

# Identification of Enabling Factors for Collaboration in Management of Risk in Construction Projects: A Literature Review

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**Abstract** - The increasing complexity, uncertainty and competition in construction industry have necessitated new approaches to managing project risks. In particular it has resulted into the development of collaborative approaches and diverse relationships among project participants. This paper critically reviews literature to identify key enabling factors for collaboration in management of risk in construction projects. The review identified fourteen factors which can be considered critical for collaboration within construction projects. Trust, open communication, commitment, fairly drafted contract, good relationship, skills/competence, information sharing, knowledge sharing, no-blame culture, mutual understanding, flexibility, seamless operation; proactive problem solving and fair distribution of responsibility are the most important enabling factors for collaboration.

**Keywords:** Construction projects, factors for collaboration, risk management

## 1.0 INTRODUCTION

Risks and uncertainty in construction projects increase with complexity of projects. Therefore, as projects increasingly become complex and big in size, new more effective approaches are sought to manage risks and uncertainty. One such approach, that is increasingly advocated for in the construction industry is collaborative risk management. Effective collaboration between the client, design team and contractor has been shown to enhance risk and uncertainty management through improving the dynamic capabilities of project participants (Davies *et al.*, 2016). This approach was first advocated in the 1990s (Faulkner and De Rond, 2000). Throughout the academic literature, there are countless definitions of collaboration, as well as various opinions on what are the factors which could enable collaboration to be successful. This research presents a review of literature on enabling factors for collaboration in management of risks in construction projects. The objective of this review is to identify the factors considered by most authors to be critical to enabling collaboration among project key players. These factors are expected to form a basis and framework for

enhancing joint risk management in construction projects and hence improve project performances.

Early literature on collaborative approaches in construction and project management were published in 1990s (Latham, 1994; Mayer *et al.*, 1995; Bennet and Jayes, 1995; Love *et al.*, 1998; Zaheer and McEvily, 1998; and Chua *et al.*, 1999). This paper, although fundamentally reviews the factors enabling collaboration among project participants, it also evaluates the growth made in this young approach in construction risk management.

## 2.0 COLLABORATIVE RISK MANAGEMENT PHILOSOPHY

Collaboration is identified as a process in which entities share information, resources and responsibilities to jointly plan, implement, and evaluate a program of activities to achieve a common goal (Davies *et al.*, 2016). It is a process of shared creation that involves mutual engagement of participants to solve a problem together and implies sharing risks, resources, responsibilities, and rewards. Sharing risks, resources, responsibilities, and rewards can also give the group to an outside observer the image of a joint identity. Real collaboration cannot happen without trust amongst the project team members.

In traditional project risk management construction parties (clients, consultants and contractors) have usually done so separately and in isolation (Sanchez-Cazorla *et al.*, 2016). Collaborative risk management approach adds a new dimension to traditional risk management methods. Collaborative risk management provides approaches by which uncertainty can be understood, assessed, and managed within projects (Ashkenas, 2012). A collaborative approach to risk management integrates individual perspectives into a coherent and rounded risk management strategy, ultimately benefiting the project and all those concerned with it (Cattie and van Riper, 2012). The benefits of collaboration in management of risk include reduced project cost for the owner, higher profit

for contractors, earlier completion of project and fewer contract disputes.

### 3.0 METHODOLOGY

The research method in this study is focuses on literature review from past research. Sources such as journal articles, books, international conference papers, and materials available on the Internet have been used as literature review in this study. While the literature search and review are not exhaustive, a systematic methodology was employed. In conducting search key terms/ phrases were used “collaboration in risk management”; “enabling factors for collaboration”; “team working” and collaboration of project participants in construction projects. Subsequently, inclusions of these search terms are applied to screen actual relevance of articles. Relevant articles are included based on how their titles, abstracts, and keywords addressing collaboration in risk management, team working in construction projects, enabling factors for collaboration and collaboration of project participants in construction projects. The literature search, based on key terms explained, contributed 45 relevant peer-reviewed articles. However, additional articles and resources were also included by the authors from their current areas of focus (e.g. lean construction). In selecting key enabling factors for collaboration was based on their appearance frequencies in reviewed articles. Enabling factor appears in three or more articles is considered key factor for collaboration.

### 4.0 LITERATURE REVIEW ABOUT COLLABORATIVE RISK MANAGEMENT

The nature of the complexity and dynamic environments within the construction industry has led to the increasing need for the collaboration of all key players in any construction project in risk management in a multi-disciplinary team at both project management and design implementation levels (Evuomwana and Anumbab, 1998). Based on the report by Leverick and Littler (1993), the demand for collaboration has moved from commercial pressures to an increase in complex projects, higher demand of innovation projects and technological development, and the higher demand in internationalization of the industries (Akintoye and Main, 2007). Stiles (1995) identified that the factors influencing collaboration around the world include: globalization demand, competition, risk and uncertainty within the business environment; while businesses as diverse as insurance, construction, airlines and computers are recognizing the need to collaborate in order to survive. Effective collaboration between the client, design team and contractor has been shown to enhance addressing risk and uncertainty through improving the dynamic capabilities of project participants (Davies *et al*, 2016). In general, collaboration and teamwork studies in construction have looked into various factors that enable collaboration between project team members, such as trust, team flexibility and seamless operation (Ibrahim *et al*, 2011; Adetola *et al* 2011), team leadership (Cheung *et al*, 2001), communication and no blame culture (Moore and Dainty, 1999), project team communication (Perry and Sanderson, 1998), project members’ participation (Leung *et al*, 2004), Interdependence and Appropriate team composition (Tarricone and Luca, 2002). However, the key factors that contribute to effective collaboration are problem solving and

decision making (Guzzo and Salas, 1995). Based on the literature reviewed above, a total of twenty [24] factors are identified and [14] were identified as critical to enabling collaboration among project participants in risk management, these are presented in Table 1 to Table 3 below, and further the adopted factors are explained in the proceeding.

Table 1 Enabling Factors for collaboration in management of risk from some of reviewed articles

Authors	Proposed enabling factors							
	Trust	Open communication	Commitment	Interdependence	Fair drafted contract	Risk allocation	Globalization demand	Skill/Competence
Adetola et al 2011	√	√				√	√	√
Tarricone and Luca (2002)		√	√	√				√
Moore and Dainty (1999)		√				√		√
Baiden et al. (2006)	√	√	√		√			
Love et al. (1998)		√						
Cicmil and Marshall (2005)	√	√	√		√			√
Guzzo and Salas (1995)	√							
Leung at el (2004)	√							
Stiles (1995)					√		√	
Ibrahim at el (2011)	√	√	√					
Factors adopted in this study	√	√	√		√			√

Table 2 Enabling Factors for collaboration in management of risk from some of reviewed articles

Authors	Proposed enabling factors								
	Information sharing	Knowledge sharing	Finance	No blame culture	Competition	Mutual understanding	Flexibility	Risk and uncertainty	Proactive and joint problem solving
Adetola et al 2011			√			√			
Tarricone and Luca (2002)						√			
Moore and Dainty (1999)				√					
Baiden et al. (2006)	√			√			√		
Love et al. (1998)						√	√	√	√
Cicmil and Marshall (2005)	√	√							
Guzzo and Salas (1995)									√
Leung at el (2004)		√					√		√
Stiles (1995)					√			√	
Ibrahim at el (2011)	√			√		√			
Factors adopted in this study	√	√		√		√	√		√

Table 3 Enabling Factors for collaboration in management of risk from some of reviewed articles

Authors	Proposed enabling factors						
	Fair distribution of responsibility	Shared goals and objectives	Appropriate team composition	Legal and regulatory Framework	Seamless operation	Good relationships	Technology
Adetola et al 2011		✓	✓	✓	✓	✓	✓
Tarricone and Luca (2002)		✓	✓	✓			
Moore and Dainty (1999)						✓	
Baiden et al. (2006)	✓				✓	✓	✓
Love et al. (1998)							
Cicmil and Marshall (2005)							
Guzzo and Salas (1995)					✓		✓
Leung et al (2004)	✓						
Stiles (1995)							
Ibrahim et al (2011)	✓				✓		
Factors adopted in this study	✓				✓	✓	

### 5.0 DISCUSSIONS

This section synthesizes and subsequently presents detailed discussions on identified enabling factors for collaboration in management of risks in construction projects.

#### 5.1 Trust among participants

Trust is an aspect of relationships described as a firm belief, confidence and hope in the reliability, truth, ability or strength of someone or something (Bennett and Jayes, 1995). Rousseau *et al.*, (1998) defined trust as a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or optimize of another. Trust impacts decision making because decisions are made in light of the level of trust and the perceived risk; moreover such decisions are also referred as risk taking in relationship (RTR) (Mayer *et al.*, 1995). Collaboration requires trust at its core. Risk is another prerequisite of trust. If there were complete certainty and the absence of risks in a relationship, trust would be unnecessary (Lewis and Weigert, 1985; Jin and Ling, 2005). More trust would need to be fostered when more risks exist. Trust is encouraged to counterbalance these risks. Zaheer *et al.* (1998) found that “firms in exchange relationships may derive competitive advantage from relationships imbued with high levels of inter-organizational trust”. Dirks (1999) found trust to have a positive influence, albeit indirect, on group performance.

Trust is a dynamic phenomenon since it could develop, decline, be built or resurface in long standing relationships within organisations. Lack of trust and commitment are important factors that can deter the development of collaboration and integrated teams (Rahman and Kumaraswamy, 2008). One of the most fundamental differences in the collaborative approach is the requirement to

trust other team members and recognise that they are trying to achieve the very best results of which they are capable (SFC, 2003). In order to achieve collaboration among the entire project team and particularly towards managing project risks, trust is critical (Moore and Dainty, 2001, Cicmil and Marshall, 2005).

#### 5.2 Open Communication about every aspect of the project

Communication has by many researchers been found to be a critical success factor in project management for collaborations’ readiness of risk management (Pritchard, 2004; Yaraghi and Langhe, 2011). Kerzner, (1995) claim that communication plays an important role in risk mitigation. Intuitively and as confirmed in the literature, communication is a prerequisite for successful project management and collaboration in risk management to align. The communication in projects with multiple stakeholders, such as construction projects, is however more difficult to manage. Effective communication may help to coordinate work activities, manage information/knowledge and make decision. As described by Love *et al.* (1998), communication has been linked to team effectiveness, the integration of work units across organisational levels, characteristics of effective supervision, job satisfaction, and overall organisational effectiveness.

Effective collaboration in risk management often relies on clear communications and the ability to pass thoughts, ideas, information and instructions quickly and effectively between people with different technical skills and interest. By establishing communication flows, involvement patterns and other behavioural responses to unexpected change events, the nature of any professional and cultural interfaces can be established (Moore and Dainty, 2001). Evbuomwan and Anumba (1998) found that lack of communication between all key players in any construction project in a multi-disciplinary team has led to difficulty in the development process for both project management and design implementation levels.

As previous researchers have proved, project communication is frequently mentioned as a key success factor (Kerzner, 1995; Pritchard, 2004), but can be difficult in many cases where the project involves graphically distributed stakeholders, meaning that regular meetings and communication between the steering group and the project group might be difficult to arrange. Communication between project participants can be either internal or external, formal or informal, vertical or horizontal, official or unofficial (PMI, 2013). Communication between the different parties is essential for collaboration when one considers the different responsibilities of the parties associated with a project. The effectiveness of parties’ collaboration is a function of the effectiveness of the communication between the various parties (Engelbrecht, 2010).

#### 5.3 Commitment of each and all project participants

Commitment enhances collaboration in handling risks because it helps the project team members to remain focused on the project goals and, consequently to find creative solutions, using the available resources and current knowledge, to reach those goals. The literature refers to this attitude as goal commitment and, it is defined as the personal

determination to try for a goal or keep trying for a goal (Mei-Yung et al., 2004). In agreement with Fowler and Horan (2007), the review findings revealed that a combination of project team commitment and top management commitment is necessary to achieve the desirable project outcomes.

Commitment and support from top management is important in every kind of management and it is thus an important factor for collaborative risk management. Ochieng and Price (2009) identified commitment from senior / top management as a key indicator of team collaboration practice, as it is critical to success in multicultural team environments. The importance of top management support towards collaboration in management of risks has been supported by these scholars (Kleffner et al., 2003). The top management support is also required, especially towards effective provision of resources, structure and creation of a collaborative risk management culture which enhances implementation. The issue of commitment is of central importance to collaboration, as construction projects involve complex organisational and technically challenging design/construction systems.

#### 5.4 Fair drafted contract

Contracts fundamentally describe obligations responsibilities and allocate risks to the parties (Soetanto, 2002). According to Klemetti (2006), contracts normally act as instruments for sharing risks, though researchers tend to think that in the construction industry exhaustive risk allocation cannot be achieved solely through contractual arrangements. The form and clarity of contracts, the quality of documentation, and the method of payment have significant impacts on performance. Ambiguous and inappropriate contracts that allocate risks unfairly, lead to disputes and conflicts. The consequence of all this is to detract some members from the pursuit of project goals resulting in poor performance (Wiguna and Scott, 2006). According to Chua et al. (1999) a fairly drafted contract should contain proper contractual arrangements which identify and allocate risks equitably, provide realistic obligations and clear objectives and targets, provide for formal dispute resolution processes, and also include motivation and incentives to the contracting parties.

#### 5.5 Good relationships

The issue of the relationship between construction project participants has been a focus of attention in the literature since the early 1980s, with particular attention on the difficulty of achieving strong relationships between clients and contractors (Khan and Reinhart, 1990; Bresnen and Marshall, 2000). The interaction between project participants is often a key factor in project management. Interactive processes include planning, communication, monitoring and control, and project organization in order to facilitate effective coordination throughout the project life. It is essential that appropriate interpersonal skill are encouraged, and that a good working relationship between client, project team members and stakeholders is maintained. Inter-organizational conflicts in a construction project most often have adverse effect on project performance (Mohsini and Davidson, 1992). Good relationships are pre-requisite by timely payments on the part of the owner, fewer claims on the part of the contractor, and the absence of legal disputes.

#### 5.6 Skill/Competence to each and all key project participants

Projects are often managed by people who probably have to make decisions and enforce procedures that might affect other people. Project participants should possess adequate capability, including skill and experience. These skills and principles may include planning, optimizing, controlling, coordinating, motivating, communicating, procuring, and leading, delegating and negotiating (Fayol, 1949). Project management tends to apply these skills and techniques to the organization and control of all aspects of every project in order to optimize the use of resources to produce a well-designed, soundly constructed, functional and financially viable facility that will satisfy the client's requirements of quality, purpose, safety, cost and time budget, and future maintenance (CIB, 2010).

#### 5.7 Information sharing to enable common understanding of project circumstances

Information sharing is the process of exchanging information between two or more people (Ford and Staples 2010). This entails accurate, timely, frequent and two-way exchange of relevant information to build confidence and trust among project participants. Many of today's complex projects are developed by multidiscipline teams that are geographically distributed across several firms and even multiple continents (Geraldini et al., 2011). It is no surprise therefore that project participants are increasingly realizing that sharing information is key to project success (McDermott et al, 2005). The need for information sharing is emphasized due to the 'cross-functional' or 'inter-organizational' nature of these projects (Nycyk, 2011). It is typical for these 'multidisciplinary' projects that the participants in the project team may have different backgrounds: education, working experience, organizational culture, and working procedures. It is, therefore, possible that they do not have 'a common language' (Koskinen et al., 2003). This may cause misunderstandings and affect the end results of the project. According to Baiden et al. (2006), project information should be available, open and accessible to all project team members as an input for efficient decision making and in order to create effective integrated project teams. The challenge is to ensure that the right information gets to the appropriate person at the right time (Baiden and Price, 2011). The lack of information or a response from project stakeholders becomes critical for progressing with project decisions (Jorgensen and Emmitt, 2009). The integrated project team should be an environment for openness, where shared information is essential for mutual respect and effective collaboration (SFC, 2003). The transparent flow of information through these distributed teams is critical for project collaboration and informed decision-making. It is also critical that the team's project data and multidiscipline models be shared on a regular basis for project coordination, design review, and analysis. In addition, the project data needs to be organized and accessible; secure yet available to the right people, in the right context.

#### 5.8 Knowledge sharing throughout the project cycle

Construction projects have well defined tasks, schedules and goals, all associated with different degrees of complexity and uncertainty. Yet, because of the underlying structure they

provide a fertile opportunity to share knowledge within projects, across projects, and over time. The construction industry is a knowledge-based industry (Egbu *et al.* 2004; Carrillo *et al.*, 2004) because the execution of construction activities requires specialized expert knowledge and problem-solving knowhow (Anumba *et al.*, 2005). Knowledge sharing helps firms to mitigate inter-connected risks (Dyer and Singh, 1998), while the knowledge base enables interpreting knowledge to create value (Trkman and McCormack, 2009). One typical problem in knowledge sharing is that knowledge is not understood in the right way by the receiver of the message (Burley, 2010). A project failure can be the result of capturing the appropriate knowledge at an inappropriate time of the project (Fuller *et al.*, 2008). The combination of the two makes knowledge sharing a very difficult task for the construction industry, resulting in poor efficiency of the overall process. In this context knowledge sharing has been viewed as an enabling factor to promote innovation and collaboration in management of risk for the construction projects.

#### 5.9 No blame culture among participants

Baiden *et al.* (2006) agreed that a 'no blame' culture is a key indicator of team collaboration practice in construction projects. It's been suggested that it's vital to have an equitable relationship and no blame culture as well as to encourage initiative to work towards the joint resolution of problems as this can influence team members to minimise their level of exposure to poor performance and. Dulaimi *et al.* (2002) contend the need for projects to have an environment where people are allowed to admit fault on the basis that fault was to be learned from, so that collective responsibility in decision making can be achieved for the best of the project and thence promote working together in a spirit of trust, cooperation and collaboration.) Outlined the importance of the creation of a 'no blame' culture as it could encourage project teams to work collaboratively integrate people who may otherwise feel exposed by their mistakes (SFC, 2003).

#### 5.10 Mutual understanding of goals, responsibilities and constraints of the project

Successful collaboration in risk management requires all project participants to understand and be dedicated and strongly committed to achieving, maintaining and fulfilling project goals. According to Love *et al.* (1998), the formulation and collective agreement of project goals within a multi-disciplinary team environment at an early stage can contribute to successful teamwork Effective risk management depends on correct and comprehensive understanding of the risks facing a project team. Forques and Koskela (2009) urge that in achieving collective decision making, it is expected that all team members have their "voice" heard and that all ideas are open to discussion.

#### 5.11 Flexibility

Collaboration in management of risk requires flexibility of the project participants in order to accommodate various changes to projects caused by complexity, uncertainty and dynamic nature of these projects. Husby *et al.* (1999), defines project flexibility as "the capability to adjust the project to prospective

consequences of uncertain circumstances within the context of the project". This could be achieved through "late locking" of project concepts, specifications and organization (Miller and Lessard, 2000); continuous step-by-step locking of the project using decision gates models (Eskerod and Östergren, 2000) and incremental decision making (Genus, 1997); or using contingency planning, where a set of base plans is defined, but also a set of alternative plans that can be activated if needed (Chapman and Ward, 1997). Flexibility allows project teams to collaboratively change the course of action to manage risks and uncertainty.

#### 5.12 Seamless operation

The majority of the authors viewed seamless operation with no organisational defined boundaries as a vital indicator of team integration practice in which the boundaries between individuals are diminished and team members work collaboratively towards mutually beneficial outcomes for the project (Kajewski *et al.*, 2003). The existence of professionally oriented boundaries within the project team has contributed to the main issue of impaired project team integration within construction projects (Moore and Dainty, 2001). The purpose of an integrated project team (IPT) is to bring together diverse groups of people and combine them into a seamless team for the pursuit of common goals (SFC, 2003; and Forques and Koskela, 2009) which is very important for risk management in complex projects.

#### 5.13 Proactive and joint problem solving

Previous research has indicated that reactive problem solving can be a bottleneck to collaboration in management of risk due to poor time and cost effectiveness (Yu *et al.*, 2007). The practice of proactive risk management improves an organization ability to manage the existing and emerging risks and helps adapt quickly to unwanted events or crisis. The defining characteristics of proactive risk management are risk mitigation and risk impact reduction. Mitigation may occur at the level of a specific risk and target the underlying immediate cause, or it may be achieved by intervention at the root cause level. Identification and correction of root causes has high value for the project participants because corrective measures can have far-reaching positive effects well beyond the scope of an individual project. Mitigation measures are best undertaken in the early stages of a project when the team still has the ability to intervene in time to effect project outcome.

#### 5.14 Fair distribution of responsibility

For effective collaboration in management of risks in construction projects, it is important to appreciate principles of equity and fairness in distribution of responsibilities as fairly described in the contracts. The need for project participants to identify and understand all potential risks associated with a project cannot be over-emphasized. One critical factor to achieving successful implementation of construction project participants' collaboration is the optimal sharing of risks and distribution of responsibilities between these parties. The guiding principle often adopted in identifying and allocating responsibilities is that the party with the best financial and technical capabilities to manage a particular activity should be responsible for the risks associated with that activity and

receive the associated rewards or losses (Ward and Chapman, 1991; Edwards, 1995; Flanagan and Norman, 1993).

#### 4.0 CONCLUSION

This paper has shown that collaboration plays an important role in effective risk management. It has discussed how enabling factors may be a good starting point for increasing collaboration between project participants to improve project results. The paper has presented fourteen [14] factors advocated by reviewed literature as crucial to enabling collaboration in risk management. These are Trust, open communication, commitment, fairly drafted contract, good relationship, skills/competence, information sharing, knowledge sharing, no-blame culture, mutual understanding, flexibility, seamless operation; proactive problem solving and fair distribution of responsibility.

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