Communication risk in contruction projects: Application of principal-agent theory

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Research paper

THE IMPACT OF A MULTIPLE PRINCIPAL-AGENT PROBLEM ON COMMUNICATION RISK IN CONSTRUCTION PROJECTS IS ADDRESSED. THE FOCUS HERE IS ON COMMUNICATION ISSUES BETWEEN THE PROJECT OWNER, THE CONTRACTOR, AND THEIR PROJECT MANAGERS, AS WELL AS BETWEEN THE TWO PROJECT MANAGERS WORKING FOR THEM. These are the key four parties in any construction project. In construction projects, the principal-agent problem is even more pronounced than is usually the case because of their short-term employment relationship. This problem is characterized by three issues concerning the relationship between the principal and the agent: adverse selection, moral hazard, and hold-up. Asymmetric information is common to all three. An exploratory survey was conducted in order to establish an understanding of the relative importance of the relationships between the key project parties in terms of the above communication risks. The respondents were project managers with considerable experience in the construction field. They agree that the main relationship in a construction project before the contract is signed is that between the project owner and contractor. However, they suggest that the main relationship after the contract is signed is that between the project owner's and contractor's project managers, both of whom are agents, which points to new and promising areas for further research.

Keywords

principal-agent theory, asymmetric information, communication risk, construction projects, project management

INTRODUCTION

Good communication between project participants is crucial for project success. Poor communication is one of the most common project risks (Ceric, 2003; Zerjav and Ceric, 2009). Communication within construction projects is a multifaceted phenomenon spanning multiple disciplinary fields, multiple organizational levels, as well as multiple perspectives and interpretations. Participants need to collaborate, share, collate, and integrate significant amounts of information to realize project objectives (Emmitt and Gorse, 2007; Emmitt 2010).

Adverse selection	Moral hazard	Hold-up
Adriaanse, A., and Voordijk, H. (2005) Bajari, P., *et al.* (2008) Brockmann, C. (2009) Floricel, S., and Lampel, J. (1998) Holt, G., *et al.* (1995) Ive, G., and Chang, C.Y. (2007) Lampel, J., *et al.* (1996a, 1996b) Lützendorf, T., and Speer, T.M. (2005) Love, P.E.D., *et al.* (2008) Müller, R., and Turner, J.R., (2005) Ong, S. (1999) Rosenfeld, Y., and Geltner, Z. (1991) Turner, J.R., and Müller, R. (2004) Ward, S., and Chapman, C. (2008) Winch, G. (2010) Yiu, C.Y., *et al.* (2002)	Atkinson, R., *et al.* (2006) Bajari, P., and Tadelis, S. (2001) Berends, K. (2007) Corvellec, H., and Macheridis, N. (2010) Demski, J., and Dye, R. (1999) Farrell, L.M. (2003) Gonzales, M. (1998) Lampel, J., *et al.* (1996a, 1996b) Mang, P. (1998) McAfee, R., and McMillan, J. (1986). Missbauer, H., and Hauber, W. (2006) Müller, R., and Turner, J.R., (2005) Schieg, M. (2008) Sorrell, S. (2003) Turner, J.R., and Müller, R. (2004) Walker, A., and Wing, C. (1999) Ward, S., and Chapman, C. (1994) Ward, S., *et al.* (1991) Winch, G. (2010)	Bajari, P., and Tadelis, S. (2001) Chang, C.Y., and Ive, G. (2007a, 2007b) Schieg, M. (2008) Tadelis, S. (2002) Unsal, H.I., and Taylor, J.E. (2010, in press)

Table 1 Key construction-related literature by main issues in principal-agent theory

Information asymmetry is the situation in which one of the two parties is better informed than the other. One of the best known applications of information asymmetry in economics is the *principal-agent problem* (*e.g.*, Jäger, 2008). Either buyers or sellers do not have reliable information about a particular product or service. For example, a project owner as buyer is less well informed about the quality of a constructed facility than a contractor as seller. Similarly, a contractor as buyer is better informed about the key characteristics of a construction project—such as time, cost, and quality—than an insurance company as seller of project insurance, for instance.

The project owner and the contractor form the key relationship in construction projects (Turner and Müller, 2004). Delegation of tasks establishes a principal-agent relationship between the project owner and contractor, where the principal (project owner) depends on the agent (contractor) to undertake a task on the principal's behalf (Müller and Turner, 2005). One can act on assumption that agents will try to maximize their own benefit even when that may involve a higher damage to the client (Schieg, 2008). This problem is characterized by three issues of risk concerning the relationship between the principal and the agent: adverse selection, moral hazard, and hold-up. Briefly, adverse selection occurs when the principal does not have the exact qualifications of the agent before the contract is signed. In the case of moral hazard, the principal cannot be sure that the agent will fully act on the principal's behalf after the contract is signed. Hold-up occurs when the principal has invested some resources in the belief that the agent will behave appropriately, but the agent acts opportunistically after the contract is signed (Jäger, 2008; Schieg, 2008).

In this paper, the multiple principal-agent problem in construction projects is addressed. The three issues mentioned above are central to the argument. What makes this paper different from those published so far is that the focus here will be on communication issues between four parties involved in construction projects: project owner, contractor, and their project managers. In the literature we can find "classical" principal-agent theory applied to construction projects that discusses issues between the project owner and the project manager working on the project owner's behalf, as well as the contractor and the contractor's suppliers, but none have discussed the relationships and communication risks of all four parties mentioned above, who perforce play the most important role in every construction project.

Of course, other participants may play important roles in construction projects. These include consultants, such as designers, and sub-contractors. However, the four parties discussed here play key roles in all construction projects, as project owners and contractors typically engage project managers. Moreover, project managers involved in construction projects are typically professionals concerned with a wide variety of construction-related disciplines, most often based in civil engineering. This is why they have been selected for special attention in this research.

It should be mentioned that many papers using the principal-agent framework can be found in the construction literature. They cover a wide spectrum of issues, which do not warrant detailed analysis here because they do not address the four key parties discussed

in this paper, but the most important among these papers have been classified by the key principal-agent theory issues—adverse selection, moral hazard, and hold-up. Potentially useful to future researchers in the field, the classification is presented in Table 1. It offers an indication of the relative importance of the key issues covered by the construction literature. To date, moral hazard has attracted most attention in the construction field, followed by adverse selection. The hold-up issue has attracted least attention so far.

In the pages that follow, the principal-agent theory framework in construction projects is first introduced. Special emphasis is placed on the communication risk in connection with asymmetric information. Then an exploratory survey of project managers is presented. Collectively, they bring considerable expertise, and their perceptions of communication risks are central to this paper because they play important roles in all construction projects. A section is thus dedicated to these perceptions. The main findings of the survey follow. They are largely qualitative in nature, but they provide sufficient guidance for future research. In particular, the relationship between project managers as agents in the construction phase of a project deserves greater attention. The paper closes with conclusions that focus on future research.

Principal-Agent Theory Framework for Construction Projects

The owner of a project is the person or group that provides the financial resources for its delivery, accepts the project milestones, and project completion (Project Management Institute, 2000). The project owner hires a contractor to perform all the activities required to complete the project. According to the principal-agent theory, the relationship between the two parties also involves self interest of each party, which is also shown in Figure 1.

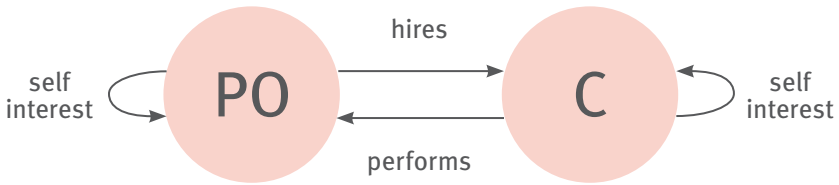

Figure 1: **Project Owner - Contractor relationship (PO: Project Owner C: Contractor)**

Also, the project owner and the contractor delegate their tasks to their project managers. Therefore, there are four different parties involved in the project even before its execution starts. It should be noted that the contractor's project manager is understood here as the person who is in overall charge of a particular project on contractor's behalf irrespective of the title. Namely, in some business environments this role is played by consultants.

However, it is important to note that project owner's and contractor's project managers play important roles in any construction project even though they are not in a contractual relationship with each other. They can be praised or blamed for success or failure of the project and they thus have a great moral responsibility (Corvellec and Macheridas, 2010). Because they are so important for the success of any project, their perceptions of communication risks between the key participants in construction projects should be explored in greater detail, which has not been done before.

It is commonly assumed that all participants in the project will work smoothly together in order to achieve the same goal. However, there is a potential conflict of interests between the participants because they all have their self interests, too. Extending Figure 1, the relationships between all the above mentioned participants taken together are shown in Figure 2. These are the key parties to any construction project. Considering only pairs of these parties, as is commonly the case in the existing literature, obscures the complexity of these relationships. The relationship between project managers, which has been neglected so far, is thus set in its proper context.

As can be seen in Figure 2, the project owner acts as the principal in relation to both the project owner's project manager and contractor as agents, and the contractor acts as the principal in relation to the contractor's project manager. Therefore, there are two principals and three agents involved, where the contractor is both the principal and agent in a project. This is why this complex set of relationships can be called a multiple principal-agent problem that needs to be addressed in the context of human resources management. Again, Figure 2 shows the key relationships that occur in every construction project.

The project owner provides the financial resources and hires the contractor. This is the key relationship in this case. According to Turner and Müller (2004), the owner is particularly interested in the following:

- the end deliverable will meet their functional requirements
- the right project process is being followed to successfully deliver the required end deliverables in the optimum way
- the project will meet the required quality, budget, and schedule requirements
- appropriate control mechanisms are in place to achieve the above
- the project manager is behaving in a professional and trustworthy manner

The project owner hires a project manager in order to achieve the goals of the project. The project owner's project manager works closely with the contractor's project manager and monitors all the actions that the contractor's proj-

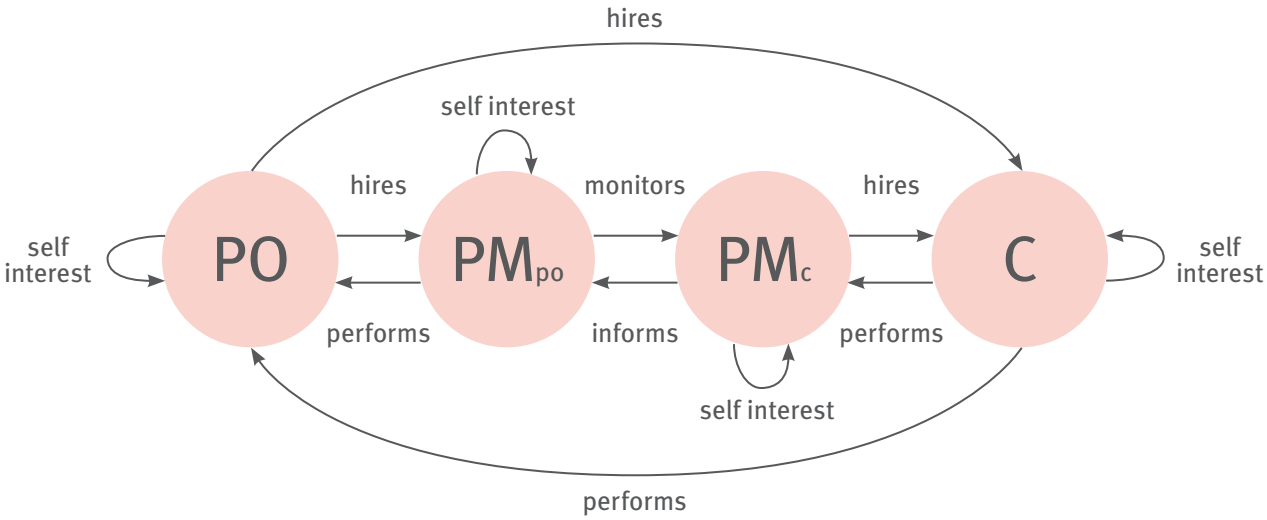

Figure 2: **Principal-agent theory framework for construction projects (PO: Project owner, C: Contractor, PMpo: Project owner's project manager, PMc: Contractor's project manager)**

ect manager takes to achieve the goals of the project, but also to satisfy the project owner. The project owner and contractor communicate in two ways: directly and indirectly—through their project managers. Although all four parties ostensibly have the same goal, they have their own self interests, as well. Some of the information will be shared only when the participants are willing to do so.

The situation in which one of the two cooperation partners is better informed than the other is characterized by *asymmetric information* (Schieg, 2008). The concept of asymmetric information is of great value to modern economic theory (Stiglitz, 2000). After Akerlof (1970), much has been written on this subject. In 2001, George Akerlof, Michael Spence, and Joseph Stiglitz shared a Nobel prize in economics for this important work.

Asymmetric information and its applications are covered by substantial literature. In the presentation of the theory, this paper relies on Jäger (2008) and Schieg (2008), which provide useful overviews of the theory. The reminder of this section of the paper follows them in the presentation of the key concepts used.

Asymmetric Information and Communication Risk

As argued in the Introduction, information asymmetries apply whenever the principal and the agent are not in possession of the same information at the same time. In construction projects, we have four key parties that work together, and it is assumed that they 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. Specifically, 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 following risks: *adverse selection, moral hazard*, and *hold-up*.

Adverse selection describes information asymmetries when the principal does not have the exact qualifications of the agent. It occurs *before* the contract between them is signed. The result can be the wrong choice of the contractual partner. In the case of the moral hazard there are information asymmetries *after* the contract is signed. The principal cannot control all the agent's activities and an information imbalance in favour of the agent can occur. If the agent uses this situation opportunistically, then this type of asymmetric information is called moral hazard. If the principal makes large investments in money or other resources because of the trusty relationship with the agent, and if these investments get lost in the case that the agent acts uncooperatively, these result with the problem called hold-up. The principal has already made an irreversible investment and this enables the agent to confront the principal with excessive demands, for instance.

Asymmetric Information in Construction Projects

Based on the principal-agent theory, relationships between the project owner and contractor, as well as the two project managers are systemized according to related asymmetric information and corresponding types of risk. Hidden characteristics are associated with adverse selection; hidden action and/or hidden information are associated with moral hazard; and hidden intentions are associated with hold-up.

Hidden characteristics cause the adverse selection problem *before* the contract is signed between involved par-

ties. 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. Generally, these phases are the most important from the risk point of view. The early phases of a project are of particular interest because the level of influence on total project costs is highest early on, whereas the impact of early decisions on total project costs is the highest (Hendrickson and Au, 1989). The potential influence of stake-holders is also highest in the early project phases, before a detailed agenda is set and the cost for making changes is low (Kolltveit and Grønhaug, 2004).

Hidden information or hidden action causes the moral hazard risk. This occurs *after* the contract is signed between involved parties. For example, 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 their self interest. People will not act in the interest of others, their principals or partners, to the exclusion of their own preferences (Eisenhardt, 1989; Jensen, 2000). 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 can happen that the contractor will act opportunistically. After the project owner realizes that the contractor is behaving 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.

Risk Minimization

There are several ways to minimize risks that arise from adverse selection, moral hazard, and hold-up problems. These are known as *screening* and *monitoring* (Jäger, 2008; Schieg, 2008). As both screening and monitoring represent costs, they are known in the literature as "agency costs." The purpose of screening is to gather information of use to the principal in an effort to learn more about the agent's qualifications—for instance, references, certificates, work probes, and credit worthiness. It helps reduce the adverse selection risk. Similarly, the purpose of monitoring the agents is to ascertain that they are behaving in accordance with the contract. That is, it helps reduce moral hazard and hold-up risks. In the exploratory survey presented below, monitoring will be shown to be of particular interest in this research.

Exploratory Survey

An exploratory survey was used to establish the relative importance of communication risk sources and types of relationship in construction projects (Appendix). Since this research is exploratory in nature, a questionnaire survey was considered an appropriate tool (Bailey *et al*., 1995). The objective was to establish an understanding of the relative importance of a number of communication risks established in the literature. The respondents were project managers with considerable experience and expertise in the field. They were selected for this study because they play central roles in all construction projects. Their perceptions of communication risks are thus important. However, the survey respondents cannot be said to be representative of all project managers, the population of which is beyond the scope of this paper.

Out of thirty-five construction project managers approached, twenty-seven participated in the survey (response rate: 75 percent). Several of them were involved in an initial pilot survey to ensure its comprehensibility. On the average, the respondents had fifteen years of experience on a wide variety of construction projects. The largest projects they had managed had an average value of $1 billion. Many of the largest projects were in infrastructure, but all other types of projects were represented. Collectively, the respondents worked on construction projects in a wide range of countries on most continents. Among more than thirty countries, they worked in Egypt, Hong Kong, India, Iraq, Italy, Pakistan, Poland, Russia, Saudi Arabia, Spain, Switzerland, Turkey, the United Kingdom, and the United States. They can therefore be understood as experts in the field. The respondents were asked to offer their perceptions, and they felt comfortable expressing them.

Following the principal-agent theory, there were five main questions, which were divided into two sections. The first section concerned three issues of information asymmetry (adverse selection, moral hazard, and hold-up), which correspond to their three sources (hidden characteristics, hidden information, and hidden intentions), while the second section concerned two types of communication risk minimization (screening and monitoring). The questions were formulated in such a fashion that the above key concepts were introduced only descriptively, so as to avoid the recognition of these concepts from

the literature by the respondents. The respondents were asked to rate the importance of each issue addressed in five questions in terms of the four relationships between the key project parties. The scale used was from one to nine, where the highest value was considered to be the most important.

The scale used here is ostensibly ordinal, and ordinal data do not permit statistical analysis using means and standard deviations, but only medians and ranges instead (Stevens, 1946). However, the scale used here can be meaningfully interpreted as the interval scale, as it involves only levels of importance, from least to most important. Each level of importance can be interpreted as the same as any other, and the scale can thus be interpreted as linear. In such a case, especially if the scale is sufficiently wide, it is permissible to treat the ordinal scale as an interval one (Knapp, 1990). Therefore, means and standard deviations can be used in the statistical analysis applied to the interpretation of the data.

However, this paper does not rely on statistical analysis. The means and standard deviations presented below are used mainly as indicators of the relative importance of various relationships studied. As such, they provide pointers for future research. Given the paucity of research concerning the relationship between the project managers as agents directly involved in the construction phase of a project, the exploratory survey presented here offers suggestions rather than definitive claims, let alone proofs.

Project Managers' Perceptions of Communication Risks

Before turning to the main findings, it is useful to review the responses to the last section of the survey, which elicits the respondents' comments. In particular, the respondents were asked to list specific communication risks between the four project parties, as well as the most appropriate risk-minimization approaches in each of the four relationships between them. The most important responses are presented in this section so as to give substance to the argument that follows, which concerns the relative importance of each relationship in different principal-agent contexts.

A significant proportion of pertinent responses refer to the relationship between the project owner and contractor, on the one hand, and the project owner's and contractor's project managers, on the other. The latter relationship deserves special attention, as will be argued in the next section with the main findings. So far, this relationship has not received any attention from the research community concerned with the construction field, but the research reported here shows that it is crucial in the monitoring phase of the project, when construction actually takes place. What follows are pertinent comments regarding all relationships covered by this research.

Project Owner-Contractor

According to one respondent, "there is no direct communication between the project owner and contractor because project managers act as a buffer between parties. Appropriate communication protocol must be set up." Another respondent suggests that "all critical issues should be openly discussed without hidden agendas due to the very complex nature of the construction process." Yet another states that "the highest risk is the inability of the owner to clearly explain what is expected from the contractor—unclear scope definition, vague expectations, etc." Two respondents mention "incomplete progress reports" and "incomplete contract and design documents." What is needed, according to one respondent, is "clear and consistent change-management from the project owner's side." Given that the respondents perceive this relationship as crucial in construction projects before the contract is signed, as will be shown below, there is a need for better communication between them.

Project Owner-Project Owner's Manager

One respondent states that there is a "lack of on-time reports." Another states that "clear definitions of responsibilities" are needed. Clearly, this relationship deserves much more attention in the future.

Contractor-Contractor's Project Manager

According to one respondent, "the project manager should be assigned from the core of the organization, so that he or she would be in position to make better assessment concerning possible conflicts and guide the higher management." Again, much more attention is required here in future research.

Project Owner's Project Manager-Contractor's Project Manager

Six respondents state that "this relationship is the most important" after the contract is signed. According to one of them, "project owners and contractors usually have more than one project, so it is most important for their project managers to work together." Another respondent argues that "this relationship is the most subjective one." According to one respondent, "the social relationship should extend outside of the project—*i.e.* by means of their families." Another respondent suggests that "both project managers should have the same level of authority; if this is not the case, the decision-making process can be negatively affected." One respondent states that "the main risk is that the project owner asks for improvements that are assumed to be included in the project, but the contractor assumes that they should be paid for on top of the project." As already stated, the two project managers play a key role after the contract is signed. This is especially important in the construction phase of the project.

Survey Question/Relationship		Project owner – Contractor	Project owner -Project owner's project manager	Contractor -Contractor's project manager	Project owner's project manager -Contractor's project manager
Contract partner's qualifications are not fully known before contract is signed between parties	Mean	7.48	6.85	6.12	5.96
	Standard deviation	2.26	1.93	2.22	2.44
Behavior of contract partner cannot be fully assessed after contract is signed between parties	Mean	7.30	6.96	6.24	6.96
	Standard deviation	1.54	1.48	1.76	1.80
Contract partner's intentions are not fully known after contract is signedbetween parties	Mean	7.41	6.85	6.48	7.04
	Standard deviation	1.72	1.96	1.44	2.07
Gathering information to learn about partner's behavior before contract is signed between parties	Mean	8.41	7.23	6.68	6.08
	Standard deviation	1.05	1.58	1.93	2.23
Gathering information to learn about partner's behavior after contract is signed between parties	Mean	7.15	6.81	6.56	7.27
	Standard deviation	1.97	1.92	1.94	2.16

Table 2: **Results of the explorative survey questionnaire**

Main Findings

The main findings of the exploratory survey can be presented in two steps. The first concerns the first four questions, whereas the second concerns the fifth and last question, which points to an important finding regarding the relationship between the two project managers.

In the first four questions, the first three of which concern the sources of communication risk and the fourth concerns risk minimization (see Appendix), the responses suggest that the most important relationship in any project is perceived to be that between the project owner and the contractor as principal and agent. This is indicated by the highest mean values of responses and low standard deviations between them (Table 2). The second most important relationship in these four questions was that between the project owner and the project manager working on the behalf of the project owner. Again, means and standard deviations are used here mainly to indicate relative importance of different relationships rather than to demonstrate their relative strength by means of statistical analysis.

Table 2. Results of the explorative survey questionnaire.

The responses to the fifth and last question, which concerns risk minimization after contracts are signed between the main parties, show a novel result: according to the project managers surveyed, the most important relationship appears to be that between the project owner's and contractor's project managers, both of whom are agents. This is shown by the highest mean value, which represents an important finding. In addition, a bar chart showing all responses to this question can be found in Figure 3. It shows that eleven out of twenty-seven respondents (or 42 percent) consider this relationship the most important, as witnessed by the highest mark assigned to it. The distribution of responses is sharply skewed toward this claim. These findings suggest that the relationship between project managers, as shown in Figure 2, has thus far been neglected in the literature. It can be hoped that the diagram will therefore be useful in guiding future research.

Figure 3: The relationship between the Project Owner's Project Manager and Contractor's Project Manager in the monitoring phase of a project as rated by the survey respondents on the scale from 1 to 9 (where 9 is "most important")

It is interesting to note that the standard deviation of ratings of different relationships in all five questions

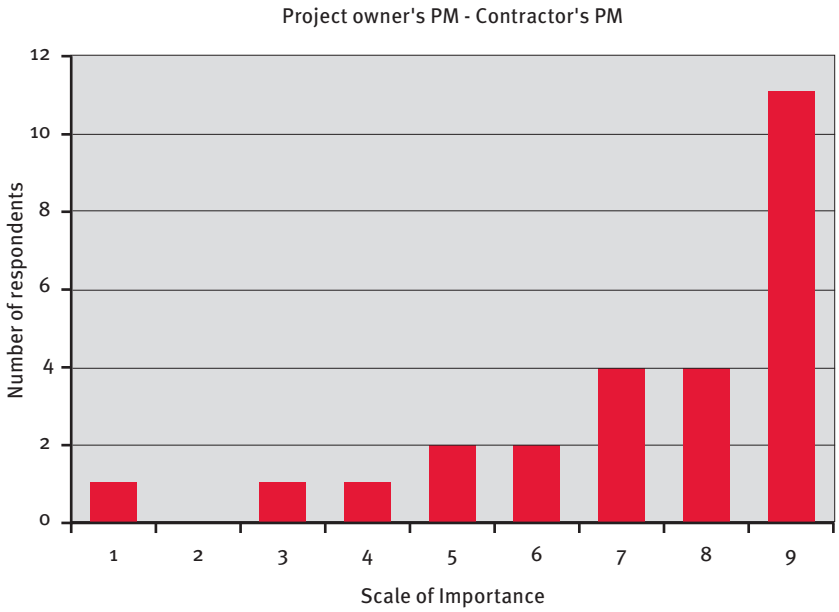

Figure 3: The relationship between the Project Owner's Project Manager and Contractor's Project Manager in the monitoring phase of a project as rated by the survey respondents on the scale from 1 to 9 (where 9 is "most important")

was highest in the case of the relationship between the project owner's and contractor's project managers. This suggests that respondents were least in agreement concerning their own role in the management of construction projects. However, it should be pointed out that the respondents appear not to have a bias regarding the importance of the relationship between the project owner and contractor, which they consider the most important one in the first four questions.

Conclusions

The main purpose of this paper was to guide future research. The exploratory survey offers an indication of the relative importance of different relationships between the key participants in construction projects. Although the results cannot be statistically demonstrated due to the nature of the exploratory survey presented here, they still point to an important area of investigation that deserves greater attention. Future research is needed in several inter-related areas.

The relationships between the four parties shown in Figure 2 have been examined in this paper only from the horizontal axis upwards. This emphasizes the perspective of the principals involved. The lower part of the diagram, which stresses the perspective of the agents, needs to be explored in the future. In terms of the principal-agent theory, this primarily concerns risk minimization strategies by all agents involved. In particular, this involves *signalling* and *reputation*—that is, marketing and good performance (Jäger, 2008).

Future research should also consider more complex relationships between construction project participants, and especially the agents. In particular, this involves consultants, such as designers, as well as sub-contractors, of which there are many in construction projects. The relationships shown in Figure 2 can be widened to better understand the complexities of the construction process beyond the four key participants investigated here.

Of course, the relationships shown in Figure 2 are of great interest to human resource management as a field. The relationship between project owner's and contractor's project managers, as well as their teams, which often include temporary members of other firms, remains an unexplored area within human resource management.

As key agents in every project, experienced project managers can be helpful in finding ways to improve their communication, both formal and informal. The Delphi method can be used to extend this exploratory research and deepen our understanding of possible improvements in communication between project managers involved in the same project. Project managers' perceptions will be crucial in such research, as well. Throughout, the principal-agent theory promises to be most useful in guiding research design.

Akerlof and Shiller (2009) offer useful guidelines for further research into behavioral economics in general. This is a field with many promises in project management as applied to the construction field, as well. They are concerned with notions such as confidence, fairness, corruption and bad faith, and money illusion. All of these notions involve asymmetric information. Assuming such problems away only makes actual problems encountered in the project management practice that much more difficult to resolve.

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Appendix: Survey Questionnaire

COMMUNICATION RISKS IN CONSTRUCTION PROJECTS — INTRODUCTION

This research has to do with the relationship between the project owner, contractor, and their project managers (see diagram below). These four parties are crucial to the success of every project. This research focuses on risks associated with their communication. Research to date has shown that communication is of vital importance to the success of construction projects. The focus here is on information asymmetry in the project-management process. An example of information asymmetry is when one party does not fully know what the other knows or does. It has been shown that this form of asymmetry is central to explaining key problems in many other fields. Extending this research to construction management may in time contribute to its further development.

SURVEY QUESTIONS

A. General information

Note that all private information will remain confidential. Only statistical data pertaining to all respondents will be made public.

1. Name:
2. Educational background:
3. Professional qualifications:
4. Current job title:
5. Years of experience in project management:
6. Value of largest project managed in $US:
7. Countries where worked:

B. Information asymmetry – Sources of communication risk

Note that information asymmetry changes once the contracts between different parties involved in a project are signed. Only three contracts are involved in the process as described in the diagram above. These are contracts between the project owner and contractor, as well as contracts between them and their project managers.

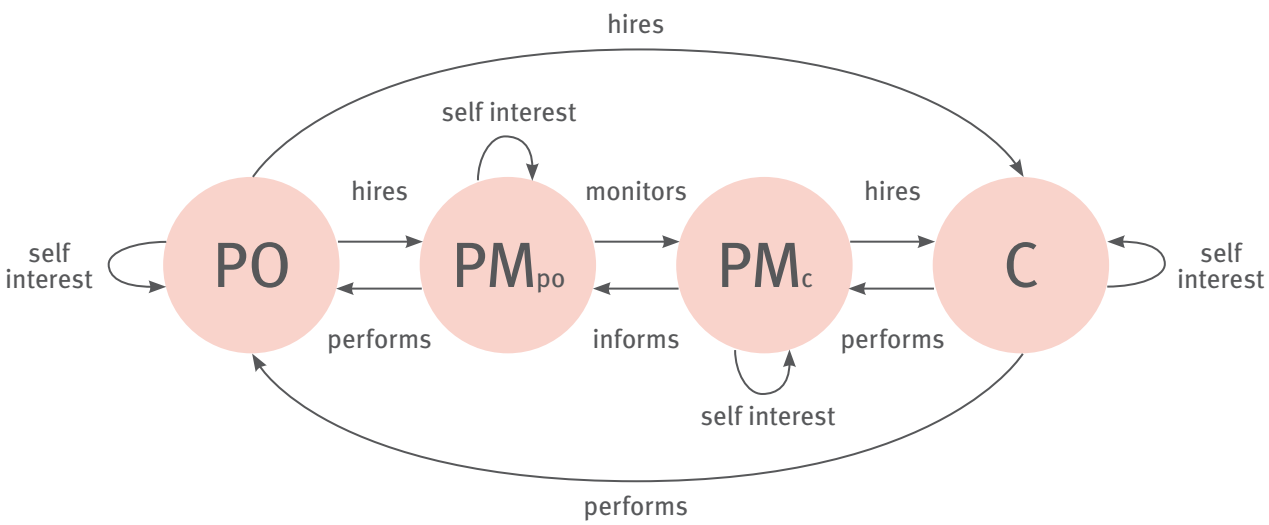
C. Risk minimization – Ways to reduce information asymmetry

As in Part B above, information asymmetry changes once the contracts between different parties involved in a project are signed. Again, there are only three contracts involved: between the project owner and contractor, as well as contracts between them and their project managers.

D. Communication risks

Please list specific communication risks between the project parties that you consider most important for project success. If possible, also list most appropriate risk-minimization approaches in each case.

- Project owner – contractor:
- Project owner – Owner's project manager:
- Contractor – Contractor's project manager:
- Owner's project manager – Contractor's project manager:



PO: Project owner; C: Contractor; PMpo: Owner's project manager; PMc: Contractor's project manager

Please use the scale from 1 to 9 (where 9 is "most important") to rate the importance of each relationship between project parties in terms of communication risk involved:

From – To	Project owner - Contractor	Project owner - Owner's project manager	Contractor - Contractor's project manager	Owner's project manager - Contractor's project manager
Contract partner's qualifications are not fully known before contract is signed between parties				
Behavior of contract partner cannot be fully assessed after contract is signed between parties				
Contract partner's intentions are not fully known after contract is signed between parties				

Please comment on the communication relationships above that you consider most important:

Please use the scale from 1 to 9 (where 9 is "most important") to rate the importance of each relationship between project parties in terms of communication-risk minimization:

From – To	Project owner - Contractor	Project owner - Owner's project manager	Contractor - Contractor's project manager	Owner's project manager - Contractor's project manager
Gathering information to learn about partner's behavior before contract is signed between parties				
Gathering information to learn about partner's behavior after contract is signed between parties				

Please comment on the communication relationships above that you consider most important: