The Intersection of Collaboration Theory and Unexpected Event Management: Towards a Process Model of Project Stakeholders' Collaboration

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Abstract—**This paper focuses on voluntary collaborative actions taken by stakeholders in response to unexpected events. This study applies the theoretical constructs of collaboration to project stakeholder management research and provides insight into stakeholder-driven collaboration for the construction project domain. After reviewing the related core theories and concepts, this paper presents a theoretical framework for the process of project stakeholder collaborations which is promoted by unexpected events. The major theoretical constructs of collaboration are discussed by drawing on the literature on interorganizational relations. Propositions are presented for guiding collaborative efforts and for investigating the application of collaboration theory to the reactive unexpected event responses of project stakeholders.**

Index Terms—**Collaboration, unexpected events, project stakeholders, mega construction projects.**

I. INTRODUCTION

In recent years, the importance of stakeholder management for the successful completion of projects has become a major concern of project management, especially in mega construction projects. Megaprojects are projects that cost greater than US$1 billion or 0.01% of the GDP [1]. They are large-scale, complex ventures that take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people [2]. Mega construction projects are commonly regarded as incomparably more complex than projects in most other industries such as IT and manufacturing in terms of number of stakeholders involved [3]. In the case of mega construction projects where a large number of stakeholders are involved throughout the project life cycle, the involvement of various parties influence the project's progress and the achievement of project objectives to a greater extent compared to smaller scale projects [4].

Ref. [5] state: "Construction is a complex production of a one-of-a-kind product undertaken mainly at the delivery point by cooperation within a multi-skilled ad-hoc team." (p.5). This definition of construction specifies at least four characteristics of construction as follows. First, construction is a "production". Second, it produces a "one-of-a-kind"

product. Third, it is "complex"; and fourth is undertaken through "cooperation". Construction teams' performance plays a crucial role on the overall quality on construction projects and constitutes an important part of the construction puzzle. Yet, it should be noted that construction projects represent a largely collectivist activity of all key stakeholders [6]. More importantly, project success criteria include time, budget, quality, customer satisfaction etc. which encompass actions of numerous people, groups and organizations. In such shared power and responsibility environment, no one is fully in charge, no single stakeholder contains the problem; and no one organization is responsible for all issues related to the project [7]. Instead many individuals, groups and organizations share influence and responsibility [8].

As discussed by [9], mega projects are more than the simple "ballooning" of the size of conventional projects. With increased size come exponentially larger risks. Some complex aspects underlie this reality, including new facility designs, sizes beyond operating experience, capital access, environmental impact, government monetary policy, and so on. Moreover, generally, it is in the public interest that mega projects succeed. In addition, mega construction projects are subject to higher risks and uncertainties throughout the project's life cycle in the form of unexpected events [10]. These unexpected events can negatively impact the likelihood of achieving project objectives often by leading to delays that have an adverse impact upon the execution and performance of the projects [11]. Generally speaking, dealing with unexpected events is also a key part of managing construction projects. It is fair to say that the longer the project duration and the greater the number of project stakeholders, the higher degree of uncertainty, risk and complexity [12], [13]. Reference [14] argued that "project complexity" can be estimated by project size, number and variety of elements, and interconnection among elements. Mega projects can be classified as "array projects" the most complex type of project: a "system of systems" composed of an array of individually complex systems joined together to achieve a common system goal. Therefore, mega construction projects – which are characterized by their very long project duration, the involvement of a large number of internal and external stakeholders, and significant capital investment – are prone to suffer more from unexpected events.

Partnership and collaborative working are often presented as a panacea to overcome complex problems that exist within a wide range of contexts [15]. Likewise, in working together, project stakeholders can combine their strengths such as their skills, knowledge, understanding and resources to react to

unexpected events in a faster, stronger and more effective way [16]. Although the extant literature suggests that unexpected events are best dealt with through the collective efforts of focused teams with a range of skills and experiences to cope with such problems (see, for example, [17]-[22].), no research to date has addressed nor considered the nature and the process of the collaborative problem solving actions of construction project stakeholders.

Taking into account all of above arguments, mega projects provide a good venue for studying both project stakeholders and unexpected event management related issues. However, the application of collaboration theory specifically to mega construction project management has not been reported as yet, despite its potential usefulness to explain how different stakeholders decide to collaborate voluntarily. Accordingly, the objective of this paper is to discuss some of the key theoretical constructs of collaboration and to demonstrate their relevance to the construction projects' stakeholder networks.

II. THEORETICAL BACKGROUND

A. Collaboration Theory

Collaboration, as discussed by many researchers (for example, [23]-[27].) is known by many names and the terminology used to describe it is similarly broad. Such terms include: networks, partnerships, coalitions, collaboratives, consortiums, councils, alliances, task forces, and groups [25]. Reference [28] indicated that some practitioners resort to describing collaboration through analogies such as "the combination of hydrogen and oxygen atoms to form water", because many practitioners found the term "collaboration" difficult to describe. [28]

Reference [29] defines collaboration as "a process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible" (p. 5). Collaboration is also regarded as "a process of joint decision making among key stakeholders of a problem domain about the future of that domain" (p. 11). Reference [30] defines inter-organizational collaboration as: the pooling of appreciations and/or tangible resources, e.g., information, money, labor, etc., by two or more stakeholders, to solve a set of problems which neither can solve individually (p.912).

Building on the collaboration theory of [30], reference [31] identified five key characteristics of the collaboration process: the stakeholders are independent; solutions emerge by dealing constructively with differences; joint ownership of decisions is involved; the stakeholders assume collective responsibility for the ongoing direction of the domain; and collaboration is an emergent process, where collaborative initiatives can be understood as "emergent organizational arrangements through which organizations collectively cope with the with the growing complexity of their environments." (p. 236). Reference [32] argued that collaboration occurs when representatives from different organizations produce something together through joint effort, resources, and decision-making, and share ownership of the final product or service. As discussed by [33], collaboration consists of the following elements: a common purpose, separate professional contributions, and a process of cooperative joint thinking and communication.

Ref. [34] identifies a continuum of collaborative efforts, ranging from loose linkages to more lasting structural arrangements as follows:
1) Linkages or interactive contacts between two or more actors;
2) Intermittent coordination or mutual adjustment of the policies and procedures of two or more actors to accomplish some objective;
3) Ad hoc or temporary task force activity among actors to accomplish a purpose or purposes;
4) Permanent and/or regular coordination between two or more actors through a formal arrangement (e.g. a council or partnership) to engage in limited activity to achieve a purpose or purposes;
5) A coalition where interdependent and strategic actions are taken, but where purposes are narrow in scope and all actions occur within the participant actors themselves or involve the mutually sequential or simultaneous activity of the participant actors; and
6) A collective or network structure where there is a broad mission and joint and strategically interdependent action. Such structural arrangements take on broad tasks that reach beyond the simultaneous actions of independently operating actors.

It is important to note that in this paper we will be examining the collaborative efforts and actions of project stakeholders which specifically do not rely on/mandated by contracts; ergo, the study will cover the first three definitions on the abovementioned continuum. Considering the various definitions of collaboration given above, we propose a working definition of a project stakeholder collaboration that encompasses the components most common to definitions found in the literature: Project stakeholder collaboration is "a process of joint decision making and joint activity by two or more project stakeholders that is intended to resolve/respond unexpected events encountered during the project implementation phase".

B. Stakeholder Theory

According to Freeman [35], widely credited as the father of stakeholder theory, the term stakeholder first used in the management literature in an internal memorandum circulated within the Stanford Research Institute (SRI) in 1963, and popularized as "those groups without whose support the organization would cease to exist" (p.31). Reference [35] defines a stakeholder as "any group or individual who can affect or is affected by the achievement of the organizations objectives" (p. 46). Stakeholder theory has attracted the attention of many researchers from a variety of disciplines. Subsequently, many different definitions of the term stakeholder were proposed by different researchers.

Ref. [36] specified that stakeholder theorists differ widely on whether they take a narrow or broad view of a firm's stakeholder universe. Accordingly, the definitions of stakeholders are classified as being either broad-spectrum or narrow-spectrum. As emphasized by [37] there are different ideas related to defining stakeholders and debates about who

or what counts as a stakeholder. The narrow view is "based on the practical reality of limited resources, limited time, and attention, and limited patience of managers for dealing with external constraints"; the broad view is "based on the empirical reality that companies can indeed be vitally affected by, or they can vitally affect, almost anyone" (p. 857). For instance, Freeman's (1984) classical definition of stakeholders represents a broad view, while the one made by SRI (1963) reflects a narrow view of stakeholders. In the literature, there are many alternative proposed definitions of the term stakeholder exist from either a narrow or a broad perspective. For example, the broadest definition of stakeholder may be [38] who defines the term stakeholder as "any naturally occurring entity which affects or is affected by organizational performance" (p. 92).

Ref. [39] introduced stakeholder notion into the project management literature and proclaimed that "project stakeholder management is designed to encourage the use of proactive project management for curtailing stakeholder activities that might adversely affect the project and for facilitating the project team's ability to take advantage of opportunities to encourage stakeholder support of project purposes" (p. 38) [39]. Thenceforth, the project management literature has been progressively enriched and complemented by researchers using concepts of stakeholder theory. Afterwards, reference [40] emphasized the reasons for performing a stakeholder management for projects as: "(I) to become acquainted with the projects' stakeholders; (II) it is important for ensuring the balance between contribution and reward; (III) it is a basis for managing the stakeholders; (IV) it is a basis for deciding who should be involved in determining the project goals and how success should be measured".

The importance of stakeholder management is emphasized in the latest edition of the PMBOK Guide [41], the most widely accepted standard for project management, by introducing project stakeholder management as a new, distinct knowledge area. According to PMBOK [41], project stakeholder management comprises the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution. The main goal of project stakeholder management is to increase the likelihood of achieving project success [42]. Reference [42] regard project stakeholder management as a process that embodies all the purposeful activities performed, particularly in connection to the project stakeholders, in order to maximize project success.

In the PMBOK Guide [41], the project stakeholder management process is described as a sequence of phases, broken down into four steps: (I) Identify Stakeholders (II) Plan Stakeholder Management (III) Manage Stakeholder Engagement (VI) Control Stakeholder Engagement. A large number of researchers have proposed similar stakeholder management process models [39], [40], [43]-[51]. However, a review of recent literature reveals that there is no consensus on which model is most appropriate. Some of these models and methods are summarized in Table I.

TABLE I: PROJECT STAKEHOLDER MANAGEMENT PROCESS MODELS AND METHODS

Literature Source	Stakeholder Management Process
Cleland (1986) --See ref. [39]	1. Stakeholder identification 2. Classification 3. Analysis 4. Strategy development
Karlsen (2002) --See ref. [40]	1. Identification of stakeholders 2. Analyzing the characteristics of stakeholders 3. Communicating and sharing information with stakeholders 4. Developing strategies 5. Following up
Sutterfield et al. (2006) --See ref. [46]	1. Vision and mission 2. Project SWOT analysis 3. Identify stakeholders and their goals 4. Selection criteria and alternative stakeholder management strategies 5. Select strategy for each stakeholder 6. Acquire resources 7. Implement stakeholder management strategy 8. Evaluate 9. Feedback

As evident from above table, there is not a single accepted method to manage project stakeholders. Ref. [52] noted that there is a need for a systematic and formal stakeholder management process model for application in construction projects. Yet it is clear that in order to achieve the project goals, it is important to identify, classify, prioritize, manage and monitor project stakeholders effectively. Key stakeholders can be identified habitually in the project initiation stage, while a detailed stakeholder analysis is required in the following project planning stage [53]. Over and above this, however, the identification of project stakeholders may be an iterative process in which refining the requirements of each stakeholder groups and adding new ones (if necessary) is a key task [50]. According to [54], there are three main activities in the stakeholder identification process. As an initial step, project managers and project team may develop a list of potential stakeholders. After then, they may try to answer some fundamental questions, such as: "How each stakeholder is important to the work of the project?" and "What each stakeholder expects from success of the project, or its outcomes?" Lastly, they may finalize the identification process by categorizing each stakeholder into stakeholders' influence categories.

For the purpose of this paper, project stakeholders have been defined in a broad strategic sense as "...individuals, groups and organizations who are actively involved in the project, or whose interests may be positively or negatively affected as a result of the project". Concordantly, the "individuals, groups and organizations" mentioned in the definition include sponsors, suppliers, mass media, contractors, partners, shareholders, consultants, clients, financial institutions, managers, insurance companies, public authorities, NGOs, labor unions, pressure groups, end users and local communities and so forth.

C. Unexpected Events

While several terms have been used to characterize unexpected events, including deviations [56], exceptions [57], surprises, unforeseen events and emergent events [58]-[60],

there is one thing in common across all conceptualizations, that is, unexpected events are events that were neither planned nor expected to occur during the project lifecycle. Ref. [61] define unexpected events as "the outcome of a range of residual uncertainties that can threaten the viability of a project". On the other hand, [56] regard unexpected events as deviations and define it as "a situation, regardless of consequence—positive or negative, large or small— that deviates from any plan in the project". Reference [55], by following the conceptualization of [56], defined an unexpected event as "any event that can be considered as a deviation from original project plans". Accordingly, in this paper, we will adopt this definition of unexpected event, as well as the notion that any event can be regarded as unexpected regardless of its level of impact on projects (such as equipment breakdown, discrepancy between specs and drawings, unexpected changes in users' or clients' requirements, shifts in some stakeholders' attitudes, bad weather conditions, cancellation of an initial governmental approval, financial crisis, wars, bankruptcy of the project sponsor etc.)

Ref. [61] interviewed 22 experienced project managers, analyzed how project managers respond to unexpected events and identified three pillars that support successful responses to unexpected events: (II) responsive and functioning structure at the organizational level, (II) good interpersonal relationship at the group level and (III) competent people at the individual level. Geraldi and colleagues' [61] identified six different categories of unexpected events: technical issues, sponsor withdrawing support, external events, resource change or constraint, human behavior and project scope. Further, reference [61] provided characteristics and examples of successful responses to those unexpected events based on their study participants' statements. It is noteworthy that all participants in their study reported that stakeholder engagement was an important issue to successfully respond to unexpected events.

Building on a conceptual framework of institutional theory, reference [57] conducted a qualitative inductive study of 23 large-scale global projects (including road building, dam construction, bridge and soccer stadium projects) to explore how institutional exceptions are triggered and how they are resolved. They conceptualized unexpected events as the "institutional exception" which they define as "an episode that involves an entrant first being surprised by, then making sense of, and then adapting to institutional differences arising between itself and local project players or external stakeholders." (p. 563)

Based on 60 large-scale engineering projects, reference [58] proposed a conceptual framework for strategically managing large projects in the context of uncertainty and turbulence. Reference [58] focused on unexpected events produced by environmental turbulence, and likewise noted that the environment in which large-scale engineering projects, (e.g. powerplants, highways, bridges, tunnels, and airports etc.) are developed has become increasingly characterized by turbulence. In their paper, they also use the term "strategic surprises" to refer to unexpected events that occur during the lifecycle of a project and pose major challenges or even threaten the survival of the project. The authors made a clear

distinction between "anticipated but uncertain risks" and "unexpected events", and developed two notions to strategically respond to these events called "robustness" and "governability". Robustness refers to the properties of a strategic system that enable the project to deal with anticipated risks. Governability is a group of properties that enables the project to react to unexpected events. A further distinction was made between "strategizing" (which is prospective construction of a strategic system function of the anticipated risks) and "governing" (which is a reactive activity responding to real events).

III. PROJECT STAKEHOLDERS' COLLABORATION

Based on the review of relevant theoretical streams (most importantly theories of collaboration, stakeholder theory and unexpected event management frameworks), a process model of project stakeholder collaboration is presented below (see Fig. 1).
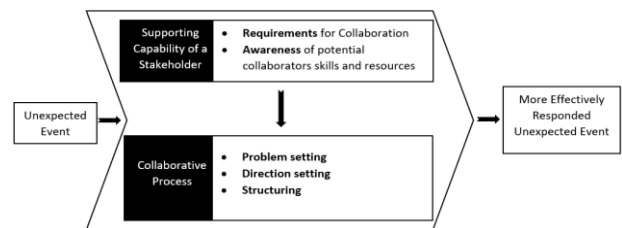

Fig. 1. A voluntary collaboration process for project stakeholders.

The focus of this paper is on voluntary (not mandated by contracts) multi-stakeholder collaborations and the stakeholder relationships within these collaborations. Voluntary collaborations do not happen automatically. So, our research question is, "What motivates collaboration between different project stakeholder groups, especially when project stakeholders have different interests, roles and goals in relation to the project? A quote from Ryunosuke Satoro, a Japanese philosopher, "Individually, we are one drop. Together, we are an ocean." can be used to emphasize why different project stakeholders should collaborate. However, it is a common perception that collaboration is costly because it takes time and resources. Costs of collaboration recognized in the literature include transaction costs, especially time, the loss of organizational autonomy, and of proprietary information, the inability for organizations to take credit, and "lowest common denominator" agreements that do not address underlying conflicts [62].

"During crises, the likelihood of collaboration increases. Justification for collaboration, however, is not only based on solving crises. Several other circumstances have been identified in which collaborative problem solving among stakeholders is warranted: (I) the existence of what Aldrich (1976) calls 'indivisible' problems, i.e., problems which are bigger than any single organization acting alone can solve, (II) limitations of traditional adversarial methods of resolving conflicts, and (III) increasing environmental turbulence." [30] (p. 912)

As stated by [63], collaboration provides an antidote to turbulent conditions. Through collaboration, the stakeholders gain appreciation of their "**interdependence**", pool their

insights into the problem, increase variety in their repertoire of responses to the problem [64] and achieve increased reciprocity, **"efficiency"** and stability among themselves [65]. In most cases, creative solutions are needed that exceed the limited perspectives of each individual stakeholder. According to [66], an event can create a significant demand on an agency may compel collaboration. For example, disaster response teams characteristically consist of different agents that have varying levels of expertise, different tasks to perform, and some of which require cooperation of multiple agents. Disaster response, by definition, means an agency must continue to meet routine needs while its resources and capabilities are overwhelmed; thus, the agency requires support from other agencies [66]. Responding to natural disasters requires range of response tasks, varying in scope and complexity, as well as in their means of execution [67]. Thus, disaster responses generally cross disciplines, agencies and jurisdictional boundaries [68].

Like disaster, an "**unexpected event**" can be a motivator for building collaboration. Reference [69] reported that emergent response groups are defined as "collectives of individuals who use nonroutine resources and activities to apply to nonroutine domains and tasks, using nonroutine organizational arrangements." (p. 150). This definition represents analogy to "project stakeholders working together to overcome the negative effects of the unexpected event during the project implementation. Therefore, we define voluntary multi-stakeholder collaborations as collectivities of project organizations that come together to respond ''unexpected events'' that cannot effectively be solved by a stakeholder acting alone.

Based on Gray (1985), reference [70] specified the conditions under which collaborative work is likely and important as follows:

1) When stakeholders are challenged by a multitude of challenging issues;
2) When these problems are perceived to be exceeding the problem-solving capacities of individual, autonomous sectoral stakeholders;
3) When traditional routines of problem-solving no longer yield results;
4) When competing agencies or units start creating unanticipated and dissonant consequences of actions that might still be considered 'routine' responses; and
5) When stakeholder agencies or units recognize mutual and often reciprocal temporal and causal interdependencies

Ref. [71] identified five requirements necessary for voluntary collaboration between organizations: (I) having a positive attitude towards collaboration in the first case; (II) recognizing the need to collaborate: (III) being aware of potential partners: (IV) assessing the compatibility and desirability of potential partners: and (V) having a capacity for maintaining the collaboration. Meeting with these five necessary requirements together with the awareness of potential collaborators' resources (e.g., information, money, labor, etc.) hereafter will be referred to as **"supporting capability of a stakeholder"** to collaborate.

Ref. [30] offers a three-stage model through which collaboration develops. These include problem setting, direction setting and structuring. The first stage consists of problem-setting (identifying key stakeholders and issues), and is followed by the second stage of direction-setting (identifying and sharing future collaborative interpretations; appreciating a sense of common purpose). The third stage is implementation/structuring (institutionalizing the shared meanings that emerge as the domain develops), which may or may not be required, depending on the nature and objective of the collaboration. According to [72], three conditions that should be present for organizations to participate in collaborative efforts: (I) recognition of interdependence (II) perceptions that significant benefit will result from collaboration, and (III) recognition of importance of the problem(s). According to [73], collaboration occurs in situations in which working alone is not sufficient to attain the desired ends. Most definitions of collaboration are based on this assumption, for example, organizational collaboration is defined as a 'process in which organizations exchange information, alter activities, share resources and enhance each other's capacity for mutual benefit and a common purpose by sharing risks, responsibilities and rewards' [74]. Ref. [73] defines collaboration as "a very positive form of working in association with others for some form of mutual benefit" (p. 1). Similarly, reference [75] remarked that collaboration and partnership are often used inter-changeably, refer to 'joined-up thinking/working'. The attributes of collaboration summarized by [75] are as follows: interdependency, intellectual and cooperative endeavor, knowledge and expertise rather than role or title, joint venture, team working, participation in planning and decision-making, nonhierarchical relationship, sharing of expertise, willingness to work together towards an agreed purpose, trust and respect in collaborators, and low expectation of reciprocation. [26] stated that scarce resources, and rising organizational interdependencies are driving increasing levels of collaboration.

Ref. [76] clearly stated that "The principals in a true collaboration represent complementary domains of expertise. As collaborators, they not only plan, decide, and act jointly, they also think together, combining independent conceptual schemes to create original frameworks. Also, in a true collaboration, there is a commitment to shared resources, **"power"**, and talent: no individual's point of view dominates, authority for decisions and actions resides in the group, and work products reflect a blending of all participants' contributions.(p. C-2)" According to [30], the dispersion of power among stakeholders enables them to direct their activities toward mutually desirable ends and, after this condition has been met, visible benefits of collaboration can eventually start to accrue. In the structuring stage, relations should be secured, each stakeholder's role in the collaboration should be clarified, tasks should be determined and distributed to achieve the collaboration's determined goals and strategy [29], [30]. Finally, as a result of a collaborative process, different stakeholders will more effectively respond to an unexpected event they faced where their independent efforts alone will not solve a particular unexpected event.

Based upon these arguments the following propositions are formulated:

Proposition 1: Unexpected events influence decisions by mega construction project stakeholders to collaborate with each other.

Proposition 2: Collaboration for a stakeholder will require realization of supporting capability of their organization which consists of:

a. carrying requirements for a collaboration

b. being aware of the potential collaborators' resources

Proposition 3: If there is a consensus within a group of stakeholders to collaborate, the quality of collaborative process will be moderated by the supporting capability of each collaborators.

Proposition 4: Problem setting efforts will require high degree of interdependence among stakeholders who decide to collaboratively work to respond unexpected events.

Proposition 5: Direction setting efforts will require dispersion of power among stakeholders towards mutually agreed directions.

Proposition 6: Structuring efforts should be yielding a mutual perception that the decisions arrived at by considering all the facts will be implemented by all stakeholders in collaboration. Responding to unexpected events effectively through collaboration will require all collaborators to act based on an agreed strategy.

Proposition 7: Project stakeholders' collaboration process will lead to more effectively responded unexpected events than the same stakeholders working individually.

IV. DISCUSSIONS AND CONCLUSIONS

A set of seven propositions is advanced above as a guide to project managers, and researchers studying collaboration in the domain construction projects. They relate to the key conditions facilitating project stakeholders' collaborations (Fig. 1). These propositions are based on the premise that project stakeholders do not collaborate unless there is a convincing necessity for them to do so. In this paper, unexpected events are believed to serve as a triggering mechanism for collaborative behavior among different stakeholders. Building on different motivational assumptions and taking into account the role of collaboration in responding to unexpected events, this paper takes the first step towards integrating collaboration theory and unexpected event management perspectives on the mega construction project management domain where a very large number of stakeholders may be involved across the entire project implementation phase. Thus, this could be an interesting topic to be investigated in the future research. The logical next step would be to conduct an exploratory study to refine the model and identify new directions for further inquiry.

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