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SUCCESS FACTORS FOR CROSS-FUNCTIONAL TEAMS IN THE CONSTRUCTION INDUSTRY: A LITERATURE REVIEW

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SUCCESS FACTORS FOR CROSS-FUNCTIONAL TEAMS IN THE CONSTRUCTION INDUSTRY: A LITERATURE REVIEW

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ABSTRACT

The use case for cross-functional teams (CFTs) as a means of improving project performance in the construction industry has increased over the last decade. These types of types of teams are a unique form of organization that can be leveraged in Design-Build (DB) and Integrated Project Delivery (IPD). Despite the need for better collaboration in the construction industry, there have been very few studies into how CFTs are formed and maintained over the life of a project. This study addresses this gap by conducting a systematic review of 51 selected peer-reviewed journal publications of CFTs across similar industries, who have a better understanding of these types of teams. For each type of CFT, we use literature to describe its purpose, typical membership and the factors that contribute to its success. From these studies, we identify five frequently cited success factors that have strong applicability to CFTs in the construction industry, including: clear team goals and shared vision, effective leadership, senior management support, human resources, and interpersonal relationships. The findings in this review are expected to provide researchers and practitioners with a set of factors that can aid in the creation of successful cross-functional teams in construction. These factors also provide a starting point to conduct further research on determining how each factor affects project performance in various types of construction projects.

KEYWORDS

Project delivery, organizational science, integration, performance, communication

INTRODUCTION

Cross-functional teams (CFTs) are used in different industries to attain innovative solutions to complex problems. They are created by combining people from different disciplines, cultural backgrounds, intellects, emotional intelligence, and problem-solving strategies (Parker, 2003). CFTs bring together an array of specialists who are jointly and simultaneously making design and production decisions. This concurrent, informed, consensus form of management has shown to produce reduced likelihood of rework, redundancy, and out of sequence activities (Love et al., 1998; Baiden et al., 2006). CFTs decentralize the vertical decision process model used in traditional organizations and utilize a horizontal decision process model that seeks out knowledge and information from a wide array of departments to speeds up the decision-making process and result in high-quality solutions (Bishop, 1999).

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A need for a decentralized system has long been established in the construction industry. For the majority of the 20th century, the Design-Bid-Build (DBB) delivery method has been widely used to complete projects in the industry. This method allows an owner to contract separately with a designer and a contractor who then operate independently using a traditional vertical process model (Ling et al., 2004). As buildings become more complex, the construction industry has become more specialized, segregating processes that were previously directed from inception to completion by one master builder (Yates and Battersby, 2003; Hale et al., 2009). The lack of collaboration in DBB establishes silos of expertise on a project, which often leads to high levels of fragmentation and high transaction costs. Over time, three alternative delivery methods were developed—Construction management at risk (CMR) in the 60s, Design-Build (DB) in the 90s, and Integrated Project Delivery (IPD) in the 00's (Yates and Battersby, 2003; Kent and Bercerik-Gerber, 2010). These methods were made to improve the quality of relations between project participants and encourage feedback and consensus within the design and construction process. In a recent study, Franz et al. (2017) showed that the use of delivery methods with improved integration and strong team relationships led to greater cost savings, better schedule, improved quality and overall client satisfaction. As a form of organization, CFTs provide a structured approach to integration that may be leveraged within supporting delivery methods, such as DB or IPD.

Despite the importance of CFTs, creating and sustaining them can be difficult. About 75% of CFTs across various industries are dysfunctional; the major reason being the lack of a systematic approach to creating and sustaining them (Tabrizi, 2015). Without a strong understanding of how to manage these teams, they could bring more harm than good to a project, leading to confusion and conflict within the team. In the construction industry, there have been limited studies on the application of CFTs. Thus, the goal of this literature review is to examine previous studies on cross-functional teams across multiple research domains, such as new product development, industrial engineering, business and finance, and healthcare, to identify success factors that could be translated to CFTs in the construction industry. The identification of these key success factors will inform future work in formulating and testing hypotheses linking them to construction project success.

METHODOLOGY

To gain an understanding of the factors that contribute to the success of CFTs, we performed a systematic literature review of publications related to their performance. A systematic literature review is a useful way to gain insight into a subject matter and appreciate the existing body of knowledge about a topic (Siddaway, 2014). This methodology used four main phases to screen for and identify relevant publications: (1) systematic search, (2) targetted search, (3) literature classification, and (4) primary publication selection. After compiling a list of primary publications, we perform a cross-comparison of CFTs across the industries in which they are used. To do this, each industry will be studied to understand their goals and objectives, challenges faced, disciplines making up the CFT, and the success criteria required for their formation and functionality. In doing this, we will draw similarities between each industry and the construction industry.

SYSTEMATIC SEARCH

The first step in the systematic search involved identifying databases that would produce a wide range of publications focusing on CFTs. *EBSCO Host*, *Engineering Village*, and *Web of Science* were chosen, as they are regarded as top databases for science- and management-related research. The second step involved filtering out papers and publications to improve the quality of selected works. Only peer-reviewed journals were included, as they have been highly scrutinized by peers for errors, and deeply analyzed by experts in various fields. The search itself was run using a string of keywords to find matches in the title, abstract or keyword sections of publications in the databases. The keywords chosen were "cross functional team," "success," "performance" and "factor." Using the Boolean logic strings shown in Table 1, these keywords were arranged and used to search each database. We made no restriction on the publication date during this search. Across all databases, a total of 287 peer-reviewed journal publications were selected and exported to the EndNote X8 document manager. After removing duplicate articles, the total number of unique publications resulting from the search was reduced to 186.

Table 1: Boolean search strings used in systematic search

Database	Search terms	Results
EBSCO Host	["Cross Functional Team"] AND [Success OR Performance OR Factor]	91
Engineering Village	["Cross Functional Team"] AND [Success OR Performance OR Factor]	121
Web of Science	["Cross Functional Team"] AND [Success OR Performance OR Factor]	75

TARGETED SEARCH

Due to the limited number of CFT-related publications from the construction industry, a more targeted search was undertaken of three additional databases. The first database chosen was *Google Scholar* for having a wide array of published and unpublished works from various research domains. The second was the *American Society for Civil Engineers* (ASCE) database for its focus on just engineering and construction-specific journals, and the third was the *Engineering Project Organization Society* database for its focus on organizational science in the industry. Upon manually searching these databases for studies that evaluate CFTs in the construction industry, five additional articles were selected, bringing the total publication count to 191.

LITERATURE CLASSIFICATION

After identifying all relevant publications, we then classified the articles based on the types of CFTs that they studied. These types of CFTs, their use and the numbers of publications in each classification are summarized in Table 2. Publications that did not specify the specific CFT being studied were classified as "General" teams. This classification had the most publications with sixty-one (61) studies, while the construction management category had the fewest with just nine (9) publications.

Table 2: Publication classification by type of CFT studied

Team Type	Use	No. of Papers
New product development (NPD)	Research and design new products	41
Industrial and manufacturing engineering (IE)	Improve production process or systems	52
Business and financial (BF)	Improve business operations	13
Construction management (CM)	Manage construction projects	9
Healthcare (HC) provider	Provide integrated patient services	15
General	Not specified	61

PRIMARY PUBLICATION SELECTION

Not all publications within each CFT classification focused solely on determining success factors; some simply considered the effect of CFTs on projects outcomes, rather than the factors that contribute to a successful CFT. A review of the abstracts of all 191 publications was conducted, followed by an in-depth text review, to select only those publications dealing directly with success factors. This process reduced the total number of publications from 191 to a final count of fifty-one (51). A summary of the results of the publication identification process in our systematic literature review are shown in Figure 1.

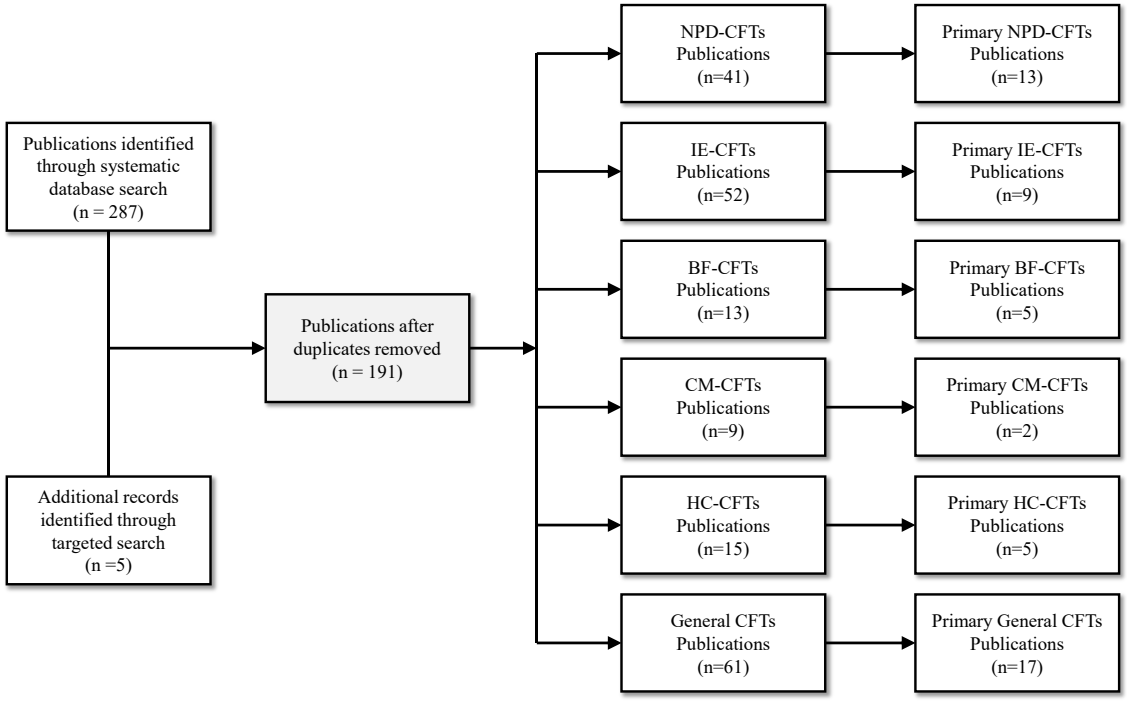

Figure 1: Summary of literature search results

RESULTS AND DISCUSSION

TRENDS IN PUBLICATIONS

Interest in CFTs has slowly increased over time. Figure 2 shows the distribution of the 191 publications that we initially identified in the literature search. The figure indicates interest in CFTs beginning around 1991 with just three papers, with the highest publication count occurring in 2015 with twelve papers. Although there are some

notable years with a drop off in CFT-related publications, there has been a slight upward trend as more industries learn to apply CFTs. This literature reviewed the use of CFTs across five different industries—new product development, industrial and engineering management, business and financial, construction management, and health care—to determine the success factors for teams in each of these fields. The following sections describe the purpose and characteristics of each type of CFT, as well as the success factors found in their primary publications.

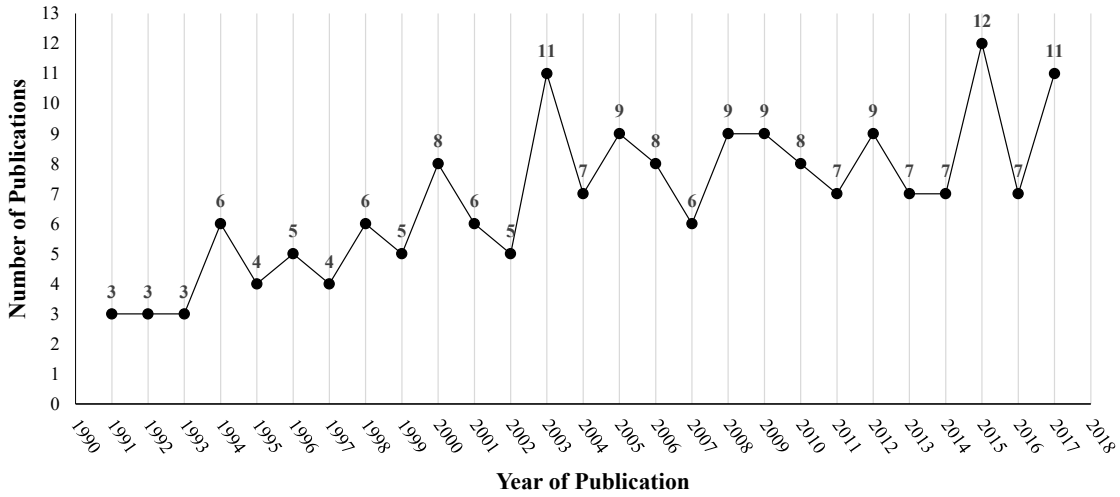

Figure 2: Number of publications focused on CFTs success criteria

NEW PRODUCT DEVELOPMENT CFTS

New product development (NPD) is the process of bringing new products to the marketplace. The objective of NPD is to produce innovative products that can cultivate, maintain, and increase a company's market share by satisfying consumer's needs (Kahn et al., 2012). The NPD process often consists of four basic stages: (1) opportunity identification, (2) development, (3) testing, and (4) launch (Kahn, 2012). The first stage, opportunity identification, involves the creation of an innovative idea for a product that either builds upon already existing products or helps in creating a revolutionary new one. This involves brainstorming research sessions with consumers, engineers, designers, and marketers to understand what product is needed by customers and how it can benefit the company. The second stage, involves the development of the product. Several prototypes are designed, manufactured and modified during this stage to maximize the product's functionality and reduce production cost. The third stage is the testing stage. This involves the testing and analysis of a beta product with a small group of consumers and allows the NPD team to confirm if the product design is viable and ready to be sent to a manufacturer for mass production. The final stage is the launch stage which involves the introduction of the product to the market. Teams involved in this stage span between manufacturing and industrial engineers, finance and R&D, and marketing research and sales (Pitta, Franzak, and Katsani, 1996; Kahn, 2012; Kahn et al., 2012).

Due to the competitiveness and fast-paced nature of the NPD industry, cross-functional teams are vital to a company's success. NPD research shows that there are two types of CFTs, operating and innovative (Barczak and Wilemon, 1989). Operating teams exist within the organization and are concerned with maintaining competitive

positions in an existing business (Bart, 1988a; Bart, 1988b). These teams recognize the need to keep up with customer needs and their competitors; therefore, these teams focus on providing updates to existing products and services. Operational NPD-CFTs consist of disciplines ranging from designers, R&D, and engineers, to market researchers, and sales agents. These CFTs are intra-organizational as they compose of disciplines that operate within the same organizations. Mutual decision making is vital to meet the team's objectives and CFTs are used to avoid problems caused by miscommunication under high-pressure situations (Barczaka and Wilemon, 2003). Innovative teams, on the other hand, explore new grounds. They focus on developing new ideas and business for the firm; and are excluded from everyday activity of the firm (Bart, 1988a; Bart, 1988b; Burgelman, 1980; Pitta, Franzak, and Katsani, 1996). Using generative learning, they challenge firms to rethink assumptions made about its customers, competitors, and strategy (Slater and Narver, 1995; Barczaka and Wilemon, 2003). Like operating teams, innovative teams are cross-functional and span a variety of disciplines. These teams, however, are *inter*-organizational. They consist of experts from different fields and industries brought together for a limited time to develop and bring an innovative product to consumers (Pitta et al., 1996). Operating and innovative CFTs are essential to the NPD industry. Upon review of fifteen (15) primary publications, we identified five factors commonly cited in the success of these teams:

- *Clear goal setting*: Nine (9) papers concluded that establishing a clear goal for NPD-CFTs was essential for their success. Clear goals were seen to provide two benefits for these teams. First, they provided team members with a common frame of reference. Second, superordinate goals helped to structure tasks and constrain team efforts within boundaries, thereby reducing confusion and improving the division of labor amongst teams, and in turn, promote cooperation and increase productivity (Conklin, 1996; Hirunyawipada et al., 2010; Kim and Kang, 2008; Melton and Hartline, 2015; McDonough and Edward, 2000).
- *Effective leadership*: Eight (8) papers reported that an effective leader was needed for NPD-CFT success. An effective leader was described as a good communicator, climate setter, and planner, who uses a participatory style of leadership to manipulate situations and surroundings to achieve desired behaviors and set goals (Conklin, 1996; Raunaiar et al., 2008; Barczaka and Wilemon, 2003; McDonough and Edward, 2000).
- *Human resources*: Six (6) papers focused on acquiring individuals with the right technical and interpersonal skills for a job. A study conducted by McDonough (1993), showed that using more highly educated teams in operational CFTs resulted in faster development while having team members with no ties to the NPD organization in innovative teams resulted in faster development. During the organization of innovative teams, studies suggested that care should be taken to ensure the recruited members are technically and emotionally balanced (McDonough and Edward, 2000; Bamber et al., 2003; Barczaka and Wilemon, 2003; Hirunyawipada et al., 2010).
- *Interpersonal cohesion:* Six (6) papers also mentioned the importance of creating interpersonal cohesion to combat the functional and personal differences within NPD-CFTs. Developing and maintaining trust amongst

members of CFTs was seen as important to reducing stress and increasing cooperation given the complexity and uncertainty inherent in the NPD process (Mat and Jantan, 2008; Hirunyawipada et al., 2010; Ghobadi and D'Ambra, 2013; Bamber et al., 2003).

- *Senior management support*: Lastly, five (5) papers identified senior management support as essential to the success of both types of NPD-CFTs. This support took a variety of forms, including demonstrating commitment, championing teams during stressful periods, and allocating funds for tools and services needed by these CFTs (Kim and Kang, 2008; Raunaiar et al., 2008; McDonough and Edward, 2000; Barczaka and Wilemon, 2003).

NPD has many similarities to the design and construction process. NPD-CFTs design products that address consumer needs or improve on an existing product. The value to consumers is central to the design as it must achieve the required function at a reasonable cost. This is very similar to the objective of design teams in the construction industry. Design teams develop building designs for their clients that maximize functionality, ideally within their client's budget. Likewise, to achieve the maximum functionality of new product design, NPD teams work with consumers to design and determine criteria for a new product. Using these set criteria, a prototype is developed and refines through testing before it is finalized and mass produced. These steps allow the NPD teams to maximize value by reducing cost and impressing functionality (Kahn, 2012). The development of design documents in the construction industry follows similar steps. In collaboration, architects and their clients work together to set programmatic criteria for projects. The architect then produces a building prototype design that is refined and tested using tools, such as building information modeling (BIM), value engineering, energy modeling, and life cycle costing (Gray and Hughes, 2007).

The main difference between NPD and construction management CFTs is in the process of making. NPD-CFTs typically plan for mass production, where their prototype can replicated an unlimited number of times with close precision. CM-CFTs, on the other hand, plan to produce a one-off product, where due to differences in the site and local building codes, can never be completely reproduced. Despite this difference, the success factors used to form and manage CFTs in the NPD industry have a strong relevance to CFTs in the construction industry.

INDUSTRIAL AND MANUFACTURING ENGINEERING CFTS

Industrial engineering (IE) is a branch of engineering that involves the optimization of complex processes, systems, and organizations. Industrial engineers aim at reducing production costs, increasing efficiency, improving the quality of products and services, and ensuring worker's health and safety, while protecting the environment and complying with government regulations (Salvendy, 2001; Kalpakjian and Schmid, 2014). Industrial engineers work across several industries and some of the tasks they perform include: streamlining operating rooms in hospitals to improve efficiency; working with logistics, shipping, and distribution facilities to improve delivery time; or at an assembly line to improve safety and increase efficiency (Davenport and Short, 1990; Garner, 2012; Boysen et al., 2007).

One of the most common industries that industrial engineers work is in the manufacturing industry. In this industry, industrial engineers coordinate with different teams throughout the manufacturing process. IEs work with (1) NPD teams to refine products and determine the manufacturability of proposed designs, (2) CAD teams to develop and simulate manufacturing processes and protocols to increase production efficiency, (3) procurement teams and material suppliers to ensure an uninterrupted flow of raw materials during production, (4) robotics and mechanical engineering teams to implement robot into the manufacturing process, and (5) quality and safety engineering team to ensure the new product meets the desired performance, safety, and government standards (Cooper and Ellram, 1993; Kalpakjian and Schmid, 2014). Due to the vast array of disciplines involved in the manufacturing process, industrial engineers utilize the breadth of knowledge contained in cross-functional teams to coordinate with other functional teams throughout the manufacturing process.

IE-CFTs are typically intra-organizational teams that coordinate with external, specialized or cross-functional teams such as NPD-CFTs, material suppliers, mechanical engineers, or sales teams to ensure that planning, implementation, and execution of the manufacturing process are done efficiently. They could also be a temporary inter-organizational CFT brought together to plan and implement a new manufacturing process (Pinto et al., 1993). Upon the review nine (9) primary publications, six factors, many similar to the factors identified for NPD-CFTs, were consistently cited as necessary for the success of IE-CFTs:

- *Clear goal setting*: Six (6) papers cited clear goal setting as an important factor for the success of both intra- and inter-organizational IE-CFTs. In temporary intra-organization CFTs, having a clear goal helped to align each member of the team strategically. In inter-organizational CFTs, external members often focus on the profitability of their home organization rather than the goal of the new team; thus, goal setting was found to shift their perspective to that of a unified internal goal (Bestow et al., 1998; Gupta and Wilemon, 1998; Piercy et al., 2013; De Oliveira et al., 2016).
- *Human resources*: Five (5) papers discussed the skills and expertise of the individual members that make up an IE-CFT. Due to the number of disciplines involved in the manufacturing process, teams in IE literature relied heavily on the expertise of functional members within the cross-functional group to improve the efficiency of the existing system. Having functional members who are both intelligent and emotionally balanced, provided a reliable source of knowledge and information for industrial engineers during the manufacturing process (Gregg, 2005; Meschnig and Kaufmann, 2015; Kaufman and Wagner, 2017; Malhotra et al., 2017).
- *Senior management support*: Four (4) papers reported the need for senior managerial support, specifically in ensuring that senior managers buy into the idea of cross-functional interaction, as well as being willing to work with other departmental heads to create programs that encourage these CFTs, provide quality team members, and allocate funding to acquire the necessary work tools and technology for the team (Gupta and Wilemon, 1998; Bestow et al., 1998; Piercy et al., 2013).

- *Interpersonal cohesion*: Four (4) papers recognized the importance of interpersonal cohesion, especially in inter-organizational IE-CFTs where each member's home organization are subjected to different levels of risk. These papers suggested that organizational individualism must be forgone, and interpersonal relationships created to improve team cohesion (Gupta and Wilemon, 1998; De Oliveira et al., 2016; Kaufman and Wagner, 2017).
- *Team proximity*: Four (4) paper also identified the importance of physical proximity to build trust, cooperation and improve communication. IE-CFTs often consist of individuals from organizations located around the world. Internal CFTs that worked in the same building or on the same floor were more successful. Similarly, external CFTs that encouraged individuals to relocate to the project site were associated with more positive outcomes (Gupta and Wilemon, 1998; Piercy et al., 2013; De Oliveira et al., 2016). Virtual spaces were also used to reduce team distance, but they were not as effective as a reduction in physical proximity (Dani et al., 2006).

Similar to NPD, IE-CFTs share many characteristics with construction management teams. IE teams utilize engineering and management skills to optimize processes and systems. Manufacturing and delivering a high-quality product to the market on time and within manufacturing budget is essential to their success. This objective is very similar to general contractors in the construction industry. The goal of every construction team is to deliver a high-quality project that is both on time and within budget. IEs often achieve this objective by planning, managing, and simulating the manufacturing process with cross-functional teams (Cooper and Ellram, 1993; Kalpakjian and Schmid, 2014).

IE-CFTs consist of a manufacturing engineer who acts as the project manager; material suppliers who ensure materials are available on time and within budget; CAD designers to help simulate and streamline the manufacturing process; and quality and safety engineers to ensure factory workers are safe and the products being manufactured meet design specifications. These cross-functional teams also work with NPD teams in the product design phase to provide design input concerning feasibility and manufacturability of the product (Kalpakjian and Schmid, 2014). The composition of these teams is similar to those in the construction industry. Construction teams often consist of a project manager; material suppliers who supply materials when needed; lead designers to help coordinate designs from different disciplines; quality and safety engineers to ensure quality standards; and a variety of trades who construct the product (Gray and Hughes, 2007). The similarities between these industries suggest that the success factors for forming and using CFTs in the industrial engineering industry would likely be similar for CFTs in the construction industry.

BUSINESS AND FINANCIAL CFTS

The business and financial industry uses technology and societal trends to manage money. Organizations in this industry aim to increase revenue, profit margins, retrench in times of hardship, and earn a return on their investments (Johnson, 2001; Saunders and Thomas, 1997). This sector consists of three general services: accounting services, which provide instruction in developing and utilizing general accounting systems; banking and related services, which focuses on the fundamentals of lending and

banking regulations; and business financial management, which helps develop skills in investment analysis and guidance (Johnson, 2001; Zhu, Kraemer, and Dedrick, 2004). These services are often undergoing shifts from traditional to non-traditional technologies and markets in response to ongoing deregulation of the industry (Storey and Easingwood, 1996; Storey and Easingwood, 1999). Due to this shift, the need for innovation is vital for organizations to stay competitive.

Utilizing the dual-core conceptualization of innovation in this industry, two types of innovations occur—technical and administrative. Technical innovation refers to innovation in the design and delivery of products and services, as well as marketing and office operations. An example of this type of innovation is the use of online banking to improve customer satisfaction and banking experiences (Bantel and Jackson, 1989; Lassar et al., 2005). Administrative innovation refers to innovations related to general management issues, such as staffing and employee survey, strategic planning, compensation systems, and training programs. An example of this type of innovation is the use of CFTs to forecast trends in the economy and create solutions to react accordingly (Bantel and Jackson, 1989; Zhu et al., 2004). These CFTs are typically intra-organizational teams that consist of department heads, strategic planners, operations officers, and human resources officers. These teams work together to make decisions that affect the profitability of the organization. Risks are associated with these decisions; therefore, having a team that views the problem from various angles is imperative to taking calculated risks (Broadbent and Weill, 1993; Alam, 2003). Upon review of five (5) primary publications, the following success factors were found to be frequently cited:

- *Effective leadership*: All five (5) papers on CFTs in the business and financial industry emphasized visionary leadership, capable of anticipating upcoming trends (Cooper, 1994; Cantrell and Benton, 2007; Ainamo, 2007).
- *Senior management support*: Three (3) papers described the importance of senior management and their role in establishing a climate that encouraged easy collaboration between departments and allowed for “out of the box” thinking (Cooper, 1994; Cantrell and Benton, 2007).
- *Effective communication*: Three (3) papers also identified communication as a success factor, specifically in the manner in which teams included debates about developed ideas and stimulated collaborations across departments. (Mishra et al., 1998; Cantrell ad Benton, 2007; Ferdousi, 2012)

Teams within the business and financial industry have less in common with construction teams than NPD or IE. By bringing together various high-level functional department leaders, teams in the business and financial industry plan observe trends in the market and make adjustments to the entire organization to either profit from a positive trend or cut back on operational costs when needed (Alam, 2003). The only similarity with the construction industry is that construction projects are first and foremost capital investments that are affected by variations and fluctuations in the market. An increase in the price of steel causes a rise in material cost estimates of all construction projects. Some success factors from the business and financial industry may be applicable to construction management CFTs, specifically those that are tasked with forecasting or responding to market trends.

HEALTH CARE CFTS

The health care provider industry consists of organizations that maintain, improve or re-establish the health of patients. Often, achieving this aim requires the coordination of multiple service providers and the industry has recently begun to use cross-functional teams. CFTs in this sector consist of medical professionals (e.g., doctors, surgeons, nurses, and paramedics) and non-medical staff (e.g., IT, office administrators, and financial advisors) working together to maximize the service being rendered to the public (McCullough, 2010; Reiling, 2006). Upon review of five (5) primary publications, the following factors were determined to be related to the success of CFTs:

- *Functional diversity*: All five (5) papers cited having a wide array of specialized medical professionals as crucial to providing timely and accurate diagnoses and treatment plans to patients (Legare, 2001; Alexander et al., 2005; Kono and Antonucci, 2006; Bitter et al., 2015).
- *Coordination*: Four (4) papers referenced the need for coordination, such that CFTs could be assembled quickly during an emergency and enabled to complete their work efficiently (Legare, 2001; Alexander et al., 2005; Bitter et al., 2015).
- *Team size*: Three (3) papers concluded that the number of members in the CFT influenced its success. While the optimal team size varied by task, the number of members was recommended to be small enough for quick assembly and decision-making, but large enough to capture the needed expertise (Legare, 2001; Kono and Antonucci, 2006).
- *Effective leadership*: The same three (3) papers also described the importance of an effective leader as one who quickly defined team goals, evaluated proposed solutions and implemented the right one accordingly (Legare, 2001; Kono and Antonucci, 2006).

Due to the time--sensitive environment in which professionals in this field work, the breadth of knowledge present in CFTs is vital to improving the quality of diagnosis, treatment, and services provided to patients (Cashman et al., 2004). The construction industry has some similarity to healthcare providers, in that design and construction firms often render services under tight schedules and high-intensity conditions that require a diverse team to provide innovative solutions to a problem. However, the scale of the work is drastically different between industries. For a healthcare CFT, their project may be a single patient, compared to a large-scale infrastructure project that construction teams must manage and deliver. Thus, there is a low similarity between healthcare CFTs and those that would be found in the construction industry.

GENERAL CFTS

Many publications studied success factors of cross-functional teams, without referencing a specific type of team or industry in which they operate. Most of these publications focused on either one or a grouping of multiple factors to study how they could be developed to improve an existing CFT. Upon reviewing seventeen (17) primary publications, the following factors were commonly cited:

- *Clear goal setting*: Six (6) papers discussed the building of a shared vision among a CFT, which is unique and sometimes at odds with external parent organizations (Webber, 2002; Chan et al., 2003; Gregg, 2005; Denison et al., 2017).
- *Effective leadership*: Five (5) papers highlighted the role of an effective leader, specifically identifying the participatory form of leadership and the ability to quickly manage conflict and stress when they arise in the team (Webber, 2002; Ehrhardt et al., 2014; Denison et al., 2017).
- *Conflict management*: Four (4) papers mentioned conflict management skills or procedures as necessary for success. During the early stages of CFT formation, resistance and inter-team conflict are common. To guide the team through this phase of development, systems of managing conflict were found in more successful teams. (Gregg, 2005; Ehrhardt et al., 2014; Denison et al., 2017)
- *Functional diversity*: Four (4) papers also recognized the need for the right balance of individuals from different disciplines. Too little diversity led to suboptimal solutions, whereas too much diversity led to more conflict (Webber, 2002; Randel and Jaussi, 2003; Tekleab et al., 2016).

CONCLUSIONS

Over the last decade, research interest in the creation, management, and use of CFTs to achieve organizational objectives and improve productivity across several industries has increased. However, to date, there have been limited study on these teams in the construction industry. Therefore, this paper reviewed and analyzed publications in peer-reviewed journals with regards to factors critical to the success of CFTs across industries similar to the construction industry. *EBSCO Host*, *Engineering Village*, and *Web of Science* databases were searched using a keyword string to identify 191 papers, which were then reduced to fifty-one (51) papers using abstract and in text review to select relevant papers. Five types of CFTs were represented in the selected literature. These CFTs are new product development (NPD), industrial engineering and management (IE), business and financial, healthcare provider, construction management, and general CFTs. Based on the number of publications, it was determined that the NPD industry had a better understanding of the functionality of CFTs, while construction industry had the least.

The analysis of publication in these various industries showed that each industry focused on many similar success factors. Industries that contained inter-organizational CFTs, such as NPD and IE, considered clear goal setting to be the most important factor to CFT success, as it helps to align functional members to strategically work towards a common goal. Intra-organisational CFTs from industries such as healthcare providers, with already aligned goals tended to focus more on team diversity, as having a broad knowledge base was crucial to delivering timely patient services. Upon cross-tabulation of the most common success factors across all types of CFTs, the top five success factors were: (1) clear team goals and shared vision, (2) effective leadership, (3) senior management support, (4) human resources, and (5) interpersonal relationships. Table 3 shows the complete list of other important factors and the types of teams for which they were considered necessary for success. We conclude that these five factors and the other listed in Table 3 have strong applications for CFTs in the construction industry.

Table 3: Factors for successful CFTs

Success Factors	No. of Publications	Type of Team
Team goals and shared vision	23	NPD, IE, BF, HC, G
Effective leadership	18	NPD, BF, G
Senior management support	12	NPD, IE, BF
Human resources	11	NPD, IE
Interpersonal cohesion	10	NPD, IE
Functional diversity	9	HC, G
Team composition	6	BF, HC
Conflict management	4	G
Physical proximity	4	IE
Effective communication	3	BF
Team size	3	HC

NPD = New product development, IE = Industrial and manufacturing engineering, BF = Business and financial, HC = Healthcare providers, G = General

Although the research objectives were achieved, some limitations of this study are worth mentioning. One limitation is in the use of databases that focused on technical industries such as NPD, IE, and construction. To get a better understanding of CFTs in non-technical fields such as healthcare providers and the business and financial industry, an additional targeted search towards journals in those research domains is recommended. Another limitation comes from relying solely on peer-review journals, as this may have introduced a publication bias by not reviewing unpublished works. Despite these limitations, the findings in this review are expected to provide researchers and practitioners in the construction field with a set of success factors to consider when forming and managing cross-functional teams.

As a result of the developed list of factors, this paper will be useful for researchers to conduct further empirical studies on cross-functional teams within the industry. First, there is a need to define the meaning of "success" for construction CTFs, with an emphasis on measurable outcomes that are common across project types. In other words, the factors that were identified in this literature review should result in more successful CFTs, but what does that success look like and how can a CFT maintain that success throughout the project? Second, there is need to understand how the success of the team translates to the performance of the project. Having a highly effective CFT is desirable in theory, but their efforts must ultimately have a measurable impact on commonly cited project outcomes (e.g., cost growth, delivery speed and facility quality) to gain broader acceptance in the industry. Can the team be successful, but have a poor performing project, and vice versa? Understanding the magnitude of this impact would help practitioners to determine when and how to implement CFTs, as well as encourage academics to conduct more research into the subject matter.

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