The impact of project managers' experience on the selection of strategies for minimizing information asymmetries in construction projects

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This research has evolved in four stages, the last of which is presented here. The principal-agent theory has formed the core of the research through all the stages. The relationship between the project owner and contractor was extended to include their respective project managers. The first stage was based on an exploratory survey of project managers with considerable experience in the field. It was found that the two project managers play the key role in the construction phase of a project, whereas the project owner and contractor play subsidiary roles during this phase. The second stage investigated this finding by using the Delphi method. A panel of experienced project managers selected from the exploratory survey confirmed its findings. The third stage of the research involved another exploratory survey of the same participants to establish the relative importance of a number of risk-minimization strategies in construction projects established on the basis of the principal-agent theory. It was established that trust is the most important risk-minimization strategy. The fourth and last stage involves three dimensions of project managers' experience and their impact on the project managers' ranking of risk-minimization strategies. The parameters of experience employed are years of experience in the field, the size of the largest project worked on and the number of countries worked in. Multi-attribute utility theory has been used in the last three stages of the research. It is used in the last stage to re-rank the strategies investigated previously with respect to the three dimensions of project managers' experience. The new ranking confirms the previous findings, but it also brings forth important differences between the three dimensions of experience. In particular, trust matters everywhere, whereas contractual arrangements drop in importance in large projects and across a variety of countries.

Keywords: Information asymmetry, multi-attribute utility theory, principal-agent theory, project managers, risk-minimization strategies.

Introduction

The communication risk is one the most common risks that appear among project participants in every construction project. According to Turner and Müller (2004), the key relationship is between the project owner as the principal and the contractor as the agent. As Ceric (2012a, in press, a) argues, the project owner's and contractor's project managers also play important roles in construction projects as agents. According to the principal-agent theory, information asymmetries apply whenever the principal and the agent are not in possession of the same information at the same time. There are several types of information

asymmetries: hidden characteristics, hidden information and hidden intention. These three types of information asymmetries generate the following types of risk: adverse selection, moral hazard and hold-up (Jäger, 2008). According to Schieg (2008), there are six strategies for minimizing information asymmetries between project participants: bureaucratic control (contracts), information systems, incentives (bonuses), corporate culture, reputation and trust. The main purpose of this research is to shed light on the impact of project managers' knowledge and experience on the selection of strategies for minimizing information asymmetries in construction projects.

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Over four years, this research has evolved in as many distinct stages, the last of which is presented here. The results of previous stages were presented in several journals and proceedings (Ceric, 2012a, 2012b, in press, a, b). The principal-agent theory formed the core of the research through all the stages. The relationship between the project owner and contractor was extended to include their respective project managers. The first stage was based on an exploratory survey of project managers with considerable experience in the field. It was found that the two project managers play the key role in the construction phase of a project, whereas the project owner and contractor play subsidiary roles during this phase. The second stage investigated this finding by using the Delphi method. A panel of experienced project managers working for both project owners and contractors was selected from the participants of the exploratory survey, and they confirmed its findings. The third stage of the research involved another exploratory survey to establish the relative importance of a number of risk-minimization strategies in construction projects established by Schieg (2008) on the basis of the principal-agent theory. The same project managers were involved at this stage, as well. It was established that trust is the most important risk-minimization strategy. The fourth and last stage involves three dimensions of project managers' experience and their impact on their ranking of risk-minimization strategies. The parameters of experience employed are years spent in the field, the size of the largest project worked on and the number of countries worked in. This information was derived from the previous stages of this research, and no further surveys were therefore necessary.

Project managers' knowledge and experience are considered vitally important in determining project outcomes. These topics are usually covered in the literature in connection with human resource management, which belongs to the human capital theory. Project managers depend on personal knowledge and experience that informs them about how to lead in a continuously changing project environment (Brown *et al.*, 2007, p. 78). They acquire various types of knowledge and skills through the experience they go through in their working lives (Edum-Fotwe and McCaffer, 2000, p. 118). For this reason, project managers' knowledge and experience are also treated under the heading of career paths, which is considered as the key to their motivation (Hölzle, 2010, p. 782). However, the literature cited does not take into consideration various dimensions of project managers' knowledge and experience, which are listed above. They are central to this paper.

The remainder of this paper is organized in six sections. First, the research methodology will be considered. This section will then focus on the multi-attribute utility theory, which has also been used in the previous stages of the research presented here. Second, the place of project management within the principal-agent theory will be explored. This section will follow the presentation offered in previous papers. Third, the risk-minimization strategies caused by information asymmetry will be discussed. Again, this presentation will be guided by that in the previous paper. Fourth, the multi-attribute utility theory will be introduced. In this section, the utility functions introduced previously will be extended to account for the three dimensions of experience. Fifth, key finding of the last stage of this research will be presented. This section will focus on the interaction between the relationships between the key parties in construction projects, strategies used to minimize the effect of asymmetric information and dimensions of project managers' experience. And in the sixth section, the conclusions and limitations of this research will be offered together with suggestions for future research.

Research methodology

As Ceric (in press, b) argues, trust is the most important risk-minimization strategy in the construction phase. It is followed by bureaucratic control (contracts) and information systems. Reputation, corporate culture and incentives (bonuses) follow, in that order. In this paper, the impact of project managers' experience on the selection of risk-minimization strategies caused by information asymmetries will be examined. As already mentioned, experience is defined by three parameters: years of experience in the field of project management, the value of the largest project managed and the number of countries worked in. There were 20 respondents who participated in the previous stages of the research. The respondents were practitioners with considerable expertise in the field as witnessed by their 13 years of experience on the average, the average value of the largest project they have managed assessed at $1.4 billion and three countries worked in on average. Focusing on project managers' experience, the multi-attribute utility theory is used in this research to come up with the ranking of the above strategies.

The same 20 respondents who participated in the previous stages of this research were selected for the present stage. Fifteen of them responded, amounting to the response rate of 75%. However, the respondents were not involved directly at this stage. Rather, the responses they provided in earlier stages of this research were analysed once again by separating the three dimensions of their experience with the help of the multi-attribute utility theory. As stated above, the respondents were practitioners with considerable experience in the field

as witnessed by their 13 years of experience on average, the average value of the largest project they had managed assessed at $1.4 billion and three countries worked in on average. More specifically, the respondents had between 2 and 40 years of experience; the largest project they had worked on ranged between $2 million and $16 billion; and the number of countries they had worked in ranged between one and seven. In particular, nine of them had worked in Turkey; four each in Russia and the USA; three each in Egypt, Spain and the UK; two each in Croatia, Hong Kong, Poland, Romania, Saudi Arabia and United Arab Emirates; and one each in Azerbaijan, Bosnia and Herzegovina, Canada, China, Eritrea, Hungary, India, Italy, Iraq, Jordan, Kazakhstan, Libya, Oman, Pakistan, Qatar, Serbia, Singapore, Sudan, Switzerland and Tajikistan. A large number of the largest projects had been in infrastructure, but many other types of projects were involved. However, the respondents cannot be said to be representative of all project managers, the population of which is beyond the scope of the present study.

The multi-attribute utility theory was used in the previous stage of this research for the calculation of overall utility functions to rank the risk-minimization strategies in the construction phase. The overall utility function combines the weights of importance of relationships between project parties and the ranking of strategies. The same approach will be employed in the last stage of this research to re-rank the strategies with respect to the three dimensions of project managers' experience. As will be shown below, the re-ranking confirms the results of the previous stage of research, but it also offers useful information about the differences between different dimensions of experience. These will be addressed in the section about the key findings.

Project management and the principal-agent theory

The situation in which one of the two cooperation partners is better informed than the other is characterized by asymmetric information (Schieg, 2008). In 2001, George Akerlof, Michael Spence and Joseph Stiglitz shared the Nobel Prize in economics for their work on information asymmetry. Information asymmetries apply whenever the principal and the agent are not in possession of the same information at the same time. In construction projects, there are at least four key parties that work together: the project owner, the contractor and their project managers. Other project parties, such as designers and subcontractors, may play important roles in construction projects, but they

will not be investigated here (Ceric, 2012b). As is assumed in the principal-agent theory, the four parties will share important information in order to meet main project's targets: time, cost and quality. However, because of self interest, they will not be willing to share all the information all of the time. Therefore, the following types of information asymmetries apply for acting parties: hidden characteristics, hidden information and hidden intention. Respectively, these three types of information asymmetries generate the following risks: adverse selection, moral hazard and hold-up (Jäger, 2008).

Now, hidden characteristics cause the adverse selection problem *before* the contract is signed between the parties involved. It means that the project owner does not have all the information about the contractor before the contractor is hired. Similarly, the project owner does not have all the information about the project manager before hiring. The same holds for the contractor and the project manager working on the contractor's behalf. Therefore, in the case of adverse selection we have three different parties involved and three information asymmetries. The adverse selection problem occurs in the early phases of the project.

Hidden information or hidden action causes the moral hazard risk. This occurs *after* the contract is signed between involved parties. For instance, the client cannot be sure that firms, once hired, will fully mobilize their capabilities on the client's behalf or on behalf of other clients of theirs (Winch, 2010). In our case, four parties are potentially involved in the moral hazard problem. After the relevant contracts are signed and the project owner has hired the contractor and the project manager, and after the contractor has hired the project manager, they cannot be sure that all information will be shared in an appropriate way because of the self-interest of all the parties involved. The moral hazard problem also occurs between two project managers because they have their self-interest, as well.

Hidden intentions can cause hold-up problems. The project owner can invest some money at any stage of the project and trust that the contractor will cooperate, but it may happen that the contractor will actually behave opportunistically. After the project owner realizes that the contractor is acting opportunistically, it can be too late for the project owner to withdraw investment. The same holds in the opposite direction. The contractor can also invest some money at any stage of the project and trust that the project owner will cooperate, but it can happen that the project owner will act opportunistically.

The application of the principal-agent theory in construction project management is extensive in the literature (Ceric, 2012a). It covers all three issues of risk

concerning the relationship between the principal and agent: adverse selection, moral hazard and hold-up. Analysing papers that have been published so far, it can be concluded that most authors have researched moral hazard dealing with supply chain management, procurement systems, make-or-buy decisions and outsourcing (Rosenfeld and Geltner, 1991; Tedelis, 2002; Yiu *et al.*, 2002; Ive and Chang, 2007). Several authors have discussed the adverse selection problem and its impact on building performance and building quality (Holt *et al.*, 1995; Corvellec and Macheridis, 2010).

Risk-minimization strategies caused by information asymmetry

Project managers play the most important role in risk minimization in the construction phase, after the contract between the project owner and contractor is signed (Ceric, 2012a, in press, a). Therefore, the research presented here focuses on the construction phase and the communication risk minimization in this phase. As already noted, there are six strategies for minimizing information asymmetries between project participants according to Schieg (2008): bureaucratic control (contracts), information systems, incentives (bonuses), corporate culture, reputation and trust.

The above strategies find considerable albeit fragmentary support in the literature. They will be considered next. The relationship between project participants is generally controlled by means of *contract* (Bower and Skountzos, 2003). The contract specifies the intentions of the two parties, and so the roles and responsibilities of both sides are clear in the case any dispute arises (Simister and Turner, 2003). As Schieg (2008) points out, *information systems* promote transparency, directness and timeliness of communication, as well as permanence of the information available. Current emphasis is on digital information and improved communication through network technologies that provide tools for better exchange of information between all project participants (Emmitt and Gorse, 2007). The use of *incentives* involves payment of a bonus or incentive to a contract party for performing its work (Bower and Skountzos, 2003). In partnering, incentives are a crucial way of reinforcing collaboration in the short term and helping to build trust between project parties (Bresnen and Marshall, 2000). According to Schieg (2008), *corporate culture* plays a very special role in construction. Shared values, targets and competences minimize coordination costs. In addition, it gives identity to an organization (Cheung *et al.*, 2011). *Reputation* is a key component

of strategic competitive advantage (Jäger, 2008). Therefore, it is capable of effectively countering harmful opportunistic behaviour. However, it should be noted that reputation has relevance only with respect to past action (Wilson, 1985). According to Zaghloul and Hartman (2003), the success of any construction project is questionable without *trust* even when powerful control systems, including contracts, are available. As Kadefors (2004) argues, if trust is present, people can engage in constructive interaction without considering hidden objectives that might motivate their partners.

Grounded in large part in the principal-agent theory, the above strategies offered a coherent framework for previous research using the multi-attribute utility theory (Ceric, in press, b). The research presented here investigates the previous results from the vantage point of three dimensions of the respondents' experience: years of experience, the largest project worked on and the number of countries worked in.

Multi-attribute utility theory

As it has been pointed out already, the respondents were not directly involved at this stage of the research project. Instead, their responses from the previous two stages were analysed from the vantage point of their experience. The multi-attribute utility theory was used for this purpose once again. The utility functions are calculated by combining the relative importance of different relationships within project teams, the relative importance of risk-minimization strategies and the relative importance of the three dimensions of the respondents' experience, which are at the focus at this stage of the research. The overall utility function that ranks the strategies with respect to the dimensions of experience was thereby obtained.

The multi-attribute utility theory is a decision-making technique of long standing that is used under conditions of both certainty and uncertainty (Luce and Raiffa, 1957; Keeney and Raiffa, 1976; Flanagan and Norman, 1993; Moselhi and Deb, 1993; Saaty, 1994; Ceric, 2003). It is used for ranking of alternatives when the best one among them needs to be selected. Alternatives are weighted with respect to one or more criteria with the purpose of calculating the overall utility function for each alternative. The value of the overall utility function is used to form the ranking list of alternatives. In this research, the alternatives are risk-minimization strategies with respect to the three dimensions of project managers' experience.

The multi-attribute utility theory has been widely used as a technique for qualitative risk analysis (Hwang and Yoon, 1981; Kangari and Boyer, 1981; Ibbs and Crandall, 1982). It was also used by Ceric

(in press, b), where three dimensions of experience were not taken into consideration. Throughout, the mean values were used for the calculation of utility functions.

Leading up to new utility functions central to this paper, Figures 1 and 2 show the main results of previous research concerning risk-minimization strategies in project management (Ceric, in press, b). As can be seen from the utility function values in Figure 1, the relationship between the project owner's and contractor's project managers is crucial in the construction phase, as pointed out in the earlier stages of this research (Ceric, 2012a, in press, a).

Figure 2 shows the ranking of risk-minimization strategies, given the relative importance of the above relationships between project parties in the construction phase. Again, trust is ranked on top as the main risk-minimization strategy in construction projects, followed by bureaucratic control (contracts) and information systems. Reputation, corporate culture and incentives (bonuses) follow, in that order.

For the calculation of utility function values, maximum values of the regression equations correlating two specific relationships between project parties and strategies with respect to three dimensions of experience are used in this research (Appendix 2). The utility function values used both in previous and this research are presented in Table 1.

For the calculation of normalized utility functions, values from Table 1 are used. For example, the normalized utility function value for the relationship between the project owner and contractor and the strategy bureaucratic control (contracts) with respect to the

years of experience is calculated as follows:

$$U_{\text{norm}}(\text{PO} - \text{C, bureaucratic control, years of experience})$$
$$= \frac{7.23}{(7.23 + 6.33 + 3.84 + 5.30 + 4.41 + 5.87)}$$
$$= 0.219.$$

The sum of all normalized utility function values concerning the relationship between the project parties and six risk-minimization strategies with respect to years of experience equals one $(0.219 + 0.192 + 0.116 + 0.161 + 0.134 + 0.178 = 1)$. The normalized utility function values in previous and this research are presented in Table 2.

The overall utility function values are calculated by combining four weights of importance concerning the relationships between project parties, the utility functions for the four relationships between key parties and the six strategies using the equation with respect to each dimension of experience. The overall utility function values offer the ranking of risk-minimization strategies in the construction phase for each of the three dimensions of experience separately. For example, it is calculated for the strategy bureaucratic control (contracts) with respect to years of experience as follows:

$$U(\text{bureaucratic control, years of experience})$$
$$= 0.236 * 0.219 + 0.239 * 0.182 + 0.226 * 0.197$$
$$+ 0.298 * 0.168$$
$$= 0.190.$$

The sum of all the overall utility function values concerning all six strategies for minimizing the risks caused
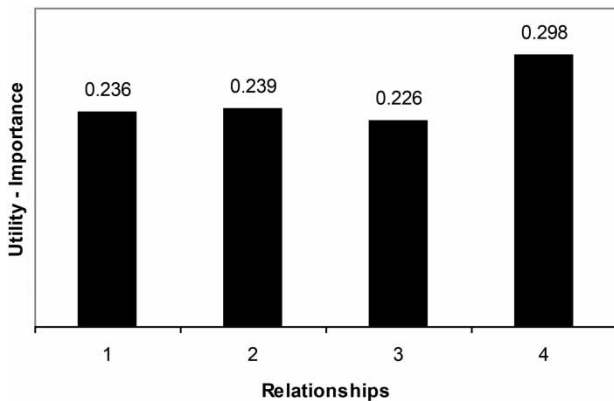

Figure 1 Utility function values for relationships between key project parties (1: project owner–contractor; 2: project owner–project owner's project manager; 3: contractor–contractor's project manager; and 4: project owner's project manager–contractor's project manager)
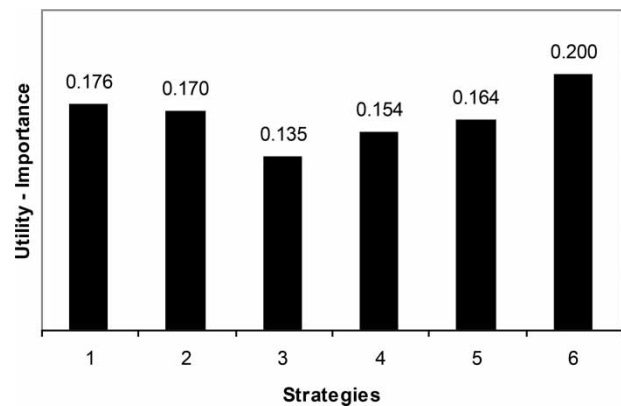

Figure 2 Overall utility function values for risk-minimization strategies (1: bureaucratic control (contracts); 2: information systems; 3: incentives (bonuses); 4: corporate culture; 5: reputation; and 6: trust)

Table 1 Utility function values

Strategies/relationships	Dimension of experience	PO–C	PO–PMpo	C–PMc	PMpo–PMc
Bureaucratic control (contracts)	Mean values	8.40	5.93	5.47	6.73
	Years	7.23	6.40	6.73	6.24
	Largest project	8.36	4.32	3.83	6.34
	Countries	8.45	5.60	5.38	6.96
Information systems	Mean values	5.60	6.73	6.47	6.80
	Years	6.33	7.07	6.69	8.01
	Largest project	5.84	8.17	8.46	7.33
	Countries	5.71	6.81	7.40	6.89
Incentives (bonuses)	Mean values	5.40	6.73	6.00	3.60
	Years	3.84	4.96	3.74	3.56
	Largest project	6.99	6.61	6.67	1.99
	Countries	7.95	6.39	6.78	4.81
Corporate culture	Mean values	5.27	6.33	6.40	5.47
	Years	5.30	3.72	4.38	5.00
	Largest project	5.15	7.95	8.14	7.31
	Countries	5.35	7.69	7.78	6.55
Reputation	Mean values	6.80	6.40	5.87	5.80
	Years	4.41	4.79	4.39	5.75
	Largest project	7.59	7.05	7.14	6.74
	Countries	7.60	6.92	6.61	5.27
Trust	Mean values	6.20	8.40	8.27	7.47
	Years	5.87	8.20	8.30	8.60
	Largest project	6.88	9.25	9.24	8.81
	Countries	5.95	8.21	7.88	6.99

by information asymmetries with respect to years of experience equals one ($0.190 + 0.202 + 0.115 + 0.132 + 0.139 + 0.222 = 1$). Figures 3–5 show the ranking of risk-minimization strategies with respect to years of experience, the largest project worked on and the number of countries worked in, respectively. It is obvious by visual inspection that they differ from the previous ranking, which is shown in Figure 2. The discussion of these differences will be presented below using Tables 3 and 4, which summarize the results of this research.

The above results will be further analysed in the following section, which is dedicated to the key findings of this research. In particular, the analysis will focus on the differences between the ranking of risk-minimization strategies established in previous research (Ceric, in press, b) and the same strategies with respect to the three dimensions of project managers' experience. As will be shown, these differences are both marked and useful for further research in this field.

Key findings

By comparison with the results presented by Ceric (in press, b), this research involves several important

findings related to the three dimensions of project managers' experience in the context of the construction phase. First, they agree on trust and incentives (bonuses) as strategies for risk minimization, which were ranked the first and the sixth in the previous research, across all the dimensions of experience. Second, they are in general agreement on information systems and reputation, previously ranked third and fourth. And third, they differ most on contracts and corporate culture, ranked second and fifth in the previous research, where the three dimensions of experience show the greatest impact. As will be shown below, the project managers' attitude to contracts is most interesting in this regard. It ranks third in terms of years of experience, fourth in terms of the number of countries worked in and fifth in terms of the largest project managed.

Project managers' experience plays an important role in the management of construction projects. It needs to be studied in greater detail in the future. The three dimensions of experience studied in this research— namely, years of experience in the field of project management, the value of the largest project managed and the number of countries worked in—need to be extended to several other dimensions: education, certification, membership in professional associations, etc.

Table 2   Normalized utility function values

Strategies/relationships	Dimension of experience	PO–C	PO–PMpo	C–PMc	PMpo–PMc
Bureaucratic control (contracts)	Mean values	0.223	0.149	0.142	0.188
	Years	0.219	0.182	0.197	0.168
	Largest project	0.205	0.100	0.088	0.165
	Countries	0.206	0.135	0.129	0.186
Information systems	Mean values	0.149	0.169	0.168	0.190
	Years	0.192	0.201	0.195	0.216
	Largest project	0.143	0.188	0.195	0.190
	Countries	0.139	0.164	0.177	0.184
Incentives (bonuses)	Mean values	0.143	0.151	0.156	0.100
	Years	0.116	0.141	0.109	0.096
	Largest project	0.171	0.152	0.153	0.052
	Countries	0.194	0.154	0.162	0.128
Corporate culture	Mean values	0.140	0.159	0.166	0.152
	Years	0.161	0.106	0.128	0.135
	Largest project	0.126	0.183	0.187	0.190
	Countries	0.130	0.185	0.186	0.175
Reputation	Mean values	0.181	0.161	0.153	0.162
	Years	0.134	0.136	0.128	0.155
	Largest project	0.186	0.163	0.164	0.175
	Countries	0.185	0.166	0.158	0.141
Trust	Mean values	0.165	0.211	0.215	0.208
	Years	0.178	0.233	0.242	0.231
	Largest project	0.169	0.213	0.213	0.229
	Countries	0.145	0.197	0.188	0.187

Such research will be useful in both training of project managers and their selection for particular construction projects.

It is interesting to note that the ranking repeatedly shows that incentives come last among the strategies investigated even though they have received considerable theoretical support in the principal-agent literature (Laffont and Mortimort, 2001). The respondents were quite unanimous about their verdict, as well. Most importantly, this was the case in terms of all three dimensions of experience considered in this research. The value of incentives in project management thus deserves a closer look in the future.
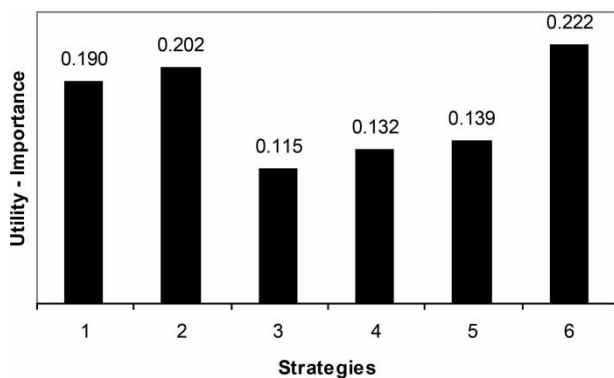

Figure 3   Overall utility function values for risk-minimization strategies with respect to years of experience (1: bureaucratic control (contracts); 2: information systems; 3: incentives (bonuses); 4: corporate culture; 5: reputation; and 6: trust)
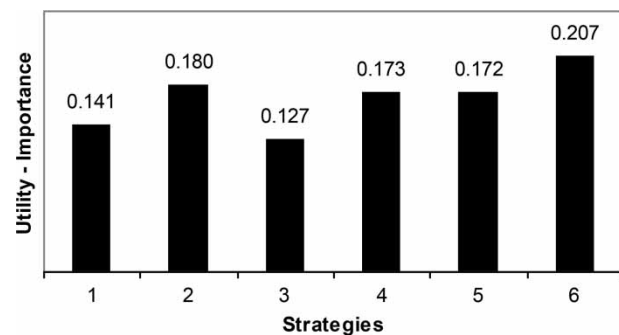

Figure 4   Overall utility function values for risk-minimization strategies with respect to the largest project worked on (1: bureaucratic control (contracts); 2: information systems; 3: incentives (bonuses); 4: corporate culture; 5: reputation; and 6: trust)
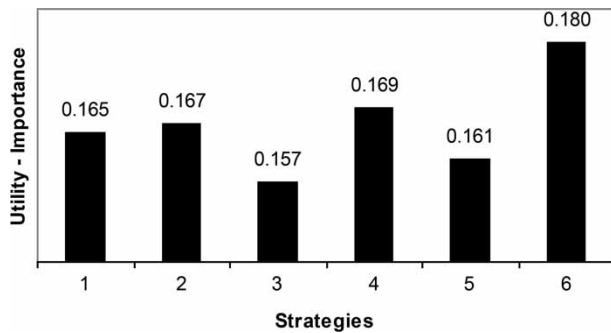
Figure 5 Overall utility function values for risk-minimization strategies with respect to the number of countries worked in (1: bureaucratic control (contracts); 2: information systems; 3: incentives (bonuses); 4: corporate culture; 5: reputation; and 6: trust)

Now, examples of regression equations and coefficients of correlation for two specific relationships between project parties and strategies with respect to dimensions of experience are shown in Figures 6 and 7. It should be noted that some of the 15 data points in a number of these charts overlap. In these cases, two or more respondents with the same experience offered identical responses to survey questions. Eight illustrations similar to Figures 6 and 7 are presented in Appendix 1. Most of them are characterized by

high slopes of regression equations and high correlation coefficients. In all these cases, the importance of a particular strategy in a particular relationship between project parties either increases or decreases with experience. However, these are illustrations only. As noted above, all regression equations and correlation coefficients are presented in Appendix 2. Throughout, the three dimensions of experience are scaled to 9.

Returning to Figure 6, it shows a very slight increase of importance of trust as a risk-minimization strategy in the relationship between the project owner's and contractor's project managers with respect to years of experience. This is illustrated both by the low positive slope of the regression equation and the low value of the correlation coefficient. As can be seen in Appendices 1 and 2, this illustrates very well all responses concerning trust. In other words, project managers who participated in this research agree on the importance of trust as a risk-minimization strategy regardless of all three dimensions of their experience.

Figure 7 is rather different in this respect. It shows that corporate culture as a risk-minimization strategy in the relationship between the project owner and project owner's project manager declines in importance with the respondents' years of experience. This figure illustrates the strongest such change with respect to any of the three dimensions of experience. In this

Table 3 Risk-minimization strategies and dimensions of project managers' experience

Strategies/experience	Years of experience	Largest projects worked on	Number of countries worked in	Previous ranking (Ceric, in press, b)
Bureaucratic control (contracts)	3	5	4	2
Information systems	2	2	3	3
Incentives (bonuses)	6	6	6	6
Corporate culture	5	3	2	5
Reputation	4	4	5	4
Trust	1	1	1	1

Table 4 Deviations from previous ranking in different dimensions of experience

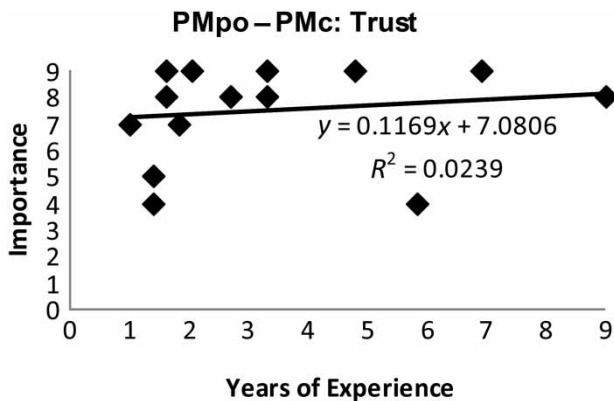| Strategies/experience	Years of experience	Largest projects worked on	Number of countries worked in	Previous ranking (Ceric, in press, b)
Bureaucratic control (contracts)	+1	+3	+2	2
Information systems	−1	−1	0	3
Incentives (bonuses)	0	0	0	6
Corporate culture	0	−2	−3	5
Reputation	0	0	+1	4
Trust	0	0	0	1

Figure 6 The importance of trust in the relationship between the project owner's and contractor's project managers by years of experience (where years are scaled to 9)

particular case, both the negative slope of the regression equation and the correlation coefficient are highest as shown in Appendix 2. However, Appendix 1 shows a number of similar examples, where the importance of a particular risk-minimization strategy either declines or increases comparatively sharply with respect to any of the three dimensions of experience.

The relationship between the six strategies for communication risk minimization and three dimensions of project managers' experience is shown in Table 3. The last column shows the ranking of strategies in the previous research (Ceric, in press, b), which is also shown in Figure 2, where dimensions of experience were not taken into consideration. The research presented here extends and elaborates the previous findings.
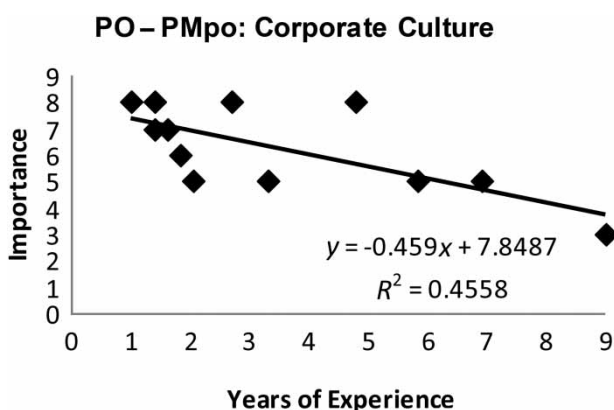

Figure 7 The importance of corporate culture in the relationship between the project owner and project owner's project manager by years of experience (where years are scaled to 9)

As can be seen from Table 3, the rankings of trust and incentives are the same as in the previous research. In particular, trust comes first and incentives last regardless of the dimensions of experience. However, the ranking of other strategies differs, and it differs considerably in some cases. The greatest difference is with the ranking of contracts and corporate culture as risk-minimization strategies. The rankings of the remaining two strategies, information systems and reputation, are roughly the same as previously. Considering different dimensions of experience, the years of experience ranking is the most similar to the previous one. The other two rankings differ considerably.

For greater clarity of these findings, deviations from the previous ranking are shown in Table 4. Here, '+' indicates a higher number and therefore a lower ranking of a particular strategy, whereas '−' indicates a lower number and a higher ranking. As can be seen once again, the smallest deviations occur with respect to the years of experience, whereas the other two dimensions differ considerably. In terms of strategies, the greatest deviations occur in the case of bureaucratic control (contracts) and corporate culture. The former would be ranked markedly lower, whereas the latter would be ranked markedly higher than previously.

Tables 3 and 4 demonstrate that the previous ranking of risk-minimization strategies is due mostly to the years of experience dimension of experience. In other words, this is the dominant dimension of experience. The other two dimensions, the largest project worked on and the number of countries worked in, have a considerably smaller impact on the ranking. Although the three dimensions of experience are perforce interrelated, these differences show that analysing them separately is a worthwhile endeavor. This is especially interesting in the context of bureaucratic control (contracts) and corporate culture, where the largest difference from previous ranking occur. Most importantly, trust matters across the board, whereas bureaucratic control (contracts) diminishes in importance with large projects and across a variety of countries.

Conclusions

The key finding of this research is that trust remains the most important strategy in the context of risk minimization in project management. And most importantly, this finding is insensitive to the dimensions of project managers' experience explored here. Similarly, incentives (bonuses) remain at the bottom of strategy rankings across all three dimensions. Although incentives have been widely studied in the context of the principal-agent theory, as has already been noted, experienced practitioners perceive them otherwise.

Still, the research presented here demonstrates that project managers' experience offers useful pointers for further research, as argued in the Introduction. Some dimensions of experience indeed point at differing approaches to risk-minimization strategies discussed in this paper. Notably, bureaucratic control (contracts) and corporate culture seem to be sensitive to the largest project worked on and the number of countries worked in. The former dimension loses in importance and the latter gains depending on the largest project worked on and countries worked in.

Additional dimensions of project managers' experience are also worth exploring in greater depth in the future. Educational experience, certification by various accreditation bodies and membership in professional organizations come first to mind. However, this research suggests that contractual and cultural differences among countries are of special interest for further research. It can be expected that trust is of particular importance in environments in which bureaucratic control (contracts) are comparatively weak and corporate culture is relatively strong.
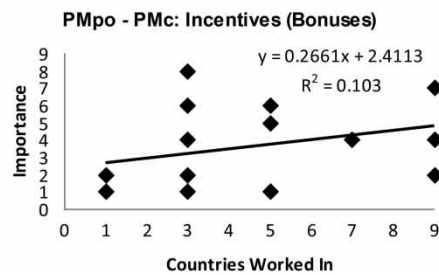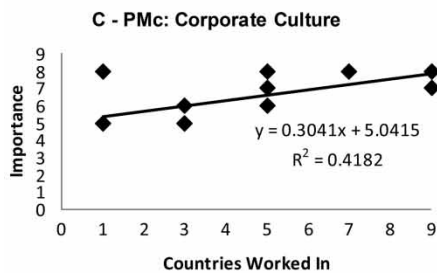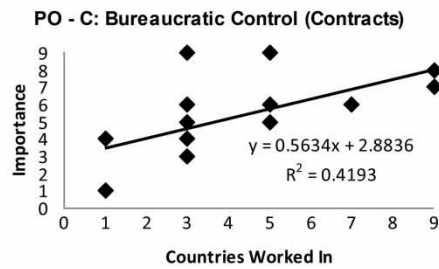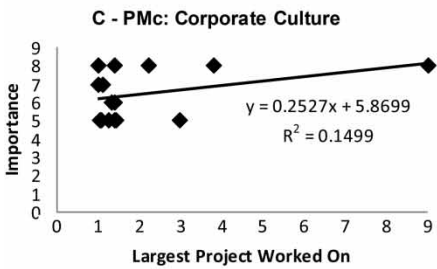
Acknowledgement

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Appendix 1. Examples of charts depicting relationships, strategies and dimensions of experience

PO - C: Bureaucratic Control (Contracts)
y = -0.2054x + 9.0783
R² = 0.1833

PO - PMpo: Reputation
y = -0.2825x + 7.3329
R² = 0.2211

C - PMc: Corporate Culture
y = -0.3541x + 7.5692
R² = 0.3745

C - PMc: Reputation
y = -0.3965x + 7.3093
R² = 0.1821

C - PMc: Corporate Culture
y = 0.2527x + 5.8699
R² = 0.1499

PO - C: Bureaucratic Control (Contracts)
y = 0.5634x + 2.8836
R² = 0.4193

C - PMc: Corporate Culture
y = 0.3041x + 5.0415
R² = 0.4182

PMpo - PMc: Incentives (Bonuses)
y = 0.2661x + 2.4113
R² = 0.103

Appendix 2. Strategies by relationship and dimension of experience—years of experience, largest project worked on and the number of countries worked in

Table 2.1 Strategies by relationship and years of experience

Strategy/relationship	PO–C	PO–PMpo	C–PMc	PMpo–PMc
Bureaucratic control				
Regression equation	$y = -0.21x + 9.08$	$y = 0.08x + 5.66$	$y = 0.22x + 4.74$	$y = -0.09x + 7.02$
Correlation coefficient	$R^2 = 0.18$	$R^2 = 0.01$	$R^2 = 0.07$	$R^2 = 0.01$
Information systems				
Regression equation	$y = 0.13x + 5.18$	$y = 0.06x + 6.54$	$y = 0.04x + 6.34$	$y = 0.21x + 6.10$
Correlation coefficient	$R^2 = 0.02$	$R^2 = 0.01$	$R^2 = 0.00$	$R^2 = 0.05$
Incentives				
Regression equation	$y = -0.27x + 6.31$	$y = -0.18x + 6.60$	$y = -0.40x + 7.31$	$y = -0.01x + 3.62$
Correlation coefficient	$R^2 = 0.07$	$R^2 = 0.05$	$R^2 = 0.18$	$R^2 = 0.00$
Corporate culture				
Regression equation	$y = 0.01x + 5.24$	$y = -0.46x + 7.85$	$y = -0.35x + 7.57$	$y = -0.08x + 5.74$
Correlation coefficient	$R^2 = 0.00$	$R^2 = 0.46$	$R^2 = 0.37$	$R^2 = 0.01$
Reputation				
Regression equation	$y = -0.42x + 8.18$	$y = -0.28x + 7.33$	$y = -0.26x + 6.72$	$y = -0.01x + 5.83$
Correlation coefficient	$R^2 = 0.35$	$R^2 = 0.22$	$R^2 = 0.10$	$R^2 = 0.00$
Trust				
Regression equation	$y = -0.06x + 6.39$	$y = -0.03x + 8.51$	$y = 0.01x + 8.25$	$y = 0.12x + 7.08$
Correlation coefficient	$R^2 = 0.00$	$R^2 = 0.01$	$R^2 = 0.00$	$R^2 = 0.02$

Table 2.2 Strategies by relationship and largest project managed

Strategy/relationship	PO–C	PO–PMpo	C–PMc	PMpo–PMc
Bureaucratic control				
Regression equation	$y = -0.01x + 8.41$	$y = -0.23x + 6.42$	$y = -0.24x + 5.96$	$y = -0.06x + 6.85$
Correlation coefficient	$R^2 = 0.00$	$R^2 = 0.04$	$R^2 = 0.06$	$R^2 = 0.00$
Information systems				
Regression equation	$y = 0.03x + 5.53$	$y = 0.21x + 6.30$	$y = 0.29x + 5.86$	$y = 0.08x + 6.64$
Correlation coefficient	$R^2 = 0.00$	$R^2 = 0.05$	$R^2 = 0.08$	$R^2 = 0.01$
Incentives				
Regression equation	$y = 0.23x + 4.92$	$y = 0.09x + 5.81$	$y = 0.10x + 5.80$	$y = -0.23x + 4.09$
Correlation coefficient	$R^2 = 0.04$	$R^2 = 0.01$	$R^2 = 0.01$	$R^2 = 0.04$
Corporate culture				
Regression equation	$y = -0.02x + 5.30$	$y = 0.23x + 5.84$	$y = 0.25x + 5.87$	$y = 0.27x + 4.91$
Correlation coefficient	$R^2 = 0.00$	$R^2 = 0.09$	$R^2 = 0.15$	$R^2 = 0.06$
Reputation				
Regression equation	$y = 0.11x + 6.56$	$y = 0.09x + 6.20$	$y = 0.18x + 5.48$	$y = 0.14x + 5.52$
Correlation coefficient	$R^2 = 0.02$	$R^2 = 0.02$	$R^2 = 0.04$	$R^2 = 0.01$
Trust				
Regression equation	$y = 0.10x + 5.99$	$y = 0.12x + 8.14$	$y = 0.14x + 7.97$	$y = 0.19x + 7.06$
Correlation coefficient	$R^2 = 0.01$	$R^2 = 0.10$	$R^2 = 0.09$	$R^2 = 0.05$

Table 2.3 Strategies by relationship and the number of countries worked in

Strategy/relationship	PO–C	PO–PMpo	C–PMc	PMpo–PMc
Bureaucratic control				
Regression equation	$y = 0.01x + 8.35$	$y = -0.07x + 6.26$	$y = -0.02x + 5.55$	$y = 0.05x + 6.51$
Correlation coefficient	$R^2 = 0.00$	$R^2 = 0.01$	$R^2 = 0.00$	$R^2 = 0.00$
Information systems				
Regression equation	$y = 0.02x + 5.49$	$y = 0.02x + 6.66$	$y = 0.21x + 5.55$	$y = 0.02x + 6.71$
Correlation coefficient	$R^2 = 0.00$	$R^2 = 0.00$	$R^2 = 0.08$	$R^2 = 0.00$
Incentives				
Regression equation	$y = 0.56x + 2.88$	$y = 0.09x + 5.61$	$y = 0.17x + 5.23$	$y = 0.27x + 2.41$
Correlation coefficient	$R^2 = 0.42$	$R^2 = 0.02$	$R^2 = 0.05$	$R^2 = 0.10$
Corporate culture				
Regression equation	$y = 0.02x + 5.18$	$y = 0.30x + 5.00$	$y = 0.30x + 5.04$	$y = 0.24x + 4.40$
Correlation coefficient	$R^2 = 0.00$	$R^2 = 0.29$	$R^2 = 0.42$	$R^2 = 0.10$
Reputation				
Regression equation	$y = 0.18x + 6.01$	$y = 0.11x + 5.89$	$y = 0.16x + 5.14$	$y = -0.12x + 6.32$
Correlation coefficient	$R^2 = 0.09$	$R^2 = 0.05$	$R^2 = 0.06$	$R^2 = 0.02$
Trust				
Regression equation	$y = -0.06x + 6.45$	$y = -0.04x + 8.59$	$y = -0.09x + 8.65$	$y = -0.11x + 7.94$
Correlation coefficient	$R^2 = 0.01$	$R^2 = 0.02$	$R^2 = 0.07$	$R^2 = 0.03$