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To cite this article: Wesam Salah Alaloul *et al* 2017 *IOP Conf. Ser.: Mater. Sci. Eng.* **291** 012003

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Communication, coordination and cooperation in construction projects: business environment and human behaviours

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Abstract. The accomplishment of construction projects is extremely dependent on the integration of several stakeholders; therefore none of them has the control or the ability to accomplish the project alone. Each of them may influence and be influenced by the project management approach. There is no comprehensive theoretical platform for defining Communication, Coordination and Cooperation (3Cs) in the management of construction project. This paper deliberates the function of the 3Cs different theoretical perceptions. Through an analysis of selected articles from reputable academic journals in construction management, the business environment and human behaviour were identified as two main parts. A little has been done so far about the 3Cs, and how they are correlated with construction projects performance. Therefore, the objective of this paper is to explain the definitions and the association between the 3Cs. There is a significant link between communication and coordination. Coordination alternatively, is trust-based a logic of mutual and exchange. Consequently, cooperation is much more sophisticated, which needing more time and attempts.

1. Introduction

The construction industry suffers from fragmentation during the project lifecycle, as activities are subdivided into further detailed levels. This context has been considered as a serious cause for poor performance, low efficiency, and bad competitiveness. Construction projects have several stakeholders, such as client, designer, engineers, contractor, and subcontractors whom should deal together on the project procurement and execution [1]. Management of construction projects includes the integration of three critical flows of materials, information and cash between the stakeholders. The modern business context described by complex and competitive which forced construction stakeholders to create effective and efficient management schemes. During the last decade, there has been a fast tendency in the direction of main initiatives to enhance the construction projects performance. Therefore using new terms and particularly as an operational context, Communication, Coordination and Cooperation (3Cs) were developed. The construction industry nature creates difficulty in deciding what alternative of 3Cs approaches could be valuable in a given conditions or tasks [2]. Due to this gap in the literature, this paper aims to investigate the existing literature related to 3Cs concepts. The 3Cs can be used interchangeably and are assumed the understanding of what stakeholders should do to work together efficiently. The 3Cs are organised procedures to offer a harmony of actions in the completion of shared objective, while specifies combined efforts of actors working in an organization. It is expected that when organizations grow, so make the 3Cs approaches they applied. However, those approaches decrease



ambiguity by generating the chance of a smaller period of accurate feedback and by aggregate information validity [3]. The 3Cs could even decrease the amount of information processing, by exchange the applicable information only on time and to the appropriate stakeholder. Finally, Communication without cooperation has no fruit and cooperation without coordination has no root.

2. Literature Review

There have been no specific definitions of the terms Communication, Coordination and Cooperation (3Cs) even though they appeared in academic and practice frequently. However, the descriptions of the 3Cs differ amongst the sections of literature based on the paper source and discipline [4]. To the best of the available information, emphasis on the outlines of information exchange and long-term activities integration. A limited current research, conversely, has started to explore how communication, coordination and cooperation subjects correlate, and the way they individually or together affect project performance. The 3Cs enables a systematic management to project planning, organizing, scheduling, and control to explore the relations between stakeholders a construction project. Table 1 shows the definitions for the three terms given by famous dictionaries.

Table 1. Definitions for the 3Cs terms

Dictionary	Merriam-Webster [5]	Cambridge [6]
Communication	“A process by which information is exchanged between individuals through a common system of symbols, signs, or behaviour.”	“Two-way process of reaching mutual understanding, in which participants not only exchange information and ideas but also create and share meaning.”
Coordination	“The harmonious functioning of parts for effective results.”	“The act of making actors involved in plan activity work together in an organized way.”
Cooperation	“To work jointly with others or together especially in an intellectual endeavour.”	“To work jointly with others or together especially in an intellectual endeavour.”

It could be concluded that several definitions are applied to describe 3Cs terms; they did not provide fixed and exact features of one term against the other. The definitions indict that the 3Cs are a sequence and growth of relationships started by communication to reach the cooperation with continuous coordination. Communication is the approach of linking actors together. In management, it is a vital role; therefore, an organization could not work without communication among its hierarchy levels and units. It refers to how actors contact each other and the way information (not just “facts,” but policies, prospects, feelings, and ideas) is transmitted. However, “lack of communication” is at the top of problems list in most organizations. Most of the actors are better at sending information out than receiving it in. The instrument of communication and response represent an essential portion of coordination and cooperation, so communication features have a significant effect on the project performance [7]. The shared information should be accurate as possible with shortest and simplest way. However, communication is challenging for many causes. Terminology and processes applied to exchange information differ between different organizations. There is an indecision to rely on other organizations, because of the lack of understanding or personal disagreements. Also, there is no consensus on the gathering and distributing information or to whom it must be transferred [8].

Coordination is the combination of various portions into an arranged system to accomplish the predefined objectives. It is an unseen power that connects all other functions of management. Based on Xue, et al. [1], “Coordination is the act of managing interdependencies between activities to achieve a goal”. In an inter-organizational perspective, coordination can be defined as the thoughtful and organised arrangement of stakeholders’ activities to accomplish the predetermined objectives. Coordination is typically accomplished with efficient communication or information transfer. It is

assumed as the connecting, meshing, harmonisation, or arrangement of tasks. Coordination appearances to notify every unit in the project as to how and when it should be performed. Coordination normally includes the requirement and information distribution, decisions, and feedback instruments to unify and carry instruction needed for resources optimisation. Coordination pursues to guarantee that stakeholders' efforts yield the optimum results with fewer procedure losses. Therefore, it considers the level to which every unit in the project endeavour considers other units considerations. The absence of coordination could lead to an incapability control, confusions between stakeholders, inefficiency in resources usage, and replication of work [1]. The motivation for applying coordination is the reality of dependencies among tasks so that the aim is to handle dependencies to make the tasks as portions of determined objectives. Management normally mentions to the necessity of project separation into work packages. However, separation of project rises effectiveness, it generates or at least rises, the necessity for coordination. Coordination can be considered as effective once the stakeholders are satisfied. Malone and Crowston [1994] note that "good coordination is nearly invisible, and coordination is notice clearly when it is lacking". All project stakeholders face coordination challenges since by definition they involve some division of project and some task interdependence between them. Amongst the main coordination difficulties in any organization is the one between the main office and field units and cultural differences between stakeholders [9].

Cooperation is now a hallmark not only of every management process but also as a culture. Cooperation is the procedure of shared the achievement: two or more actors with harmonising abilities contacting to establish a shared objectives which none had earlier controlled. Cooperation from a mutual sense regarding a procedure, product, or a task. Different from communication, to transfer information, it is about applying information to generate something none of the cooperators can achieve alone. Moreover, the opposite of cooperative is competitive. Different from coordination, cooperation aims for different understanding and spontaneity, not only structural harmony. As the cooperation relationship represent the last stage of the 3Cs chain, its operational needs the formation of an earlier communication and continues coordinative relations [10].

Cooperation mentions to long-term prescribed relations, like outsourcing or commissioning. For instance, in a real cooperative association, cooperation agreements would be established after some level of sharing predictions and exchanges concerning. Nevertheless, as associations reach the cooperative phase, these agreements grow to include further strategic features like long-term contracts and knowledge investments [11].

3. Methodology

This study provides a systematic review of reputable journals to track the growth of the 3Cs in the construction industry. The investigation applied for this study started with a meta-analysis of project management exploration and literature on 3Cs crossing all disciplines. Concentration was located in the present literature in construction management articles, precisely those with an emphasis on business context and human behaviours. Known the fast growing environment of this arena, the investigation highlighted articles finalized in the previous ten years. The article's sources have been recognised as the protuberant and significant-quality sources and have been engaged in reviewing other subjects in construction. For instance, Lin and Shen 2007 [12], using a keywords exploration in similar sources, offered a critical review of evaluating the performance of value management research in the construction industry. Also, Chan et al.2002, [13] identified the critical factors of design/build and partnering construction projects. In this study, the articles were investigated by keywords, title and abstract. Several terms have been applied to define 3Cs, like "collaborative, alliance, partnership, partnering, networking, coalition, consortium, teamwork, joint venture, community, and coordination". Consequently, the way to choice the correct keywords to retrieve the articles is an essential concern that could have a large influence on the investigation outcomes. To complete the investigation; first, a preliminary exploration was conducted by all of the previous terms. The outcomes illustrations that more than 300 paper were retrieved. In order to enhance the efficiency of the review procedure, the titles and keywords of the 300 paper were checked and concluded that "communication, coordination, and cooperation" are the most

relevant keywords. There is 180 paper that involves at least one of the keywords. Finally, the processes for retrieving the articles were as below: (1) the titles, keywords, and abstracts were checked with the keywords in every article. (2) Abstracts were evaluated to realize whether these articles fitted for the study purposes. (3) After sieving, 34 paper reporting on 3Cs were used and scanned in details for the purpose of this study.

4. Results and Dissection

The fluctuating construction industry business is considered as extreme competitiveness, and complex context necessitates construction organizations to start effective management schemes [1]. The 3Cs have been regarded as critical factors for organizations existence and performance enhancement in the construction industry. The intention of separating among cooperation, coordination, and communication and well-establish organizations is problematic, especially in construction management. They accomplish what the stakeholders aim to effect composed as integrated potential. The 3Cs have the benefits that attract the stakeholders, for instance, improve the possibility of enhanced performance or objectives achievement. This attraction is due to, 3Cs not only share the effort depend on every actor knowledge but accomplish a continuous information exchange. Enhancing efficiency of organizational procedure and the necessity for further well-organized usage of the resources are two issues that motivate the 3Cs.

The significance of communication is due to its capability to allow stakeholders to work composed on shared activates or toward common objectives. The organization that engaged communications only between stakeholders, where everybody is socialized to norms, does not certainly have high performing projects. The absent portion is the linking among the stakeholders' efforts to coordinate their efforts. The analysis of cooperation and coordination associated investigation so far has presented that most of them studied cooperation and coordination subjects separately. A group of research suggest that the degree of cooperation within an association could affect its components and accordingly the worth of the coordination and vice versa [14]. On the other hand, the probability that cooperation and coordination connected association features outline performance interactively rather than independently. Coordination could also endorse further cooperation that is wide and extensive. Cooperation and coordination effect each other and have a mutual influence on project results that surpasses their joint effects. The connections of the 3Cs are displayed in figure 1:

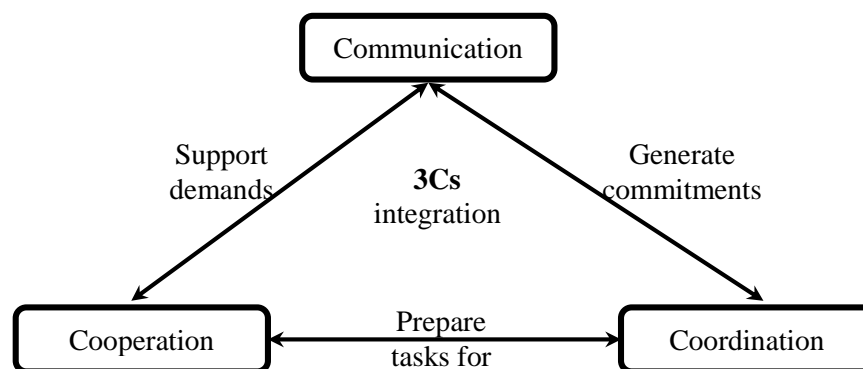


Figure 1.The 3Cs triangle relating communication, coordination and cooperation

Figure 1 shows that the communication needs stakeholders' commitment to become coordination and coordination prepare the tasks for cooperation. However, the level of communication should be increased to support the demands of cooperation. Therefore, the 3Cs can be interpreted individually as; Communication is considered as the exchange of information. It hinges on the selection of media, transmission approaches, discussion arrangement and tracks. Coordination is indicated by the harmonicity of stakeholders, their tasks and resources. It is the controlling perception of integration.

Cooperation is the fruit that can be gained in a shared working context. It is the workflow or project lifecycle perception. The arrangement can be applied on storyboard interface [15].

A conceptual focus on coordination issues rather than cooperation issues provides a different perspective on relationships: while the cooperation perspective centres attention on partners' level of agreement, the contribution of resources, and the sharing of benefits [16]. The coordination perspective highlights the specific ways that stakeholders devise to implement and manage the relationship. Importantly, coordination challenges are not automatically resolved because stakeholders' interests align. On the contrary, coordination problems require intelligent, vigorous, persistent and organized effort. Table 2 presents a comparison between the 3Cs based on the "Vision and Relationships, Structure and Responsibilities, Authority, Accountability and Resources Management".

Human behaviours have direct influences on 3Cs success in construction projects. Behaviour analysis has become an important research area to investigate projects performance improvement.

Table 2. A comparison between the 3Cs characteristics.

Element	Commination	Coordination	Cooperation
Vision and Relationships	Organizational mission and objectives are not deliberated.	Mission and goals are deliberated for compatibility.	Shared, novel mission and objectives are formed.
	Interaction is as needed basis/no time limit.	Interface typically on particular project.	One or more projects are started for longer-term outcomes.
Structure and Responsibilities	Relations are informal; depend on every organization purposes individually. Information is exchanged as required.	Organizations assume required functions but still individually. Channels for contact are formed.	Novel structure and/or formal division are formed. Several stages of channels are formed.
	Authority rests uniquely with individually. All authority and responsibility rests with every organization.	Authority rests on every organization, but there is coordination. There is some shared risk, but most still individually.	Authority is defended by the stakeholders to equilibrium ownership. The equal risk is shared.
Resources	Resources are separate.	Resources are available for a specific project.	Resources are pooled for a long-term effort.

Trust has been founded as the most significant influence on effective 3Cs, which is not only the main factor of behaviours but also a critical factor for a business strategy.

4.1. OVERVIEW OF 3CS IN CONSTRUCTION PROJECTS

In Fact, 3Cs in construction projects have emerged and implemented for a long period from the viewpoint of working together. The development of 3Cs can be seen from two viewpoints: a working relationship and delivery systems, as shown in figure 2.

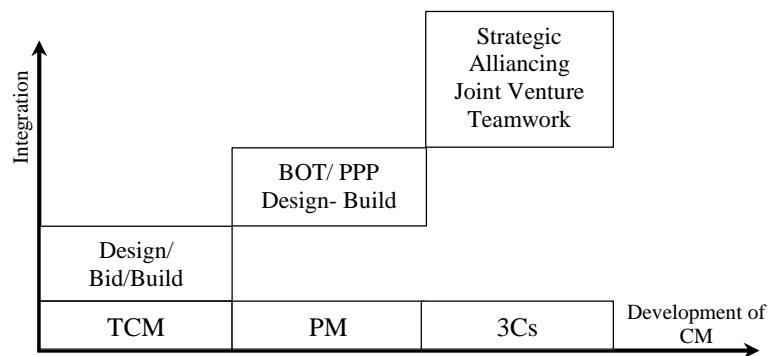


Figure 2. Development of 3Cs in construction projects

From the viewpoint of delivery systems, the construction industry mainly experienced three development processes: the TCM strategy, the PM strategy, and the partnering strategy. TCM relies on independent firms brought together by competitive bids and tough contracts. From the viewpoint of working relationship, there are various forms of 3Cs in construction projects, such as partnership, alliance, joint venture, and coalition. The central principle of these forms of 3Cs is to build an integrated team or entity virtual or physical to work integrally with the predefined objectives. These 3Cs forms have been applied to improve performance and working relationships in construction projects.

5. CONCLUSION

The business context of construction projects is characterized by adversarial relationships, fragmented operation and complexity. The 3Cs business culture, attitudes, and working strategy in the construction industry are emerging to improve the project's performance. Research on the business context of 3Cs in construction projects mainly focuses on the design and construction stage at the project or organizational level. Although the volume of alliance activity is growing, the potential benefits of such arrangements are not being realized in practice yet. This is because the stakeholders are emphasizing short-term profit sharing and accountancy procedures to the detriment of the more long-term value-added dimensions. The purpose of this paper is to address the current gap in project management literature, which need the adequate definition of 3Cs. More work is required for establishing the boundaries of 3Cs theoretical approaches, about construction projects performance.

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