost management, monitoring work ("*participants will need a detailed understanding of risk management*") and project management ("*risk management will probably be expected as a standard service*").

One of the findings in a survey of twelve thousand quantity surveyors revealed that over half of respondents think that their traditional cost modelling role is under threat and likely to be replaced with software packages in the near future (Cavil, 1999). Three-quarters of respondents strongly believed that unless they start to offer a new range of services then other professionals, such as accountants and management consultants, would take their business away. The chairman of one leading quantity surveying practice argued, *"Construction risk is what we are all about. By that, I mean we advise on what can go wrong in the process of arriving at the construction phase, in construction activity itself, and in the life-cycle of the built structure"* (Ainsley, 2000). However, the approach to risk management has not evolved in the construction industry and now lags behind other industries in the sophistication of approach (Ernst & Young, 2002). The industry has acknowledged the challenge of risk, but is in danger of being overtaken by the speed of change in the markets that it serves. Clearly, considering the problem of risk in project budgets, there is a need to develop new models that will enable the industry to rise to the challenge of providing more accurate estimates.

## CONCLUSION

In the domain of construction project budgets and risk management, two key conclusions can be drawn from this research. Firstly, that complete project information leads to more accurate capital cost budget estimates. One of most serious problem when a budget is being estimated is that little information is often available. The requirement is to invest more time in the early briefing stages of design to clearly define a project's scope and complexity. The secondly key conclusion is that change may be classified as the greatest risk. No matter how much design information is produced for estimating, this can be counterbalanced by any design changes that are subsequently made. However, it should be noted that change is not just a threat – if managed effectively it can be an opportunity to make savings or provide greater value for money. Future research should consider the monitoring of industrial risk trends to classify budget risk and understand how it evolves. New integrated models are also needed to help cost estimators to systematically manage risk during project appraisal. However, whilst the industry is often criticised for being inefficient, the clients must also review their driving contribution to the processes of effective risk management.

## REFERENCES

Ainsley, D (2000) Letters - Risk is the name of the QS game, *Building*, 22 September, 32.

Allen, P (2000) £600k row as Edward's builder goes bust, *Daily Mail*, 4 February, 1.

Baldock, H (1999) The spin starts here, *Building,* 23 July, 24-25.

Barrick, A (1995) Poll reveals one in three jobs late, *Building*, 28 July, 10.

Barrie, G (1997a) MPs' offices now £100m over budget, *Building*, 26 September, 9.

Barrie, G (1997b) The percentage, *Building,* 30 May, 36.

Barrie, G (1997c) The player, *Building*, 7 March, 32-33.

Barrie, G (1999a) 'Blame MPs', says Portcullis House audit, *Building*, 19 March, 7.

Barrie, G (1999b) Why the new parliament building is costing £1.2m for each MP, *Building*, 26 January, 20-24.

Brandon, P S (1990) *Quantity surveying techniques - New directions the challenge and the response*, in Brandon [ed] (1990), *Quantity surveying techniques: New directions*, Blackwell Scientific Publications, Oxford, 1-20.

Brandon, P S (2000) *First keynote speaker*, Bizarre Fruit Postgraduate Research Conference on the Built Environment, RICS Foundation, 9-10 March, Built and Human Environment Research Centre, University of Salford.

Building (2002) Euro HQ may be £800m over budget, *Building*, 11 January, 12.

Cavil, N (1999) The QS: Profession on the brink, *Building,* 18 June, 42-45.

Construction Clients Forum (1997) 60% of clients dissatisfied, *Building*, 23 May, 8.

Construction Industry Board (CIB) (2000) *The Construction Industry Best Practice Programme*. Viewed at: <URL: http:www.cbpp.org.uk>

Crosher & James (1994) Value-added cost control is best, *Building Economist Supplement, Building*, February, 4.

Department of the Environment, Transport and the Regions (DETR) (2000a) Performance indicators show improvement*, Construction Monitor*, May, 4.

Department of the Environment, Transport, and the Regions (DETR) (2000b) *Rethinking Construction*, The report of the Construction Task Force to the Deputy Prime Minister, John Prescott, on the scope for improving the quality and efficiency of UK construction. Viewed at: <URL: http://www.construction.detr.gov.uk/cis/ rethink/index.htm>

Department of the Environment, Transport, and the Regions (DETR) (2000c) *KPI Report for the Minister for Construction,* DETR. Viewed at: <URL:http://www.construction.detr.gov.uk>

Ernst & Young (2002) Construction Risk, *Building*, 13 January, Supplement.

Fairs, M (2001) Scottish parliament: The true story, *Building*, 28 September, 38-43.

Flanagan, R and Tate, B (1997) *Cost control in building design*, Blackwell Science Limited, Oxford.

Fortune, C and Lees, M (1996) *The relative performance of new and traditional cost models in strategic advice for clients*, Research Paper Series, **2** (2), Royal Institution of Chartered Surveyors, London.

Harlow, J and Syal, R (1995) British Library not ready before 2000, *The Sunday Times*, 26 November, 1.7.

HM Treasury (1995) *Setting new standards: a strategy for government procurement*, HMSO, London.

Jackson, S.H., Griffith, A., Stephenson, P. and Smith, J. (1997), *Risk management tools and techniques used when estimating initial budgets for building projects*, Proceedings of 13th Annual Conference of the Association of Researchers in Construction Management, King's College, Cambridge, September, 123-132.

Jones, M (2000) Banks blamed for pulling the plug too soon, *Building*, 11 February.

King, D (1999) Firms hit by tough tax and risk rules, *Building,* 15 January, 16.

Latham, Sir Michael (1994) *Constructing the team*, HMSO, London.

Leftly, M (2001) What went wrong?, *Building*, 19 October, 26-27.

Makin, C (1996) What do surveyors know about risk, *InfoRM*, November, 6.

Martin, J (2000) Chartered surveyors provide benchmarking data for construction, *Chartered Surveyor Monthly*, February, 19.

National Audit Office (NAO) (1998) *Cost Over-runs, Funding Problems and Delays on Guy's Hospital Phase III Development*, Reported by the Comptroller and Auditor General, 10 June, NAO, London.

Royal Institution of Chartered Surveyors (1991) *QS2000 - The future role of the Chartered quantity surveyor*, RICS, London.

Royal Institution of Chartered Surveyors (1998) Towards a sustainable profession, *Chartered Surveyor Monthly,* June, 56-65.

Scottish Parliamentary Corporate Body (2000) *Report on the Holyrood Project,* SP Paper 99, Session 1. Viewed at: <URL: http://www.scottish.parliament.uk/ agenda_and_decisions/bb-00/holy-01.htm>

Seeley, I H (1996) *Building Economics (4th Edition)*, Macmillan Press Limited, London.

Spring, M (1997) Gentle giant, *Building*, 31 October, 40-45.

Wheeler, C (1998) Thanks for the insight, *Building*, 9 January, 17.

White, D (2000a) Costain turns to KPMG to cut risk - Contractor's review of project risk may lead to a spend-earlier-to-save-later approach, *Building*, 4 February, 17.

White, D (2000b) Balfour to spend £5m on project database, *Building,* 31 March, 19.

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