

Risk Registers in Construction: Theory with Practice

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Risks can be documented on construction projects by using risk registers. The purpose of a risk register is to record and manage project risks to enable projects to be delivered successfully. This paper compares the content of risk registers and their use in the construction industry based on the body of knowledge on the topic, obtained from various books, papers and publications. These findings were then compared with information obtained from a number of semi-structured interviews with construction professionals who use risk registers regularly. The main findings from the participants are that construction risk registers are used regularly on construction projects, and should include details on risk identification, likelihood, impact, responses and owner/user actions. The risk register should also be updated regularly by the construction project manager via monthly risk review meetings, as updates to the risk register helps the document and the risk management process to remain fresh and effective and contribute to successful project decision making and deliver project expectations.

Keywords: Construction risk management, risk registers, project manager, project decision making.

Introduction

Risk is commonly referred to as events that will cause a detrimental effect to a project (Winch, 2002). Risk Management has been identified as a key construction project process, fundamental to the successful delivery of construction projects within the United Kingdom and as such is to be used on all construction projects which receive government funding (OGC, 2003). The purpose of risk management is to provide information to empower the project manager to make better decisions and so improving confidence that the outcome of the project will deliver the business expectations (Dallas, 2006) and to enable action to be taken on project risks with a view to increasing the probability of project success and reducing the likelihood of failure (The Institute of Risk Management, 2007).

The process of risk management can be generally divided into three phases: Identification, Analysis and Response, (Hassanein and Afify, 2007). Of these, the first two are considered the most important (Maytorena et al, 2007) as an effective response to risk can only be sought if the information used to calculate the response is accurate. Smith also (2003) identifies risk identification as the most important aspect of the risk management process, and identifies three main techniques to achieve this. These are industrial checklists, brainstorming sessions, and historical precedence. Winch (2002) however realizes the importance of brainstorming sessions but states that "Risk identification is usually done through relying on the experience of older hands".

Maytorena (2007) identified that the project manager's experience in the risk identification process is often much less significant than is commonly assumed, he also suggests that a more thorough approach be adopted. The experience of the project manager however is still important when conducting workshops or brainstorming sessions as a means of guiding the session. Dallas (2006) also suggests that the project manager should attempt to identify as many risks as possible before the session even begins. The most common device adopted for keeping track of these identified risks is the use of a risk register (H.M. Treasury, 2004).

The basis of this paper is to study risk registers and their use on construction projects, to ascertain whether any common format exists and is adopted and what the content of the register should include, and having identified a common basis the next stage is to compare the literature with construction practice.

Literature search

A risk register is defined as a “body of information listing all the risks identified for the project; explaining the nature of each risk and recording information relevant to its assessment and management” (The Association of Project Management, 1997). The risk register is an iterative working document used by the construction project team to record project risks and associated actions. It should be maintained collectively by the integrated project team and regularly updated during the project lifecycle to reflect risk management actions and outcomes.

Flanagan and Norman (1993) identified a phenomenon called ‘the risky shift’. This theory is based on scientific findings and contradicts the conventional belief that groups, such as committees, are prone to adopting very conservative policies. They further state that social scientists established that when a group of people discuss a risk-taking problem they usually arrive at a riskier solution than the average of their own previous individual solutions. They give two reasons for this; the first is that boldness is more socially desirable than conservatism so people try to appear courageous in front of their peers. The other reason is that emotional bonds form between the members in the group so each individual member feels less of a personal responsibility for failure. Perhaps this phenomenon is why Dallas (2006) recommends that the project manager should compile the initial risk register independently and then ask other project team members for their input.

Further, risk registers have also been used successfully on projects other than construction i.e. in preparation for the Beijing Olympics, where 242 risks were identified and 112 were allocated to the risk register and given action owners (Zhu et al, 2006). Patterson and Neailey (2002) developed a risk register database based on the fact that risk registers are discussed in literature yet very little information is available on their development and construction, finding that 67% of respondents to a survey documented their risks in some form, however no one risk register approach dominated.

The first risk register reviewed was taken from a non-construction industry to provide an alternative view. A University of Glasgow (2006) risk register was identified which had been used on university based administration projects. The headings utilized on this risk register included:

- a number - unique for each risk;
- a description – giving a brief summary of the risk;
- the likelihood – describing how likely it is that the risk will occur, with categories i.e. low (<30%), medium (31-70%) and high (>71%);
- the severity – an assessment of the potential impact on the project, again classed as low, medium, or high; counter measures – the action to be taken to prevent, reduce or transfer the risk; the risk status – whether the risk is current or ended;
- the owner – the individual with the responsibility for managing the risk;
- the risk type – this splits the risks into business, project or stage risks, with business risks related to achieved benefits, project risks related to things such as time, resources and stage risks which are associated with a specific stage of the project.

The Handbook of Project Management recommended the use of a generic risk register model (Young, 2002). This took a slightly different approach splitting the risk register into two documents. The first classed as a risk log to record the risks as they are identified and the second document being a risk management form for subsequent action planning. All the information to be populated while identifying risks was located on one document while all the information needed to manage a specific risk was contained on a separate document. The risk log form provided for:

- a unique number;
- the stage of the project affected;
- a date;
- the likelihood and a probability of the risk event occurring.
- Reference to a risk management (second) form. This second risk management form was required for action planning and there was to be one form per identified risk and its content included risk description, probability and impact, the stage of the project affected, review, action and by whom.

The Chartered Institute of Building (2002) risk register also had two documents, one to detail the risks and the second to detail how risks were to be mitigated. This register also contained:

- a numbering system with its purpose is to break the risks into categories. Risks identified as general risks i.e. that are inherent irrespective of the nature of the project were listed by numbers. Specific risks that are related to specific activities within the project should be listed and finally residual risks are listed. This is the only register that identifies that some risks cannot be mitigated and allows for contingencies to be put into place well in advance.
- columns for date, action owners, probability etc. Columns that are surprising are the unmitigated impact columns, normally the impact will be very simplistic such as high medium or low, but this register wants to know cost, time and function impacts. At the time of populating the risk register quantitative risk analysis would not have been carried out, therefore these values must be estimated from the experience of the participants in the risk workshop or added in after the analysis has taken place.
- There is also a column to briefly detail the mitigation strategies adopted, as the main detail will be listed on the separate action plan. This action plan is very similar to the one proposed by Young (2002). There is space to detail information specific to the risk and also space to detail what actions are going to be taken. Importantly there is also space to detail when reviews of the risk occur.

A computer-based risk register (Jiscinfonet.ac.uk, 2004) provided an advantage in that its content (the risks identified) was not confined by the size of a piece of paper (unlike all the previous risk registers reviewed) and a large amount of data can be imputed without the register becoming physically unwieldy. The user guide mentioned a number a fields that need to be entered, which were similar to those from the registers above. These fields included:

- a unique id,
- title,
- description,
- likelihood,
- impact,
- review dates.

No further additional items were identified from this approach that had not already been identified from the previous risk registers.

Similar features identified from these sources have been appropriately grouped (see Table 1) and have identified typical risk register inclusions.

Table 1 – Review of format and content of risk registers

A non construction sector risk register: University of Glasgow (2006)	A generic risk register: The Handbook of Project Management, (Young 2002)	A construction risk register: The Chartered Institute of Building (2002)	A computer-based risk register: (Jiscinfonet.ac.uk, 2004)
One document	Two document	Two document	One document
A unique number for each risk	A unique number	Numbering system	A unique id
A brief description of the risk	Description of the risk (risk log)	Risk identification	Risk title and risk description
The risk likelihood	The likelihood and a probability of the risk event occurring	Risk probability	Risk likelihood

The risk severity	-----	-----	Risk impact
The risk owner -----	Risk action owner Risk review	Action owners Risk reviews	----- Risk review dates.
The resultant risk management action -----	----- The stage of the project affected	Risk actions -----	----- -----
The risk status	-----	-----	-----

The literature review has established that risk registers are available from a number of sources, that they vary in their format in terms of number of the number of documents which comprise the actual risk register and the content of each register has identified a number of similar inclusions and a lesser number of differences between the risk registers.

Research methodology

The objective for this research project was to compare what was identified from the literature search with the information that emanated from research, i.e. comparing the literature view of the use, format and content of risk registers with practical experience.

Data collection methods used by qualitative researchers have referred to interviews as a conversation with a purpose (Marshall and Rossman, 1999). Interviews are an effective form of data collection as large amounts of information can be obtained from experienced participants, relatively quickly, whilst allowing an immediate follow up and clarification of data if needed. Interviews also have the advantage that because only the participants' views are important and not their actions etc., therefore interviews could be conducted over the telephone.

As a pilot study, interviews were carried out among a small sample of construction professionals, the distribution which followed a schedule with a set of predetermined open ended questions. The identification of likely participants for the pilot study was then considered. The primary factor for eligibility for participation was deemed the amount of experience in dealing with risk management and risk registers, with participants additionally needing to have experience in the architecture, engineering or construction industries (AEC). In order to identify experienced risk register users, the researchers identified The Institute of Risk Management, who described themselves as risk management's leading professional education and training body (The Institute of Risk Management, 2008). A number of individuals were recommended by this organization who met the criteria of experienced risk register users within the AEC sector and ten of these recommendations were selected to participate in the pilot study, based on risk register experience, professional qualifications and AEC contract participation. This selection ensured that the responses would be able to respond to the specific areas associated with risk register use.

The pilot study comprised interviews which followed a schedule with a set of predetermined open ended questions, sixteen in total, grouped into four main areas. The first part defined the respondents' job description within the construction industry and the duration of their experience in the use of risk registers. The second part of the interview concerned the origin and form of the risk registers used by respondents. Further, a group of questions dealt with inclusions and content of risk registers used by respondents. The final area of questions was designed to establish the respondents' opinions as to the effectiveness of the use of risk registers in securing successful project delivery.

Research results

Interviewee details and experience of dealing with risk

The ten candidates who undertook the telephone interview were specifically chosen for their experience in dealing with risk registers (see Table 2 – Participant details)

Table 2 – Participant details

Respondent Profile	PhD – 1 respondent; MSc – 2 respondent BSc – 2 respondents Managing Director – 1respondent; Assistant Vice President – 1 respondent Experience – 3 respondents
Total number of years risk register experience	97
Highest number of years of risk register experience	25
Lowest number of years of risk register experience	5

This broad level and range of experience meant that the candidates could be classed as experienced in the field of risk management and are more than qualified to participate in questioning on the subject of risk register use and content. Their initial answers on the use of risk registers on projects saw an equal split in the use of the risk registers from use on large projects only, to use on any project that was undertaken.

Origin and format of risk registers

All of the candidates, bar one, indicated that they used pre prepared risk registers. Some were developed in house by the companies themselves and others developed by external companies or taken directly from published sources. Other sources of development included software packages, use of professional services or consultancies e.g. developed by lawyers, who during the bid stage of a construction project would produce the risk register along with the project agreement. One approach described by two candidates was for risk registers to be based on previous jobs and contracts. At an early stage when meeting with the client a register from a similar previous job would be identified and the items present would be considered, this is because at the early stage of a project a lot of the risks are similar over a range of projects. This register will be constantly reviewed as the project progressed and risks added in or taken out as risks become more specific.

However, by far the most popular approach to developing and formatting risk registers was those developed in-house. This approach was described by four candidates, who cited clear benefits over other approaches. It would be specifically suited to own needs, do exactly what was wanted and made as easy or as difficult to use as required, also its contents and format could be whatever was wanted. On the downside there was cited the cost of development and the chances that early editions may not work very well until they have been tweaked during the project. Two candidates cited they had used a very simplistic in-house register at the tender stage and a more detailed register for the project stage of a contract.

Only one candidate did not use a pre prepared document for their risk register. The candidate described how all of the risks were gathered in a facilitated setting, this allowed for subsequent scoring and mapping, with key project and organizational personnel validating the final responses that were included in the register. One advantage cited of not having a pre prepared document is that the register was adapted more easily to suit the project situation.

No one specific format of risk register predominated. It became evident that the risk registers used were essentially either a single or group of documents identified for use from a number of different sources and even if the chosen format did not initially suit specific project needs, with some small tweaks it was amended to suit. This is shown As even with many different sources used no candidate reported that the risk registers they had used had failed in anyway during the project.

The format of the risk register was then investigated, this ascertained whether the risk registers was presented in one or two documents. Of the 10 candidates interviewed only two thought that the split approach was beneficial. Their comments were that it was a good idea because more information can be included for more important risks, however the split approach still had its drawbacks as it was seen as more labor intensive.

Four candidates believed that the risk register should remain within a single document. The main reasons cited were that the completed register was issued to all project team members so that everyone was up to date on the risks that are occurred or were likely to occur. Problems were envisaged concerning the two document approach when there was split responsibility for a risk, and also in reducing effective teamwork. Parties may only concentrate on their own specific risks whereas if they could see all the risks they may have a more beneficial contribution to make.

All other candidates had respect for the splitting approach yet still preferred the more traditional single document approach for risk registers. They however deemed that the effectiveness of this approach was dependant on the specific project but that one centralized register was deemed important for effective risk management and it should not be split up unless there is a very good reason, with separate documents would only be needed if there were too many risks to consider.

Key information included in risk registers

Another one of the key objectives for this project was to determine the most important headings to be included in risk registers.

There were a variety of responses to this question and although the majority of the candidates included the use of the 'big four'; risk identification, likelihood, impact and response, there were some very different opinions on the quantity of information that needed to be recorded on risk registers, some candidates listed as few as four items while others had as many as thirty one. Three of the ten candidates gave very extensive and comprehensive list of inclusions, six others just listed a few items and described that they preferred to take a simplistic approach and the final candidate failed to comment on the precise details of his risk register as he had developed his own risk register and wanted its contents to remain confidential. Table 3 indicates the main inclusions cited by participants.

Table 3 – Inclusions on risk register

	Participants										
Risk Register inclusions	A	B	C	D	E	F	G	H	I	J	Total
Number	X	X	X	X	X	X	X	X	X	X	10
Description/ identification		X	X		X		X		X	X	6
Likelihood	X				X		X	X		X	5
Severity						X		X			2
Owner			X	X		X	X	X	X		6
Review/ response			X	X	X	X	X			X	6
Action date									X		1
Impact	X	X	X		X		X	X		X	7
Status	X					X					2
Exposure									X		1

The more simplistic risk registers had inclusions which were simply described as risk identification, likelihood, severity and mitigation or review/response.

With more complicated risk registers the level of details cited as necessary increased noticeably. Thirty one headings were supplied by candidate I, these were not detailed at the time of the interview, instead they were supplied afterwards. The headings included; an id, date, owner and owner code, Sector, risk name, risk description, impact headings of probability and severity. All these headings were repeated for residual risks. Other headings included mitigating action, action owner, and action due date. Finally there was a status column, data closed and

comments. There was also room for updates. Candidate G also described a very comprehensive approach including; id number, title, owner, date, background information and assumptions, risk drivers and sensitivities, the level of control, area of impact, escalation status (i.e. has the risk been escalated to a higher level), close date, time and cost implications, results of quantitative/qualitative analysis, mitigation strategies, target completion date and completion status, and finally fall back plans. This approach is very comprehensive yet there appears to be no repetition, each heading requiring information that had not been previously included.

Effectiveness of risk registers' use for successful project delivery.

50% of participants described how the actual process of risk management is far more important than the risk register, agreeing that by using a risk register this caused proper risk identification sessions to be undertaken and hence the process of risk management was completed. Further when risk registers were used as part of the risk management process they had to be kept fresh, i.e. constantly updated. 40% of candidates described that from their experience using a risk register had been a very effective procedure. The comments made included that the document was needed to be simple so all project participants would understand what needed to be done and that it aided communication as well as risk reduction. The risk register also had the ability to focus the project team to work together to solve potential problems. Another theme that was expressed by participants was that the use of a risk register required a pro active project approach and this benefited all project delivery areas.

Only one candidate didn't find the risk register effective and the reasoning was that a risk register was just a small tool within the whole risk management process. There are many other tools and the effectiveness of the risk register cannot be judged singularly, therefore it was impossible to say how effective its use had been.

Discussion and conclusion

This research is a planned series of activities into the area of risk registers – the first stage of this, and the basis of this paper, was to compare theory with practice to identify the use, popularity and content of risk registers on construction projects. The preliminary research, carried out via an interview based pilot study confirmed:

Origin and format of risk registers

The literature study identified that whereas a previous survey on the use of risk registers identified 67% of respondents said they documented their risks by using risk registers on construction projects (Patterson and Neailey, 2002). From this study 100% of participants recorded use of risk registers on construction projects. The literature review established that the format of risk registers was varied with a number of formats identified as being available for use, this pilot study confirmed that a range of risk registers are in use, albeit that in-house, pre-prepared registers did predominate. The literature search identified that risk registers comprised a number of documents either a one or two document approach, the pilot study confirmed this approach and further identified that even if the chosen format did not initially suit specific project needs, with some small tweaks it was amended to suit, with no singular document approach emerging as dominant.

Key information included in risk registers

The literature study identified a number of common inclusions on risk registers; these were a unique number for each risk, a brief description of the risk and the risk likelihood. It also identified a number of other inclusions albeit these were not consistently used across all risk registers reviewed, these inclusions were risk action owner, risk review and the stage of the project affected. The pilot study found that the only information used in risk registers by all participants was that of a unique numbering system. No other inclusion item was used by all participants although from the initial literature review items risk description, likelihood, response and owner were all identified by more than 50% of the participants. The participants also identified inclusions that the original theory search did not identify, namely risk impact, exposure and status.

Effectiveness of risk registers' use for successful project delivery.

The original literature review identified a link between use of risk registers and project success (Zhu et al, 2006), the view of the participants was not so conclusive with 50% of participants who described how the actual process of risk management is far more important than the risk register, 40% who described that from their experience they felt that using a risk register had been a very effective procedure and 10% did not find the use of risk registers effective with the reasoning that a risk register was just a small tool within the whole risk management process.

This study's literature search identified a range of risk registers available for use, in differing formats and from differing sources. It further identified a number of likely inclusions on a risk register and that that use of risk registers could aid successful project delivery. In comparison the practice, via the interviews, identified that most risk registers used were predominantly in-house pre-prepared documents and that with the inclusion of risk numbering no other risk headings were consistently used, although some items were more mentioned than others. Risk registers were used on all participants' projects; however this did not always ensure successful project outcomes.

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