

AMERICAN UNIVERSITY OF BEIRUT

A STEP TOWARDS IPD IMPLEMENTATION: ESTABLISHING
TRUST IN DBB PROJECTS

by
GHINA MAZEN EL SABBAGH

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by
GHINA MAZEN EL SABBAGH

Approved by:



Dr. Mohamed-Asem Abdul-Malak, Professor
Department of Civil and Environmental Engineering

Advisor



Dr. Hiam Khoury, Associate Professor
Department of Civil and Environmental Engineering

Co-Advisor



Dr. Farook Hamzeh, Assistant Professor
Department of Civil and Environmental Engineering

Member of Committee

Date of thesis defense: April 23, 2019

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AN ABSTRACT OF THE THESIS OF

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Integrated project delivery (IPD) is one of the relational project delivery approaches that has been lately adopted in construction projects in the United States, Canada, China and many other countries in the world. IPD presents many benefits on project performances over the traditional transactional delivery approach Design-Bid-Build (DBB) that is mostly used in the construction field in the Middle East (ME) region. Implementing IPD requires trust between project participants since trust is at the core of relational contracting. However, the construction industry in the ME area lacks trust which hinders the implementation of IPD in the region. Therefore, establishing trust in the DBB approach is a crucial and critical step towards IPD implementation.

Many researchers have tackled the issue of distrust and how to establish trust in construction projects but no research has yet described how trust attributes found in the literature can be employed in a DBB approach in order to improve project performances. This research study presents a theoretical model targeted at establishing trust between project participants. Results revealed that many of the IPD traits effective in building trust, in addition to a basket of trust attributes composed of relational, organizational and project characteristics, can be applied to a DBB project lifecycle especially to the construction phase. The study contribution lies in providing owners and project managers with a strategic model that can help improving the distrust issue faced in a traditional transactional delivery approach and develop a trustful working environment.

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CHAPTER 1

INTRODUCTION

1.1. Background

Before the twentieth century, when in need of a new facility, an owner used to hire a master builder to handle the entire design and construction processes (Paik et al., 2017). However, over the years, the AEC industry became complex and mostly fragmented in its operations, especially in large scale projects in which a variety of additional expertise is needed (e.g., lighting, mechanical and electrical, commissioning). Therefore, to cope with the complexity and size of construction projects and the specialization in design and construction areas, new project delivery methods have been introduced to the AEC industry. Such delivery methods are the traditional Design-Bid-Build (DBB), the fast-track oriented methods (i.e. the Construction Manager at Risk (CMR) and the Design-Build (DB) method) and the Integrated Project Delivery (IPD).

Matthews and Howell (2005) presented the IPD concept as a construction contractual structure that promotes risk and profit sharing among participant in order to solve the systemic problems faced in the traditional contractual approaches (Sun et al., 2015). IPD by contract is distinguished by a multiparty agreement including the owner and the very early involvement of key participants (El Asmar et al., 2013). IPD ties major project party interests contractually to project success, enhances collaboration across project teams, and optimizes project performance (Forbes & Ahmed, 2011). According to the AIA & AIACC (2007), IPD can increase the construction productivity, promote project teams to achieve higher goals and benefit all major project participants. Moreover, IPD aims to facilitate team integration, open goal sharing, and transparent team communication and it performs efficiently along with Lean construction methods and

Building Information Modeling (BIM) to synergize project performance and optimize the interests of all project parties (Sun et al., 2015). This delivery method makes use of a collaborative approach of combining the incentives and risks with goals of the team to improve project performance (Zhang et al., 2017). Kent and Becerik-Gerber (2010) illustrated the benefits of IPD by conducting an empirical study and showed that “the most commonly observed benefits are fewer change orders (70.3%), cost savings (70.3%), and shorter schedule (69.4%)”.

According to Thomsen et al. (2010), an owner’s top concerns are 1) trust and integrity in the construction process, and 2) coordination/collaboration among team members. Trust is described as a mutual confidence between the interacting parties when the nature of exchange among these parties encloses some degree of vulnerability (Coleman, 1990; Sabel, 1993). Trust is an attitude; Pishdad-Bozorgi and Beliveau (2016a) discussed that trust is built over time when honesty, openness, dependability, integrity, competence and fairness are expressed between team members. According to Smith and Rybkowski (2012), trust is a competency: it’s something we can work on and improve. We can do things to build trust just as we can do things to damage it. Trust is more critical in a large complex project because of the large network of interdependencies and a greater need for parties to rely on each other’s actions (Chiocchio et al., 2011; Swan et al., 2002). According to Larson and LaFasto (1989), trust is comprised of four elements: 1) honesty, 2) transparency, 3) consistency and 4) respect and if one or more of these elements is absent trust is broken (Svalestuen et al. 2015).

A review of the literature has shown that partners in a construction project need some assurance that the other parties will not withdraw which makes trust a precondition for cooperation. In order to deliver a project successfully, trust between team members is

essential to create a collaborative environment. Zhang et al. (2017) pointed out the importance of trust in creating a harmonious environment to communicate. Trust is critical to the success or failure of the construction project and therefore a high level of trust between internal and/or external customers is perceived to be an important part of many construction companies' goals and objectives (Smith et al., 2014).

Duke et al. (2010) determined that one of the most significant drivers for change in the construction industry is the lack of trust. Interpersonal mistrust leads to guarded behaviors and dysfunctional conflicts, which result from the individuals pursuing and protecting their own interests (Pishdad-Bozorgi and Beliveau, 2016a). According to Ashcraft (2011) efficiency and team productivity is reduced as a result of the lack of trust. One of the key barriers to having an integrated team is lack of trust among the contracting parties (Pishdad-Bozorgi, 2016). The problem of mistrust in the construction industry is proved to be one of the key drivers to increased cost and delay (Pishdad-Bozorgi and Beliveau, 2016b).

Recently developed trends, such as Lean and IPD aim to address the issue of mistrust by creating an environment of mutual trust and respect (Pishdad-Bozorgi & Beliveau, 2016a). The IPD contract form of agreement is aimed at changing behaviors, and its contractual structure exists to promote best value and reinforce mutual respect and trust between the parties (Dal Gallo & Wilson, 2017). IPD has been proven to be more effective in building trust than more traditional delivery approaches (Pishdad-Bozorgi, 2016).

Integrated project delivery (IPD) has been touted as a strategy that provides the most effective and efficient way to procure a built asset (Rowlinson, 2017). Although its adoption is increasing in the United States and other parts of the world, no sign of IPD

implementation in the Middle East can be detected (Rached et al., 2014). The governing project delivery approach in the region is still the traditional one (e.g. DBB), whereby a contractor constructs the works in accordance with a design package provided by the architecture and engineering consultant to the employer (Rached et al., 2014). Littrell and Bertsch (2012) found that the Middle Eastern society finds difficulty in changing its habits and does not readily accept the idea of change. A study by Javidan et al. (2006) was done to analyze the Middle Eastern construction culture in order to examine the barriers for implementing collaborative delivery methods such as IPD. The Middle Eastern cluster scored low in the following four attributes: 1) uncertainty avoidance, 2) future orientation, 3) team-oriented and 4) participative (Javidan et al. 2006). Rached et al. (2014) found that these cultural dimensions are fundamental qualities required for the success of an IPD project and their absence is considered a barrier to switch from traditional delivery approach (DBB) to IPD.

1.2. Problem Statement

Our construction industry seems to suffer from a critical problem: the lack of trust between project parties. As previously mentioned, trust among project participants is very important and IPD has been identified as the most effective project delivery approach to establish and promote trust. However, the construction industry in our region is far from adopting or accepting IPD since the majority of the Middle East clients use the DBB approach in their projects and not everyone is willing to change their organizational culture to start adopting IPD. The problem of distrust in DBB projects must be addressed and there is a crucial need to achieve the goal of establishing trust.

The literature addresses the topic of trust in an abstract sense. It has not yet addressed how establishing trustworthy relationships between project participants can be implemented in a transactional project delivery method. Various studies have tackled the issue of relational contracting and trust in improving project performance. However, the question as to how to establish trust in transactional contracting (e.g. DBB) has not yet been answered.

1.3. Research Objectives

On the one hand, the purpose behind this research is to make use of any available information concerning methodologies that can help deduce trust-building model among project parties in a transactional contracting approach such as DBB. On the other hand, it is important to look at all the trust-building attributes that can be useful to the model. This entails understanding what the literature offers as guidelines and defining how to expand and develop any such possible existing framework. Furthermore, analyzing the results of a trustful environment in a DBB project and comparing it to the IPD delivery approach will be useful and beneficial for the current situation in the construction industry. To this end, scrutinizing specific trust-building attributes that can be implemented in a DBB project delivery approach may prove to be instrumental in shaping the current construction situation into a more integrated and IPD-like one.

1.4. Methodology

The methodology to be followed in this research is represented in Figure 1 and includes the following steps:

1. Conduct a review of the literature concerned with the issue of trust in the construction industry.
2. Identify the IPD traits and the general trust attributes effective in building trust among project parties.
3. Classify these general attributes into three classes:
 - Relational characteristics;
 - Organizational characteristics;
 - Project characteristics.
4. Group the IPD traits and general trust attributes into three groups:
 - Group 1: IPD traits covering a number of general trust factors;
 - Group 2: Remaining un-matched general trust attributes;
 - Group 3: Innovative IPD traits not covered previously in the trust literature.
5. Allocate the trust attributes of each group to the different phases of a DBB project life cycle and explain the rationale behind each allocation.
6. Offer a summary of the work, conclusions, and future work.

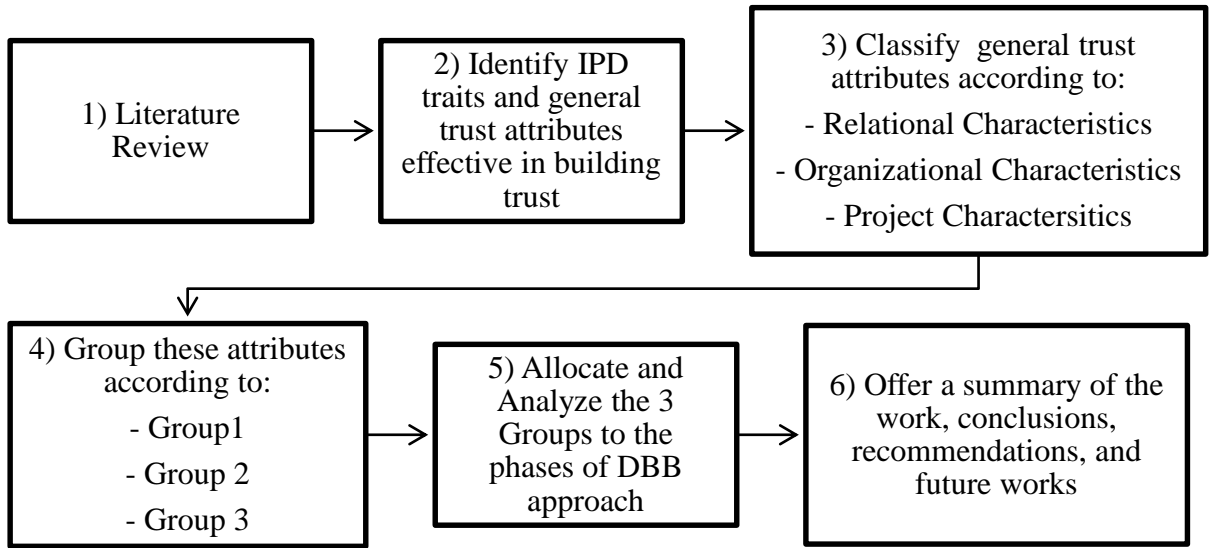


Figure 1: Methodology of Work

CHAPTER 2

LITERATURE REVIEW

2.1 IPD Delivery Approach

The American Institute of Architects, AIA and AIA California Council (2007) defines IPD as "a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction." The AIA website later in 2010 defined IPD as "a project delivery method distinguished by a contractual agreement between a minimum of the owner, constructor and design professional that aligns business interests of all parties". This definition highlights a unique feature of IPD which is the multi-party contract. (Sun et al., 2015) Nowadays, the old concept of master builder is reappearing again with the Design-Build approach and more contemporary the IPD. The latter approach incentivizes collaboration between project parties. The core philosophy of this relational contracting arrangement is to generate a cooperative and trustful climate for the benefit of an improved performance of the project (Kalach et al., 2018).

The AIA National & AIA California Council (2007) stated that as a relational delivery approach IPD provides a new contractual, behavioral, and organizational context for delivering construction projects. IPD motivates collaboration by tying stakeholder success to the project success throughout the design and construction process. Relational project delivery methods differ from transactional ones by their collaborative organization governed by trust and operating system based on integration (Abdel Hamid,

2012). Moreover, Yeung et al (2012) distinguished five core elements of relational contracting: commitment, trust, cooperation, communication and common goals and objective (Pishdad-Bozorgi and Beliveau, 2016a).

There is a huge attention drawn to IPD as an innovative project delivery method in the AEC industry because of its potential to reduce overall project costs and improve project quality and schedule (AIA 2010, 2012). According to Mollaoglu-Korkmaz et al. (2014), project parties in IPD openly share information via the use of technology and meetings throughout the project life cycle; moreover, they establish collaborative processes and share financial savings and losses (Paik et al., 2017).

As a new type of delivery approach, IPD has gained popularity in recent years. Given its benefits to the AEC industry, various organizations are concerned with its implementation to their projects (Zhang et al., 2017).

Since 2005, IPD has emerged in the U.S. IPD aims to increase value to the owner, reduce waste and maximize efficiency throughout the project life cycle.

IPD traits can be grouped into four categories: 1) Organizational and management, 2) Contractual, 3) Communicational, and 4) Behavioral (Pishdad-Bozorgi and Beliveau, 2016b).

Lahpendra (2012) recognized IPD as an example of “relational project delivery arrangements” along with Project Alliancing (PA) and to a lesser extent, Project Partnering (PP) (Rahman and Kumaraswamy 2002, Rowlinson and Cheung 2004). However, IPD is distinguished from other relational project delivery arrangements by the multi-party contract signed between a minimum of the owner, the designer and the contractor. In this way, IPD seeks a more fully integrated construction process by getting use of the lessons learnt from PP and PA (Smith and Rybkowski, 2012).

2.2 Limited Use of IPD delivery approach

Kent and Becerik-Gerber (2010) stated that the percentage of construction projects that use IPD delivery approach is very small even though IPD has been described as the most efficient way to build an asset (Rowlinson, 2017). According to Pishdad-Bozorgi (2016), DBB has been “the most widely used project delivery method”. Rowlinson (2017) indicated that IPD is being used in some organizations in the United States, in London (such as organization of Transport for London) and in Hong Kong. However, the use of IPD is still limited and it is not a matter of time but a matter of political will and business will to have the courage to change the current procurement systems into ones that enhance collaboration, information exchange and trust between project participants. In addition to these barriers, IPD implementation is a matter of cultural issue (Rowlinson, 2017) because of the challenge it carries in changing the organization's existing cultures and the mentality of project teams (Paik et al., 2017).

Rached et al. (2014) recognized that there is no sign of IPD implementation in the Middle East region despite the numerous advantages of this innovative delivery method. Reliance is still on traditional project delivery approaches (Hamzeh et al., 2019). In comparing DBB delivery to IPD, various underlying principles, which enable the implementation of IPD, are found to be missing in DBB which may hinders IPD implementation One of these underlying principles is: “Trust and respect between parties and a “no-blame” culture within the project (Hamzeh et al., 2019).

Ghassemi and Becerik-Gerber (2011) said that in order for IPD to be widely adopted in the AEC industry, IPD projects should overcome several barriers such as financial, legal, cultural and technological barriers. They mentioned that many companies do not feel comfortable about changing their management system and here comes the

cultural issue of resistance to change. This natural trait poses itself as a barrier to switch from traditional delivery approach DBB to IPD. In addition to the cultural issue, Ghassemi and Becerik-Gerber (2011) noticed that the use of BIM is one of the limitations of IPD implementation. Subcontractors for example do not have enough expertise with such a technology and this makes the coordination with other project parties confusing and difficult. Trainings and workshops on BIM can help overcoming this barrier (Rached et al., 2014). As for the financial barriers, Cohen (2010) indicated how challenging is to choose compensation and incentive structures adequate to the IPD project and its participants.

Because of all of these barriers, the dominant project delivery method in the Middle Eastern AEC industry is still the traditional one: Design- Bid- Build (DBB). The latter has different principles than the IPD ones such as teamwork, early collaboration, trust and information sharing. (Rached et al., 2014). In order to facilitate the implementation of IPD, projects in our region need to go through radical changes at the organizational and commercial level and most importantly have trust and transparency present between their participants.

2.3 Lack of Trust in the Construction Industry

The AEC industry seems to suffer from a critical problem which is the lack of trust between project participants. Lau and Rowlinson (2010) conducted a case study in which they found that most of the respondents considered the level of trust to be low in the construction industry. According to Ashcraft (2011), efficiency and team productivity are reduced in absence of trust. Pishdad-Bozorgi and Beliveau (2016b) described mistrust as one of the key drivers to increased cost and delay in construction projects. Lack of trust

affects negatively the communication and productivity of team members (Erdem et al., 2003).

The construction industry is famous for being one of the most corrupted sectors worldwide (Rizk et al., 2018). It is structured in an antagonistic and biased manner which leads individuals not to trust each other and commit illegal actions. Stifi et al. (2017) stated that the main three reasons for corruption are lack of integrity, lack of transparency, and lack of accountability. These reasons are correlated with the lack of trust between project participants. Svalestuen et al. (2015) pointed out the need for a more collaborative management style with a high degree of trust between the participants.

Construction projects are characterized by a complex, uncertain and ambiguous environment (Pitsis et al., 2004). These circumstances lead to adversarial relationships resulting in a poor project delivery. Lau and Rowlinson (2011) believe that people are responsible to remove this defensive behavior and there is a need to manage differences in people and get them work together in harmony. Therefore, trust is required in situations of no choice and no knowledge. Schöttle and Gehbauer (2012) stated that if trust is present between project participants, better project performance can be achieved. Lau and Rowlinson (2009) found that most project organization suffer from low levels of interpersonal and inter-firm trust. The AEC industry is distinguished by an adversarial culture which makes people defensive and protective forming a barrier to trust (Lau & Rowlinson, 2009). A cultural change is recommended to transform the construction industry into a modern, efficient, safe and environmentally responsible industry (Tang report, 2001). In addition to these changes, social safety should be added to the construction working environment so that people can trust one another without facing the risk of being taken advantage of (Lau & Rowlinson, 2009). Having good and trust-based

relationships with others is very important for a successful project delivery. However, it is difficult to define what should be done or what tools should be used in order to build this type of relationships. Lau and Rowlinson (2010) stated that Clients, Consultants, Contractors, Sub-contractors and Suppliers have different value systems and different goals. Their work behavior is based on blaming, criticizing and punishing the other party which leads to having adversarial relationships. In order to avoid this defensive behavior, there is a need to create a friendly, trustworthy and supportive working environment that promotes good working relationships. However, trust relations do not just happen, they are built over time and need effort from project participants. Lau and Rowlinson (2011) said that trust can survive with the presence of incompetence, insincerity and selfishness only if one believes about trust intentions.

2.4 Trust

2.4.1 Definition of Trust

According to Rousseau et al. (1998), ‘Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviors of another.’ Pishdad-Bozorgi (2016) in her paper “Case Studies on the Role of Integrated Project Delivery (IPD) Approach on the Establishment and Promotion of Trust” interviewed project parties and asked them to define trust. They said that trust is to believe in someone without reservation, having confidence that he/she is honest, honors his/her promises, and acts in the interest of himself/herself and the party with whom he/she has a relationship. Moreover, trust is believing that one can interact with another without fear and anxiety to achieve a mutual goal. Trust is the uninhibited, unguarded feeling between partners that allows them not to hold anything back. People

usually succeed in environments in which they feel comfortable and do not find themselves feeling nervous and defensive. Trust entails mutual respect and the confidence that things will be taken care of in a collaborative way (Pishdad-Bozorgi, 2016). Lau and Rowlinson (2011) described trust from a Chinese perception: they believed that trust is a social phenomenon that can bring harmony and is a positive attitude that one should develop and maintain. They mentioned that trust is multi-faceted, multidisciplinary and multi-dimensional and can be subject to change over time. Moreover, they mentioned that too much trust can be harmful and disastrous if the trusted party does not perform.

Another definition of trust is given by Mayer et al. (1995); trust means that one believes in and is willing to depend on another party. Smith (2003) described trust as a willingness to be vulnerable. According to Larson and LaFasto (1989), four elements constitute trust: honesty, transparency, consistency and respect; and if one or more of these elements is absent, trust is considered broken (Svalesstuen et al., 2015). Bolton and Bolton (1996, p. 116) state that 'True honesty is not something that comes easily. It is a rigorous moral achievement' and it takes time to assure oneself whether the other is honest (Lau & Rowlinson, 2009). People's perception of others' ability, benevolence and integrity plays an important role in determining others' trustworthiness (Williams, 2001). Solomon and Flores (2001) said that "Trusting people begins with trusting ourselves".

Laan et al. (2011) defined trust as a positive expectation regarding the competences and intentions of participants. The psychological sources of trust are of high importance. Colocation and having frequent and informal interactions among project parties is very crucial to building trust, in addition to the transparency and having a common project administration. In order for trust to develop, firms should have

dedication and benevolence, especially in situations where high risk and disputes are present.

Throughout the literature, researchers have defined trust as positive expectations, confidence, vulnerability, risk, interdependence and subjective psychological state of mind (Smyth and Edkins, 2007; Brewer and Strahorn, 2012; Lewicki et al., 2006). Interpersonal trust is the willingness of one party to be vulnerable to the other party (Ding et al. 2013), rather than favorable outcomes. According to Doloï (2009), trust is not to be enforced in legal and contractual arrangements, it consists of factors that drive individuals' performance (Zuppa et al., 2016).

2.4.2 Inter-firm and Interpersonal Trust

Trust being a quality of relationships involves interaction between people at two levels: interpersonal and inter-firm and to have a successfully delivered project, trust should be established at both levels (Lau & Rowlinson, 2009). According to Lau and Rowlinson (2009), project parties have different tendencies to trust; Clients and Consultants tend to trust individuals whereas Contractors and Subcontractors tend to trust firms. Interpersonal trust creates harmonious environment to communicate (Zhang et al., 2017). Duck (1990) recognized the necessity of trust and confidence in others for good interpersonal relationships. Building trust among team members may take several transactions and commitments. In the absence of personal history and relationships, reputation is the only thing to rely on in the form of inter-firm trust (Lau & Rowlinson, 2009). Lau and Rowlinson (2009) discussed a type of trust called "goodwill". This type is present when inter-firm relationships exist at an informal level i.e. with no formal agreement done. This "goodwill" is a high degree of trust found among decision-makers

or key persons of the firms. Sozen and Kayahan (2001) suggest that goodwill should be embedded in the exchange between Main Contractor and Subcontractors since it's the most effective and least costly mean to protect this relationship. Williamson (1993) said that trust "is a word known by all and is a term with many meanings". Trust can refer to belief, confidence and integrity at the personal level while it can have the meaning of reputation, credibility and keeping promises at the functional level. All of these definitions can be applied to both an individual and a firm. However, Lau and Rowlinson (2009) assigned integrity and reliability to interpersonal trust while credibility and reputation to inter-firm trust. Moreover, they explained that inter-firm trust cannot be created by individuals acting on their own, these individuals must have the ability to influence the whole organization's processes and rituals.

Organizations or firms cannot trust, whereas individuals can both trust an organization and the individuals representing it (Janowicz and Noorderhaven, 2006). Both types of trust are distinct but yet relevant (Hagen and Simons, 2003). Trusting an organization and trusting its individual representatives are closely related (Zaheer and Harris, 2006). Zaheer et al. (1998) considered building up interpersonal trust an important step towards the development of inter-organizational trust. In their research, Laan et al. (2011) emphasized the findings of Khalfan et al. (2007) that whenever asking project participants about trust, respondents answered referring to interpersonal trust. This is because of two reasons: they do not make a distinction between the two types of trust (at the interpersonal and inter-firm level) and because trust on a personal level seems much more concrete to them.

Khalfan et al. (2007) pointed that most individuals interviewed tend to trust people rather than companies. However, a firm's reputation was important since the

construction industry was referred to as a “small world”. According to Lau and Rowlinson (2009), interpersonal trust comprises integrity, confidence, faith, reliability and keeping promises, while inter-firm trust includes credibility, reputation, confidence and keeping promises.

2.4.3 Theoretical traditions of trust

There are two contradictory theoretical traditions that explain where trust comes from. The first tradition, favored by micro-economics, perceives trust as a calculated risk and states that trust is sourced in a rational evaluation, highlighting the extrinsic value of trust. The other tradition is the psychological tradition which perceives trust as a presumed other-regard without any calculativeness and assumes that trust is sourced in a social orientation towards people, highlighting the intrinsic value of trust (Rousseau et al, 1998). Kramer (1999) defined the rational reasons for trust to be based on assumptions of someone’s trustworthiness indicating how a trustor should make decisions about trust from a normative standpoint. Whereas, Nooteboom (2002) stated that trust is based on psychological causes of affect, routine, lack of awareness or neglect of relational risk which in turn have an impact on rational evaluations of trust (Laan et al., 2011).

2.4.4 Levels of Trust

Trust can be found in high, medium and low levels between team members. There is no scientific rule to determine or define the level of trust. Lau and Rowlinson (2009) defined a high level of trust to be tied up with a positive perception about other’s motive which can be drawn from past experience and the belief of a bright future relationship. According to Kao and Ng (1992), a high level of trust between project parties can be

found if one is confident, relaxed and psychologically secured with no defensive attitude towards the other. A medium level of trust includes some uncertainty about the other party's intentions and the feeling of being threatened by some risks (Lau & Rowlinson, 2009).

Different levels of trust can be found in different working environments and situations. Since the AEC industry is exposed to high risk and uncertainty, a high level of trust is required among parties and organizations in order to deliver construction projects successfully. When the environment is more stable, a low level of trust is required (Lau & Rowlinson, 2009). "Goodwill" defined earlier is regarded as a high level of trust while credibility and reputation form the other levels of trust.

2.5 Importance of Trust in the Construction Industry

Lau and Rowlinson (2009) found that mutual trust is highly recommended in a multi-party working environment such as the AEC industry where different interests, needs and expectations are present. Mutual trust can help smoothing the construction process; it allows some flexibility to face arising uncertainties, it increases efficiency and sustains long-term relationships (Lau & Rowlinson, 2010). To create a collaborative environment and deliver a project successfully, trust between project participants is needed (Pishdad-Bozorgi and Beliveau, 2016a). When asked about trust, project parties agreed that the importance of trust cannot be disregarded. Trust promotes a suitable atmosphere for the team to communicate and exchange knowledge (Zhang et al., 2017). Pishdad-Bozorgi and Beliveau (2016a) mentioned that true collaboration occurs only when individuals trust and respect each other. Yulk (2012) said that a climate of "psychological safety and mutual trust" can benefit and motivate team members to think

outside the box and be creative in solving problems (Sun et al., 2015). Lau and Rowlinson (2009) believed that trust emerges as a result of individuals that have previously worked together or have knowledge of each other or the work they perform. Trusting behaviors are found to be a problem-solving attitude for design and technical issues, as well as a quick response to arising matters without written agreement or prior to formal instructions (Lau & Rowlinson, 2009). Trust relations should be present at the internal and external level in a construction project. Internally, employer and employee should have solid trust between them. As to externally, trust has to be built between clients, consultants, main contractors, sub-contractors and suppliers. Trust is needed in all these relationships since trustworthiness is a “highly regarded value concept for the industry as a whole”. (Lau & Rowlinson, 2010).

Contracts are considered a form of agreement that formalize arrangements but do not make successful relationships. Instead, people and individuals are responsible for establishing human relationships. Therefore, getting the contract right is as crucial as getting the people right in order to deliver a project successfully (Lau and Rowlinson, 2011). Unpredictable events are inevitable in a construction project environment which increases the level of uncertainty and risk. Contractual trust is there to play cover up for these uncertainties and risks (Lau & Rowlinson, 2011). Kwan and Ofori (2001) conducted a survey to show that trustworthiness is important in affecting contractors’ business relationship with others and it’s a predominant feature of Chinese-Chinese business transactions.

Trust has several benefits, it can reduce the costs in a business relationship (Wood & McDermott, 1999) and it can affect information flow and communication between project participants (Cheung et al., 2013). Trust can highly influence project performance;

it improves team dynamics, cooperation and enhances inter-organizational and intra-organizational relationships (Pishdad-Bozorgi and Beliveau, 2016b). Smith and Rybkowski (2012) mentioned that increased levels of trust and project performance are correlated. They also found that several researchers in the AEC industry supported the idea that one of the important pillars for the success of a construction project is trust. Schöttle and Gehbauer (2012) assumed that trust-based incentives motivate team members more than mandatory incentives. Cooperation is believed to be a behavioral consequence of trust and working relationships play an important role in affecting project performance (Lau & Rowlinson, 2009). Better performance is found in a high-trust groups where members show better coordination and greater efficiency (Lau & Rowlinson, 2010).

CHAPTER 3

IDENTIFICATION AND CLASSIFICATION OF TRUST- BUILDING ATTRIBUTES

3.1. IPD and Trust

3.1.1 Literature Review

According to Pressman (2007), projects that use the IPD as a delivery approach experience higher levels of trust between the shareholders. Kalach et al. (2018) stated that the core philosophy of relational contracting is to create a cooperative and trustful environment for the benefit of the project. Relational project delivery methods such as IPD are characterized by a collaborative environment governed by trust; this type of climate is not found in transactional delivery methods such as DBB (Abdelhamid, 2012). According to Costa and Tavares (2012), a social e-business concept that combines BIM and IPD can improve communication and develop trust between team members.

Pishdad-Bozorgi and Beliveau (2016a) considered IPD a project delivery mechanism founded on trust and interpersonal relationships. Relational contracts, are developed with a flexible language that encourages parties to have a trustful attitude, good faith, decent judgement and open communication. Comparatively, in transactional contracting, individuals tend to have adversarial relationships because risk is shifted and each individual is concerned with minimizing its risk (Pishdad-Bozorgi and Beliveau, 2016a). Thus, transactional contracting builds defensive behavior while relational contracts build trust and mitigate development of a such defensive behavior or mistrust (Pishdad-Bozorgi and Beliveau, 2016b). Rached et al (2014) considered IPD an alternative to overcome the obstacles faced in the traditional project delivery approach.

They agreed that IPD principles are more likely to achieve better project performance than traditional methods such as DBB. One of the IPD principles is shared financial risks and rewards which increases collaboration and trust between project parties. Participants in the California Pacific Medical Center project and the Cathedral Hill Hospital project described IPD as an effective project delivery method that improves mutual trust and respect among team members and eliminates the need for contingencies (AIA, 2012). Smith and Rybkowski (2012) found that IPD and Lean construction are more effective in sustaining high levels of trust than traditional delivery approaches. According to Pishdad-Bozorgi and Beliveau (2016a), IPD and trust have a symbiotic relationship: “while trust is a cornerstone of IPD, IPD also helps raise trust to higher levels”. In the case studies conducted on two IPD construction projects, Pishdad-Bozorgi (2016) found that participants in both projects agreed on IPD being more efficient in building trust than more traditional delivery methods such as DBB. Finally, it seems reasonable that the choice of project delivery method plays a crucial role in the resultant levels of trust between project parties (Smith and Rybkowski, 2012).

3.1.2 IPD traits Effective in Building Trust

As mentioned earlier, having a trustful working environment is a crucial prerequisite for IPD implementation in any construction project because trust is at the core of relational contracting. However, the construction industry in the Middle East region suffers from lack of trust which in addition to the cultural, financial and social barriers, makes it hard to implement IPD as a project delivery approach.

Therefore, establishing trust in the DBB approach employed in most of our region construction project is considered to be a step towards IPD implementation.

This research aims at collecting and analyzing all trust factors that can help establishing trust in a transactional delivery approach.

Through an extensive review of the literature, a set of IPD traits was found to be effective in building trust between project parties. Table 1 summarizes these IPD traits with their literature sources.

Table 1: IPD Traits and their Literature Source

IPD Traits	Literature Source
Early involvement of key participants	AIA, 2012a; Ashcraft, 2011, 2012 (Retrieved); Cleves & Gallo, 2012; Thomsen et al., 2010.
Collaborative planning	AIA, 2012a.
BIM	Thomsen et al., 2010, p. 52.
Relational Contracting	AIA, 2012a; Lahdenperä, 2012, p. 59; Pishdad-Bozorgi and Beliveau, 2016a.
Shared risks and rewards	AIA, 2012; AIA, 2012a.
Equitable contract	Duke et al., 2010, p. 17; Fish & Keen, 2012; Boukendour and Hughes 2014
Liability waiver	AIA, 2012a
Peer performance evaluation and feedback	AIA, 2012a
Colocation	AIA, 2012a; Ashcraft, 2011, 2012 (Retrieved); Cleves & Gallo, 2012; Thomsen et al., 2010
Information sharing	Ashcraft, 2011

Transparency	Ghassemi & Becerik-Gerber, 2011; Lahdenperä, 2012, p. 63; AIA, 2012.
Mutual respect	Ashcraft, 2011
Collaborative mindset and culture	Cleves & Gallo, 2012, p. 45; Ghassemi & Becerik-Gerber, 2011; Lahdenperä, 2012, p. 63
Mutual confidence on each other's competencies	Pishdad-Bozorgi and Beliveau, 2016a.
Lean	Ashcraft, 2011; Ghassemi & Becerik-Gerber, 2011; Thomsen et al., 2010, p. 27

- **Early involvement of key participants:** Lack of contractor's involvement in the design phase creates many problems such as miscommunication and disconnection of knowledge flow which in turn leads to a diminution of trust between team members (AIA, 2012a; Ashcraft, 2011, 2012 (Retrieved); Cleves & Gallo, 2012; Thomsen et al., 2010). However, bringing the contractor into the project team early on helps team members to be familiar with each other and build relationships leading to trust (Rahman & Kumaraswamy, 2008).
- **Collaborative planning:** According to the AIA (2012a), when all project parties engage in collaborative decision making regarding project activities, trust can be established. Team members develop a sense of co-ownership and belonging to the project and form a shared understanding of the project conditions.
- **BIM:** According to the US National Building Information Model Standard Project Committee (2016), Building Information Modeling (BIM) is a digital

representation of physical and functional characteristics of a project. It is a shared knowledge resource for information about a facility forming a reliable basis for decisions during project life cycle. BIM does not cover geometry only, it covers “spatial relationships, light analysis, geographic information, and quantities and properties of building components” (Eastman, 2009). Rizk et al. (2018) mentioned that the common data environment within BIM adds more transparency and accountability which leads to trust-based relationships. BIM allows project parties to practice collaboration and build trust during pre-construction phase (Thomsen et al., 2010, p. 52). Moreover, the results of the survey conducted by Zuppa et al. (2016) showed that BIM supports the development of trust.

- **Relational Contracting:** According to Pishdad-Bozorgi and Beliveau (2016a), a trustful and cooperative climate is generated by relational contracts such as IPD. In relational contracting responsibilities are more transparent and benefits are fairly shared among project parties whereas in transactional contracting adversarial relationships arise as a result of shifting risks to the party with the least bargaining power (Lahdenperä, 2012, p.59). Commitment to mutual trust, good faith and open communication are found to be embedded in the relational contracts language (AIA, 2012a).
- **Shared risks and rewards:** IPD enforces shared financial risks and rewards which has a positive effect on collaboration and trust (AIA, 2012). When individual’s success is tied with the overall project’s success, team members tend to focus on project goals and collaborate with each other to ensure the best outcome of the project (AIA, 2012a).

- **Equitable contract:** A fair risk-sharing agreement between project participants helps in establishing trust (Duke et al., 2010, p. 17; Fish & Keen, 2012). It gives incentives to contracting parties and removes any suspicion between them; therefore, collaboration and trust increase. (Boukendour and Hughes 2014).
- **Liability waiver:** The use of liability waiver was found to have a positive impact on the level of trust and respect between team members and project partners. This was proven by a survey conducted by the AIA (2012a) on a several IPD projects, one of which was the Cathedral Hill Hospital project
- **Peer performance evaluation and feedback:** One effective way for building and maintaining trust between project parties is to allow them to state how they perceive each other and evaluate each other (AIA, 2012a).
- **Colocation:** The placement of project participants in a single location facilitates communication and interaction and therefore help in developing trust-based relationships (AIA, 2012a; Ashcraft, 2011, 2012 (Retrieved); Cleves & Gallo, 2012; Thomsen et al., 2010).
- **Information sharing:** Team members should have the willingness to share important information with each other in order for trust to be built (Khalfan et al., 2007). According to Ashcraft (2011), hoarding information leads to distrust and defensive behavior.
- **Transparency:** Honest and open communication between project parties is very effective in building trust-based relationships (Ghassemi & Becerik-Gerber, 2011; Lahdenperä, 2012, p. 63). IPD team members when surveyed by the AIA (2012), mentioned that fiscal transparency has a positive effect on trust and respect for project partners.

- **Mutual respect:** Trust and respect are two concepts that come along. Norsen (1995) said that cooperation cannot exist without mutual respect and trust. According to Ashcraft (2011), treating people with respect supports building trust between them and IPD requires project parties to have mutual respect.
- **Collaborative mindset:** Relational form of contracting generates a collaborative and trustful climate (Lahdenperä, 2012, p. 63). In order for IPD contractual and operational tools to be employed, a shift in the traditional mindset and culture is needed (Cleves & Gallo, 2012, p. 45). According to Ghassemi & Becerik-Gerber (2011), collaboration has a positive impact on building trust and respect.
- **Mutual confidence on each other's competencies:** When individuals have successful past working experience, they have mutual confidence on each other's competencies and they present initial trust. They can judge each other's ability and trustworthiness and therefore trust is established between project participants based on good pre-existing performance and relationships (Pishdad-Bozorgi and Beliveau, 2016a).
- **Lean:** Lean construction is based on several concepts such as reliable promising, Target Value Design (TVD), and Last Planner System (LPS). These concepts help in fulfilling commitments and therefore build trust between project participants (Ashcraft, 2011; Ghassemi & Becerik-Gerber, 2011; Thomsen et al., 2010, p. 27).

3.2. General Trust Attributes

Development of trust relationships between project participants seems to be difficult. The interactions between project participants are often conflict-ridden, leading to unsatisfactory project outcomes (Chan et al., 2004). The issue of lack of trust in the construction industry has been the interest of many authors. After an extensive review of the literature on how to build trust in the construction projects, three classes of trust attributes were found: 1) Relational Characteristics among the parties involved in a project; 2) Organizational Characteristics related to the organizations (Client, A/E or Contractor) involved in a project); and 3) Project Characteristics related to the project itself (size, complexity, contract type...).

3.2.1. Relational Characteristics

Table 2 below shows the Relational Characteristics and their literature source. These relational characteristics, if found among the parties involved in a project, can lead to trust relationships.

Table 2: Relational Characteristics and their Literature Source

Relational Characteristics	Literature Source
Disposition of trust - Trusting intentions - Trusting beliefs	McKnight et al., 1998; McKnight and Chervany, 2006; Laan et al., 2011.
Competence trust	Smith and Barclay, 1997; Klein Woolthuis et al., 2005; Nooteboom, 2006; Brewer and Strahorn, 2012; Cheung et al., 2011; Liu and Fang, 2006; Lui et al., 2006; Jin and

	Ling, 2005a, b; Wong et al.,2005; Wong et al., 2000,2008; Huemer, 2004; Vaaland, 2004; Pinto et al., 2009; Lau and Rowlinson, 2009.
Intentional trust - Trust in dedication - Trust in benevolence	McAllister, 1995; Lamsa and Pucetaite, 2006; Aurifeille and Medlin, 2009; Laan et al., 2011.
Honest communication	Khalfan et al., 2007; Hansen-Addy and Nunoo, 2014.
Reliable behavior	Khalfan et al., 2007; Brewer and Strahorn, 2012, Lander et al., 2004.
Experience	Khalfan et al., 2007.
Problem solving	Khalfan et al., 2007; Wong and Cheung, 2004; Wong et al., 2005.
Shared goals	Khalfan et al., 2007.
Reciprocity	Khalfan et al., 2007.
Reasonable behavior	Khalfan et al., 2007.
Long-term relationships	Wong and Cheung, 2004; Wong et al., 2005.
Effective collaboration and cooperation	Zuppa et al., 2016; Cheung et al., 2011; Lau and Rowlinson, 2009; Wong et al., 2000, 2008; Liu and Fang, 2006; Lui et al., 2006; Jin and Ling, 2005a, b; Huemer, 2004; Vaaland, 2004.
Face-to-face communication	Lau and Rowlinson, 2009; Zuppa et al., 2016.
Integrity	Rosenfeld, et al., 1991; Brewer and Strahorn, 2012; Jones and Saad, 2003; Lau and Rowlinson, 2009.

Effective communication	Doloi, 2009, 2013; Wong and Cheung, 2004, 2005; Wong et al., 2005.
Alignment of efforts and rewards	Wong and Cheung, 2004, 2005; Wong et al., 2005.
Information flow	Wong and Cheung, 2004, 2005; Wong et al., 2005; Hansen-Addy and Nunoo, 2014.
Unity	Wong and Cheung, 2004, 2005; Wong et al., 2005.
Openness	Wong and Cheung, 2004, 2005; Wong et al., 2005, Das & Teng, 2001; Lui & Ngo, 2004.
Respect	Wong and Cheung, 2004, 2005; Wong et al., 2005.
Compatibility	Sarker et al., 1998; Wood et al., 2001. Wong and Cheung, 2004, 2005; Wong et al., 2005.
Social interaction	Ding and Ng, 2010.
Keeping promises	Lau and Rowlinson, 2009; Yiu and Lai, 2009.

- Disposition of trust:** Trusting intentions and trusting beliefs are two factors affected by one's disposition to trust. McKnight et al. (1998) and McKnight and Chervany (2006) define the disposition to trust as the assumption that others are trustworthy. Trusting intentions are defined to be "the willingness to become vulnerable to another in a risky situation" while trusting beliefs are defined as "the expectation not be harmed by the behavior of the other in a risky situation" (Laan et al., 2011). In order for trust to be built, trustworthiness intentions must be present among project participants.

- **Competence trust:** According to Smith and Barclay (1997), competence is the degree to which partners perceive each other as having the necessary skills, abilities and knowledge to accomplish a task effectively. Competence trust reflects the level of trust one has in the organizational, technical and managerial expertise of a trustee (Klein Woolthuis et al., 2005; Nooteboom, 2006). According to many authors, Cheung et al. (2011), Lau and Rowlinson (2009), Wong et al. (2000, 2008), Liu and Fang (2006), Lui et al. (2006), Jin and Ling (2005a, b), Huemer (2004), and Vaaland (2004), competence is one of the most important trustworthy attributes in the construction industry. On the client-contractor relationship level, contractors can inaugurate trust by their competent performance (Wong and Cheung, 2004, 2005; Wong et al., 2005). Brewer and Strahorn (2012) pointed out that competence is a crucial base for trust and they described it as one party's belief that another party is competent to handle the work and tasks assigned to it (Hartman, 1999).
- **Intentional trust:** Trust from an intentional perspective can be distinguished from the competence trust's perspective. Intentional trust refers to the intentions of a partner towards a relationship and the expectation that the trustee won't behave opportunistically (Laan et al., 2011). Trust in dedication and trust in benevolence form the intentional trust. Dedication is the willingness to apply one's capabilities in a relationship (McAllister, 1995) while benevolence is the willingness to treat well the trusting partner under unforeseen conditions (Aurifeille and Medlin, 2009). According to Lamsa and Pucetaite (2006), benevolence is the belief that the trusting party will act helpfully and they consider it a common trust characteristic.

- **Honest communications:** The results of the interviews conducted by Khalfan et al. (2007) showed that trust and communication are strongly correlated. Project participants considered being open and honest while sharing information with each other is very important for the establishment of trust. Giving the real, adequate and important information that reflect the real situation supports trust and ensures better project delivery. According to Hansen-Addy and Nunoo (2014), honest and truthful communication has a positive effect on the trust level.
- **Reliable behavior:** According to Brewer and Starhorn (2012), reliable behavior of project participants supports the creation of a trustful working environment. Team members rely on the information they are being given and they trust that people will deliver what they said they will on time and to the standard they expect (Khalfan et al., 2007). Being reliable is one the most preferred determinants of trustworthiness. According to Lander et al. (2004), unreliable behavior prevents the development of trust and promotes for a distrusting environment.
- **Experience:** Working with people on a day-to-day basis contributes in building relationships. The results of the interviews conducted by Khalfan et al. (2007) showed that all interviewees learned to trust or not to trust people they worked with based on repeated actions and outcomes.
- **Problem solving:** According to Wong and Cheung (2004) and Wong et al. (2005), problem solving is a factor that affects the trust level between project participants in a construction project. Khalfan et al. (2007) pointed to the fact that trust is not only working with people when things are going well, it is also working together to solve problems. The results of their interviews showed that site personnel expressed trust when problems are solved without being referred to

their superior. Moreover, at the more senior level, solving problems without referring to contracts was seen as a vital element in building trust.

- **Shared goals:** Project participants who have shared goals fulfill their tasks together as joint tasks rather than individual and separate ones. This has a positive effect on enhancing communication and creating a mutual understanding between project parties. This means that project parties understand each other's position and their individual and organizational goals (Khalfan et al., 2007).
- **Reciprocity:** Respondents to the interviews conducted by Khalfan et al. (2007) stated how important is to feel that the favors they are doing to the other party are being returned. If they had to put themselves out for people and make sacrifices for other project parties, then they need to feel that the same thing is being done to them and that team members are supporting and rewarding each other's trusting behavior. Reciprocity is vitally important; it helps build trust.
- **Reasonable behavior:** Being reasonable is to work fairly and professionally with the project participants. The idea of reasonable behavior is to understand what the other party perceives and expects. For example, the senior interviewees in Khalfan et al. (2007)'s research found that reasonable behavior is about professionalism. Meanwhile, the site personnel viewed it as being "easy going" and that everyone is doing its own share of work.
- **Long-term relationships:** Having previous working experience and long-term relationships helps in building trust between project participants. People tend to trust others that they have worked with before and had a successful relationship. According to Wong and Cheung (2004) and Wong et al. (2005) long-term relationships is one factor that affect the level of trust of construction parties.

- **Effective collaboration:** According to Zuppa et al. (2016) effective collaboration between project participants is one of the most important factors that affected the level of trust in a construction project. Cooperation contributes to the development of trust in the construction industry (Cheung et al., 2011; Lau and Rowlinson, 2009; Wong et al., 2000, 2008; Liu and Fang, 2006; Lui et al., 2006; Jin and Ling, 2005a, b; Huemer, 2004; Vaaland, 2004).
- **Face-to-face communication:** One of the factors identified to strengthen trust included face-to-face communication (Zuppa et al., 2016). According to Lau and Rowlinson (2009), face-to-face communication supports trust and influences interpersonal trust. The results of the interviews conducted by Zuppa et al. (2016) point out that face-to-face communication was the most preferred communication method for trust establishment on construction projects.
- **Integrity:** Hartman (1999) defined integrity to be the belief that one party will protect the welfare of another party. According to Lau and Rowlinson (2009) and Luo (2007), integrity has a vital role in the development of trust. This implies that failure of integrity between project participants by practicing distrusting acts such as lying, cheating and hiding facts remains a barrier for the establishment of trust relationships in the construction industry (Rosenfeld, et al., 1991; Jones and Saad, 2003).
- **Effective communication:** According to Doloï (2009, 2013), effective communication between project parties supports trust. Wong and Cheung (2004, 2005) and Wong et al. (2005), point out that contractors can initiate trust in a construction project by having effective communication practices with the clients.

- **Alignment of efforts and rewards:** Studies by Wong and Cheung (2004) and Wong et al. (2005) showed how important is to align efforts and rewards between project participants in order to establish trust. Project parties need to feel that they are working together with common efforts and rewards shared between them.
- **Information flow:** Wong and Cheung (2004) and Wong et al. (2005) identified information flow as one of the factors that affect the trust level of construction partners. A study by Hansen-Addy and Nunoo (2014) showed that sufficient information flow was one of the attributes that ranked high between project interviewees for effective trust building.
- **Unity:** Unity of project participants affects trust relationships in a construction project; understanding other party's requirements, difficulties and expectations supports the development of trust (Wong and Cheung, 2004; Wong et al., 2005). Trust and unity are two pillars for a successful workplace. Trust cannot be present without unity and vice versa: they have a symbiotic relationship.
- **Openness:** Das and Teng (2001) and Lui and Ngo (2004) identified openness as the perception of good will of one party and the expectation that project participants will fulfill their responsibilities. Openness was identified as a factor that affects trust building among construction parties (Wong and Cheung, 2004; Wong et al., 2005)
- **Respect:** Trust and respect are strongly linked. If project parties respect each other then it is easier for them to build trust relationship. Studies by Wong and Cheung (2004) and Wong et al. (2005) identified respect as one of many other factors that affect the trust level among project participants.

- **Compatibility:** Sarker et al. (1998) and Wood et al. (2001) defined compatibility as sharing similar cultures and values between project team members. Wong and Cheung (2004) and Wong et al. (2005) considered compatibility as an important factor for establishing trust.
- **Social interaction:** In order to establish trust, social interaction among project participants is required (Ding and Ng, 2010). When project parties spend time together communicating, having friendly conversations and going out, trustful relationships can be developed.
- **Keeping promises:** Project parties need to keep their promises in order to develop trust between them. Lau and Rowlinson (2009) mentioned that interpersonal trust consists of keeping promises. Moreover, Yiu and Lai (2009) found that keeping promise and not lying to the disputing parties is of the most common trust-building tactics in construction mediation.

3.2.2. *Organizational Characteristics*

Table 3 below shows the Organizational Characteristics and their literature source. These organizational characteristics, if found in the organization's structure can lead to trust relationships.

Table 3: Organizational Characteristics and their Literature Resource

Organizational Characteristics	Literature Source
Paying on time	Zuppa et al., 2016.
Reputation	Lau and Rowlinson, 2009; Xu et al., 2005.
Financial stability	Wong and Cheung, 2004; Wong et al., 2005; Hansen-Addy and Nunoo, 2014.

Adoption of alternative dispute resolution techniques	Wong and Cheung, 2004; Wong et al., 2005; Yiu and Lai, 2009; Zuppa et al., 2016.
Establishment of project rewards	Maurer , 2010
Organization's leadership	Khalfan et al., 2007.

- **Paying on time:** According to Zuppa et al. (2016) organizations that pay on time are trustworthy. For example, contractors will trust client organization that abide by contract conditions and pay them on time without any delay.
- **Reputation:** Lau and Rowlinson (2009) and Xu et al. (2005) stated that trust is affected by the reputation of the trustee's organization. The beliefs and opinions that are generally held about the organization's work attitude plays a vital role in building trust.
- **Financial stability:** An organization's financial stability is found to be important in building trust (Wong and Cheung, 2004; Wong et al., 2005). The results of the study conducted by Hansen-Adddy and Nunoo (2014) showed that clients were concerned about contractor's financial stability because a contractor with a healthy financial status will not seek profit by finding loopholes in contract or applying unreasonable claims. Therefore, the financial status of a contractor is very important to the development of trust.
- **Adoption of alternative dispute resolution techniques:** Zuppa et al. (2016) found that in order to have trust, it is important for organizations not to be litigious. Therefore, adopting alternative dispute resolution methods contributes to the development of trust between project participant (Wong and Cheung, 2004;

Wong et al., 2005). Yiu and Lai (2009) pointed out that the use of effective trust-building tactics is needed for successful construction mediations.

- **Establishment of project rewards:** According to Maurer (2010) organizations that establish transparent, objective and measurable project rewards play a critical role in building trust.
- **Organization’s leadership:** Values and culture of an organization have an impact on the trust level between project participants. When employees or representatives of an organization behave in an adversarial way, they are often reflecting the “policy” of their organization. An organization that is going to engage with trusting teams needs to have leadership, policies and values that support trust building. However, along with the organization’s policies, there is a need for commitment to implement and support the policy at all levels (Khalfan et al., 2007).

3.2.3. *Project Characteristics*

Table 4 below shows the Project Characteristics and their literature source. These project characteristics, if found in the construction project itself can lead to trust relationships among participants.

Table 4: Project Characteristics and their Literature Source

Project Characteristics	Literature Source
Use of electronic document management system	Lau and Rowlinson, 2009.
Timely and adequate responses to RFIs	Zuppa et al., 2016.

Risk allocation	Chiles and McMackin, 1996; Deutsch, 1958; Becerra et al., 2000; Cheung et al., 2011; Lau and Rowlinson, 2009; Wong et al., 2000, 2008; Liu and Fang, 2006; Lui et al., 2006; Jin and Ling, 2005a, b; Huemer, 2004; Vaaland, 2004.
Project delivery method	Laan et al., 2012;
Contract type	Kadefors, 2004; Khalfan et al., 2007.
Early involvement	Rahman & Kumaraswamy, 2008.
Control mechanisms	Wong et al., 2007; Brewer and Strahorn, 2012.
BIM	Zuppa et al., 2016.
Project size	Khalfan et al., 2007.
Project complexity	Khalfan et al., 2007.

- **Use of electronic document management system:** According to Lau and Rowlinson (2009), the use of electronic documents, electronic schedules and estimates and digital pictures and videos contributes to high levels of inter-firm trust.
- **Timely and adequate responses to requests for information:** The study of Zuppa et al. (2016) showed that when consultants respond to the RFI's raised by contractors within an acceptable range of time, trust is then developed between the two parties.
- **Risk Allocation:** Chiles and McMackin (1996) defined risk as “the perceived probability of loss” and according to Deutsch (1958) and Becerra et al. (2000) risk

must be present in order for trust to arise. Later in years, many authors who researched the issue of trust in the construction industry found that risk allocation is one of the most important trustworthy factors (Cheung et al., 2011; Lau and Rowlinson, 2009; Wong et al., 2000, 2008; Liu and Fang, 2006; Lui et al., 2006; Jin and Ling, 2005a, b; Huemer, 2004; Vaaland, 2004). Risk does not cover only financial risks, it also includes risk of failure, risk of delays in time, and risk of defects in work. Allocating these risks to the project participants has an impact on the trust level between them.

- **Project delivery method:** Non-traditional project delivery methods strongly influence trust between project participants in a construction project (Laan et al, 2012).
- **Contract type:** According to Kadefors (2004) traditional contracting gives rise to adversarial relationships and hinders the development of trust among contracting parties. Khalfan et al. (2007) consider contract form as a factor influencing the development of trusting relationship; they point out that relational contracting strengthens trust in contrast to transactional contracting.
- **Early involvement:** Rahman and Kumaraswamy (2008) mentioned that bringing major project participants early on helps in building trust.
- **Control mechanisms:** Control mechanisms are used in construction projects to control risk, mitigate uncertainty and protect the vulnerability of participants (Wong et al., 2007). According to Brewer and Strahorn (2012), the presence of such control mechanisms can activate trust among project parties. However, Wong et al. (2007) pointed out that excessive control mechanisms may be

interpreted as a signal of distrust, inhibiting trust-based relationships within the project environment.

- **BIM:** The results of the survey conducted by Zuppa et al. (2016) showed that BIM supports the development of trust.
- **Project size:** According to Khalfan et al. (2012) project size has an influence on the trusting behavior of participants. The results of their study showed that managing relationships in smaller projects is much easier than in larger projects because smaller projects have less people in the supply chain. Moreover, smaller projects present lower level of risk which contributes to higher level of trust. On the other hand, larger projects with more people involved offer more time and scope for developing long-term relationships which enhances the development of trust.
- **Project complexity:** Khalfan et al. (2007) stated that the need for trust increases with the level of complexity in a project. They pointed out that in a complex project, people have to rely on other's actions due to the presence of many specialist trades and not everyone will have the expertise to understand what is being done. Moreover, a complex project will have more information so the need to trust and rely on these communications is higher. In addition to this, at the site level there will be multiple interfaces between different trades of different organizations so in order to limit conflict at this level, a high level of transparent information exchange is needed and trust can be developed.

CHAPTER 4

GROUPING OF TRUST ATTRIBUTES

IPD traits effective in building trust and general trust attributes (relational, organizational and project characteristics) were identified. The following chapter presents a grouping of these trust factors. The first group consists of IPD traits that cover many of the relational, organizational and project characteristics identified in the literature. The second group consists of the remaining general trust attributes not cover in IPD and can be applied to a DBB project life cycle in order to build trust.

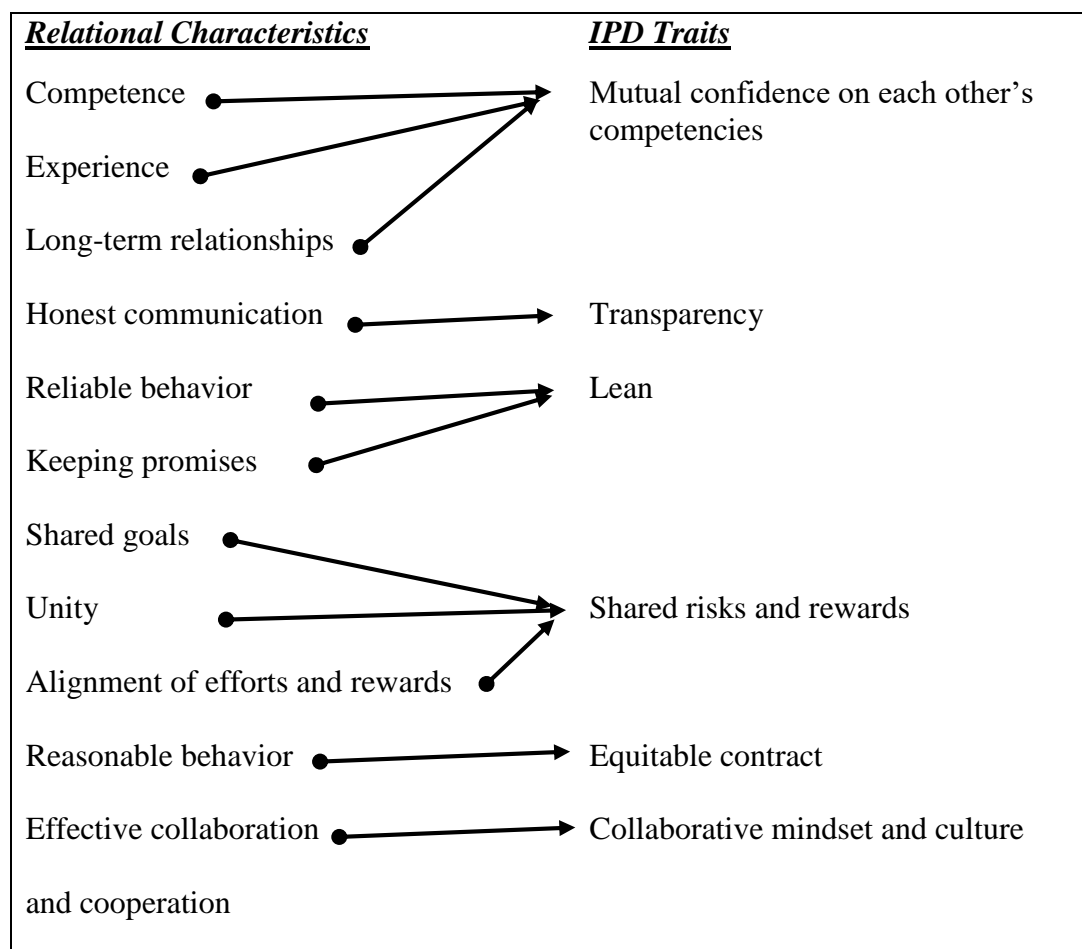
4.1. Group 1: IPD traits Covering Trust Attributes

IPD and Trust have a symbiotic relationship: while trust is considered a key cornerstone for IPD approach, the IPD approach also promotes trust (Pishdad-Bozorgi and Beliveau, 2016a). Therefore, many of the Relational, Organizational and Project characteristics are covered by the IPD traits that were described to be effective in building trust.

4.1.1. IPD Traits and Relational Characteristics

Figure 1 below shows the relational characteristics covered by the IPD traits. Competence trust, which was defined earlier as the degree to which partners perceive each other as having the necessary skills, abilities and knowledge to accomplish a task effectively, is covered by the mutual confidence on each other's competencies IPD principle. Having honest communication between project participants is covered by the transparency IPD trait. As for the Lean principle, it covers two relational characteristics: reliable behavior and keeping promises. Shared goals, unity and alignment of efforts and

rewards are all covered by the IPD trait of sharing risks and rewards. Reasonable behavior means working fairly and professionally, this concept is covered by the equitable contract IPD trait. Effective collaboration and cooperation among project parties is satisfied by the collaborative mindset and culture IPD trait. Colocation as an IPD trait favors face-to-face communication and social interaction between project participants. BIM is one of the IPD traits that can lead to effective communication among team members. Information sharing in IPD covers information flow and mutual respect in IPD takes into account the relational characteristic of respect. We have to note that two IPD traits effective in building trust which are Liability waiver and Peer performance evaluation and feedback did not cover any of the relational characteristics found in the literature.



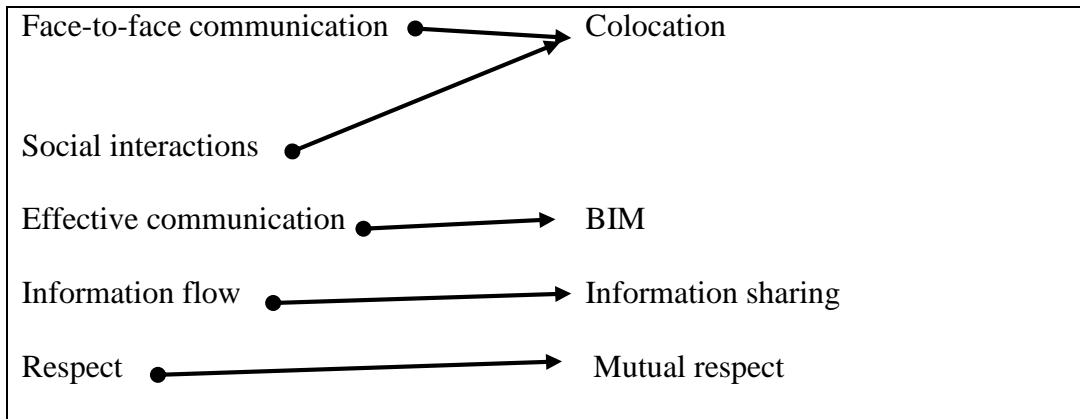


Figure 2: Relational Characteristics Covered by IPD Traits

4.1.2. IPD Traits and Organizational Characteristics

Figure 3 below shows that only one organizational characteristic which is the establishment of project rewards is covered by the equitable contract IPD trait. The remaining organizational characteristics were not supported by the IPD traits effective in establishing trust but this does not mean that they cannot be applied to a DBB project in order to develop trust among project participants.

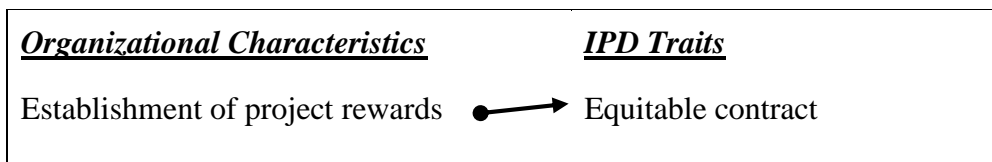


Figure 3: Organizational Characteristics Covered by IPD Traits

4.1.3. IPD Traits and Project Characteristics

The Project characteristics covered by IPD traits are shown in Figure 4 below. Project delivery method and contract type are two project characteristics against traditional contracting and thus they are both covered by the relational contracting IPD trait. Early involvement of key participants and BIM are seen to be effective in building trust in both project characteristics and IPD traits. Project complexity is covered by two

IPD traits: collaborative planning and information sharing; these two principles are essential to be employed in a complex project to enable trust-based relationships.

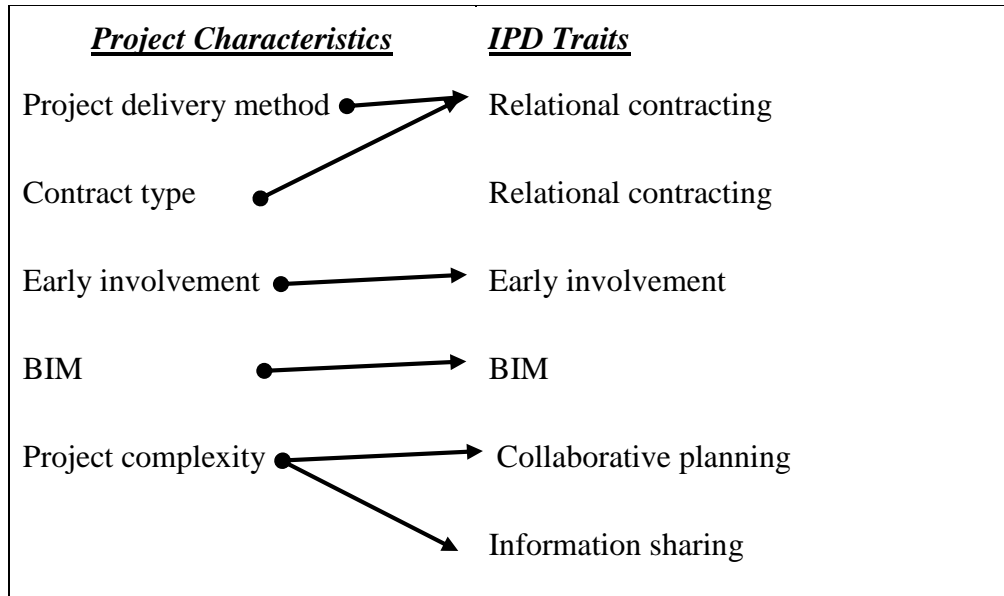


Figure 4: Project Characteristics Covered by IPD Traits

4.2. Group 2: Trust Attributes Not Covered by IPD traits

Table 5 below shows the remaining trust attributes not covered by IPD traits yet are very important for trust development in the construction field. The remaining Relational characteristics are: Disposition of trust, Intentional trust, Experience, Problem solving, Reciprocity, Long-term relationships, Integrity, Openness and Compatibility. As for the remaining Organizational characteristics, they are: Paying on time, Reputation, Financial stability, Adoption of alternative dispute resolution techniques and Organization's leadership. From the project characteristics basket, the remaining ones that were not covered by IPD principles are: Use of electronic document management system, Timely adequate responses to RFIs, Risk, Control mechanisms, and Project size.

Table 5: Remaining Trust Attributes

	Class		
Trust Attributes	Relational	Organization	Project
	Disposition of trust - Trusting intentions - Trusting beliefs	Paying on time	Use of electronic document management system
	Intentional trust - Trust in dedication - Trust in benevolence	Reputation	Timely and adequate responses to RFIs
	Problem solving	Financial stability	Risk allocation
	Reciprocity	Adoption of alternative dispute resolution techniques	Control mechanisms
	Integrity	Organization's leadership	Project size
	Openness		
	Compatibility		

4.3. Group 3: Innovative IPD Traits

Liability waiver and peer performance evaluation are two IPD traits that were found to be effective in building trust but did not cover any of the general trust attributes previously found in the literature.

CHAPTER 5

ALLOCATION OF TRUST ATTRIBUTES TO A DBB

PROJECT LIFE CYCLE

Fifteen IPD traits were identified to be effective in building trust along with a number of Relational characteristics, Organizational Characteristics and Project characteristics. Group 1 of trust attributes consists of IPD traits covering many of these characteristics, Group 2 consists of the remaining characteristics not found in IPD principles, and Group 3 consists of two innovative IPD traits. The following chapter explains how the trust attributes found in the three trust groups can be applied to the different phases of a DBB project life cycle by presenting a detailed rationale behind every allocation.

5.1. Group 1 and the DBB approach

The analysis of IPD traits found in Group 1 takes into consideration the analysis of the characteristics covered by these IPD principles. Table 6 shows an allocation of IPD traits to the four phases of a DBB approach. Relational contracting is shown in red because it is a trait specific to the IPD approach and not applicable to a DBB project.

Early involvement of key participants is a common trust factor between IPD traits and Project Characteristics (Figure 4). Bringing the contractor early on into the design phase for advising on constructability exercises and pre-construction services, can have a positive impact on building trust-based relationships with the client and the designer. The contractor will no longer be an intruder into the Client-Designer-Project Manager

(PM) combination. Therefore, trust can initiate in the design phase and expand through the project life cycle.

Table 6: Allocation of Group 1 to a DBB project life cycle

		Project Phase			
		<i>Pre-Project Planning</i>	<i>Design</i>	<i>Bidding</i>	<i>Construction</i>
Group 1	Early involvement of key participants		✓		
	Collaborative planning	✓	✓		✓
	BIM		✓✓	✓	✓
	Relational contracting				
	Shared risks and rewards		✓		✓✓
	Equitable contract			✓	
	Colocation		✓		✓✓
	Information sharing		✓		✓✓
	Transparency	✓	✓	✓	✓✓
	Mutual Respect	✓	✓	✓	✓
	Collaborative Mindset and Culture	✓	✓	✓	✓✓
	Mutual Confidence on each other's competencies		✓		✓✓
	Lean (such as TVD, last planner, reliable promising)		✓		✓✓

✓ **Present**

✓✓ **Present in high relevance**

Implementing collaborative planning in the pre-project planning phase and in the design phase can develop a sense of ownership to the project participants. When design consultants are involved in the decision making process rather than just following directions given by clients, they tend to build trust-based relationships with the client. Moreover, when contractors and designers collaborate together with the client, they develop trustful relationships during the construction phase.

BIM is an effective tool for communication when employed in the pre-construction phases, especially in the design phase. Having all trades communicating and sharing information through an electronic platform supports the development of trust. In the bidding phase, BIM leads to better project pricing since contractors have the actual quantities and thus trust between client and contractors can be established without the fear of over-pricing and the risk of arising claims for extra money later on. Before signing the contract, the contractor will have all the combined drawings reflecting the real situation in a project. BIM implementation starts in the design phase and expands to the construction phase supporting trust growth.

Shared risks and rewards is another IPD trait that can be applied in the design and construction phases of a DBB project to develop trust between participants. Tying individual's success to the overall project success supports collaboration and establishment of trust-based relationships among team members at the intra-organizational level and among project parties at the inter-organizational level. In the design phase, sharing rewards between client and design team can be a motivation for a cost cutting and more profitable design which provides a more trustful working environment. The level of risks is higher in the construction phase, thus the importance of sharing risks among client, design consultants, contractors and

subcontractors/suppliers can have an immense impact on the trust level. Participants will collaborate in order to maximize project performance which will in turn reflect on their own profit.

Fair contract conditions support establishing trust between bidders and clients because allocation of risks is a very important issue for contractors thus the need for a well-designed and equitable contract that fairly allocates risks and gives incentives to contractors.

Face-to-face communication and social interaction between project participants is provided by colocation. In the design phase colocation is satisfied only in the case of one-stop shops firms. These companies have full in-house design which facilitates resolving design issues between different consultants and supports trust. In case of early involvement of contractor, allocating space for the contractor's team during the design phase will not be an issue for such big companies. In the construction phase, colocation is more critical and it's employed by locating the resident teams of the designer and the contractor in the site offices; this can lead to resolving conflicts on the spot and help in establishing trust-based relationships among project parties involved. Therefore, colocation can be employed in the DBB approach during the design and more importantly in the construction phase.

Sharing information is very important for the development of trust. Hording information may lead to adversarial relationships and development of distrust among project participants. In a DBB approach, this IPD trait can be allocated in the design and construction phase. However, its implementation is more relevant in the construction phase where all project teams are on board and a huge amount of information is being shared. The contractor provides the design consultant and the client with shop drawings,

daily site reports, monthly reports and many other documents. However, in order to build trust an accurate exchange of information is needed. For example, normally when the contractor submits the particular of claims, no clarification is given and amounts of money are thrown. If the client is to trust the contractor, the latter needs to share all necessary information with the client and give justification for the aroused claim. Moreover, information exchange in the design phase between different consultants is very important.

Transparency is needed along the whole project life cycle in order to develop trustful relationships among project participants. In the pre-project planning phase, transparency and honesty are required between client representative and PM in order to have clear objectives and goals for the project. Most importantly in the construction phase where the contractor has to be transparent and honest about the schedule updates and claims submitted. Therefore, this IPD trait is relevant to schedule administrators and claim managers. In the design phase, transparency is required between the different design teams. In the bidding phase, the contractor has to be honest if any mistake or ambiguity in the design is found; he has no right to ignore or hide this type of information.

Mutual respect is applicable to all phases of a DBB project and to all participants engaged in the construction project.

Effective collaboration and cooperation between parties is satisfied by having a collaborative mindset and culture. Cooperation is needed from the beginning of a project (pre-project planning phase) and expands all along the project life cycle. Collaborative behavior contributed to the establishment of trust.

Mutual confidence on each other's competencies is a vital contributor to the development of trust. This IPD trait can be employed during the design and construction

phases where high technical knowledge is present. In order for a client to trust a designer, he has to have full faith and confidence that this designer is able to deliver the design for the project at its best. Similarly, the contractor should have the enough expertise and technical abilities to earn the client's trust.

Target value design (TVD), last planner and reliable promising are Lean construction concepts that support the development of trust and can be applied in the design phase and construction phase of a DBB project delivery approach. In the design phase, applying TVD helps the designer to be trusted by the client. In the construction phase, reliable promising and last planner are critical to establishing trust since the contractor has to reliable as to what to deliver and when.

5.2. Group 2 and the DBB approach

Group 2 constitutes of the remaining trust attributes that were not covered by IPD traits yet are applicable to a DBB approach to establish trust. Table 7 shows an allocation of these trust factors to the different DBB project life cycle.

Project participants in all phases should have trusting intentions and trusting beliefs in order to establish trust. In the pre-project planning phase, the client has to believe that his client representative, the PM and the Architect are trustworthy. Similarly, the client representative, the PM and the Architect should trust each other and collaborate together to deliver the best to the client. In the design phase, disposition of trust among team members is vital in order to have a well-coordinated design between all specialist consultants. In the bidding phase, the client team (client representative, A/E and PM) should have trusting intentions and beliefs towards the selected contractor. As for the

contractor, he has to accept to be vulnerable in risky situations faced in the construction phase with the belief that no party will act against him.

Trust in dedication and trust in benevolence are relational characteristics that should be present among all project participants in all DBB phases. Client, client representative, designer, PM, contractor and subcontractors should be willing to apply their capabilities in any relationship and have the expectations that the other party will not behave opportunistically. When this mentality is satisfied throughout all the project life cycle, establishing trust becomes more achievable.

Problem solving is one of the most important relational characteristics effective in establishing trust. Dealing with conflicts and debates that may arise in the design phase is very critical to the development of trust-based relationships between client and designer and within the designer team itself. Moreover, solving problems that may arise during the construction phase seem to be more serious since the number of people engaged in this phase is higher and thus interactions are more complex and diversified. On the site level, many trades are working simultaneously and therefore judicious problem solving techniques are to be employed in order for trust to be built among the participants.

Reciprocity supports trust in all the phases of a DBB project life cycle since all project participants need to feel that the favors and sacrifices they are doing are being returned. In the pre-project planning, the conceptual design is obtained after negotiations and efforts to get to a common ground between client and architect. In the design phase, coordination and efforts are to be made between specialist consultants (e.g. architectural and mechanical consultants) in order to attain the client's best interest. These efforts have to be from both sides in order to develop trust-based relationships.

Table 7: Allocation of Group 2 to a DBB project life cycle

		Project Phase			
		<i>Pre-Project Planning</i>	<i>Design</i>	<i>Bidding</i>	<i>Construction</i>
Group 2	Relational Characteristics				
	Disposition of trust (1a)- Trusting intentions (1b)- Trusting beliefs	✓	✓	✓	✓
	Intentional trust (3a) Trust in dedication (3b) Trust in benevolence	✓	✓	✓	✓
	Problem solving		✓		✓✓
	Reciprocity	✓	✓	✓	✓
	Integrity	✓	✓	✓	✓
	Openness	✓	✓✓	✓	✓✓
	Compatibility	✓		✓	✓
	Organizational Characteristics				
	Paying on time		✓		✓✓
	Reputation	✓		✓✓	
	Financial stability			✓	✓✓
	Adoption of alternative dispute resolution techniques				✓
	Organization's leadership	✓	✓	✓	✓✓
	Project Characteristics				
	Use of electronic document management system		✓		✓✓

	Timely and adequate responses to RFIs				✓✓
	Risk Allocation	✓		✓	✓✓
	Control mechanisms				✓
	Project size		✓		✓✓

✓ **Present**

✓✓ **Present in high relevance**

Project participants should believe in protecting the welfare of each other and failing to do so leads to distrust. Integrity is present in all project phases and can be applied to all project parties.

Similar to integrity, openness is applicable to all four phases of a DBB approach. However, its implementation is more relevant in the design and construction since responsibilities in these two phases are high and participants are expected to fulfill them in order for establishing trust.

Sharing similar cultures and values between project team members is an important factor for the development of trust. This attribute is necessary to be employed in the pre-project planning phase and bidding phase. In the pre-project planning phase, compatibility between client, designer and PM is needed in order to have a successful conceptual design and appropriate budgeting for the project. In the bidding phase, the client will trust the contractor that is most compatible for the work.

One of the organizational characteristics that contributes to the development of trust is paying on time. It can be employed in design phase but has a more relevant role in the construction phase where most of the money is. The contractor tends to trust the client that pays on time according to the contract conditions. Trust issues arise when clients wait until the last day of paying period to pay the contractor and follow this pattern.

Similarly, distrust relationships are developed if the contractor follows a pattern of late payments paying with his subcontractors.

Reputation plays a vital role in the development of trust in the pre-project planning phase and bidding phase. When selecting the Architect to do the conceptual design of the project, the client and the PM relies on the reputation of the A/E team in order to build trustful relationships. Similarly, in the bidding phase, the owner only send invitation to bid for the pre-qualified contractors. The contractors in turn can refuse to give their offers if they do not trust the client based on his bad reputation.

Clients prefer to work with contractor organizations that are financially stable and in their turn, contractors trust client organizations that do not have financial difficulties. When the contractor is financially stable, he is more trustworthy because he does not need to find loopholes in the contract or bid low in order to make more profit. Financial instability will make the owner doubt the bid price of the contractor. Similarly, if the client has difficulties in money, the contractor will be anxious and worried all the time which prevents the establishment of trust-based relationships.

Adopting alternative dispute resolution techniques in the construction phase contributes to having trust-based relationships between client and contractor. If the contractor does not comply with the contract conditions and is known for rising global claims and going to time at large, then the client will definitely not trust such a contractor. When the client is very strict and refers to the contract conditions in every single problem, this leads to distrust with the contractor.

An organization's leadership is reflected by its policies. When employees and representatives of an organization behave in an adversarial way, they are often reflecting the "policy" of their organization. This trust attribute can be employed in the pre-project

planning and affects the trust relationships between the client, the PM and the Architect. When the Architect's organization has flexible yet strict policies, the employees will act upon these policies and develop trust with the client and the PM. Also, leadership has an impact in the design phase, in the bidding phase and most importantly in the construction phase. In the design phase, the working attitude of the design team reflects on the organization's leadership and has an impact on building trust. In the bidding phase, the contractor's organization leadership plays a vital role in how to price the project in an accurate and honest manner. This leads to trust-based relationships with the owner. As for the construction phase, where all project participants are on board, each party's organization policies are reflected in the interactions among the participants and can influence the level of trust in the project.

The use of electronic document management system in the design phase and in the construction phase of a DBB project facilitates establishing trust relationships since all information are being shared among participants. Visual data is usually favored by team members because it's easier to understand and it's a better reflection of the real situation. The implementation of an electronic document management system in the design contributes to better collaboration and higher trust level between the different consultants as well as between the A/E team and the client/ the PM. However, its implementation is more critical in the construction phase where a higher level of coordination between project participants is required and therefore a higher level of trust is needed.

One of the main issues that has a negative impact on the trust relationships between contractor and consultant is the long response time to RFIs. Therefore, having adequate

and timely response to RFIs can be a solution to most of the problems and disputes that arise during construction.

The construction industry is a high risk working environment. In the pre-project planning phase, the client and the Architect agree on a fair risk allocation formula that leads to trust-based relationships between the two parties. In the bidding phase, risk allocation is written under the contract conditions with the contractor. When financial risks, risk of failure and risk of delays are allocated in fairly, the contractor tends to trust the client. Risk allocation plays a vital role in building trust in the construction phase where risks are fairly assigned to the designer, contractor and sub-contractors.

The existence of control mechanisms is crucial to mitigate risks and protect the vulnerability of participants. The level of uncertainties and risks is higher during the construction phase, thus to establish trust the involved participants, control mechanisms such as surveillance, close evaluation and self-based control must be employed.

Project size affects the trust level in the construction phase of a DBB project. The limited number of people involved in a small project and the low level of risk contribute to easily manage the relationships between project participants and thus establish trust. As for large projects, on one hand, the large number of contractor and subcontractor team members involved in a large project hinders the development of trust especially on the site level where different trades working simultaneously. On the other hand, larger projects have more time to be accomplished which helps the development of trust-based relationships.

5.3. Group 3 and the DBB approach

Table 8: Allocation of Group 3 to a DBB project life cycle

		Project Phase			
Group 3 Traits		<i>Pre-Project Planning</i>	<i>Design</i>	<i>Bidding</i>	<i>Construction</i>
	Liability waiver				
	Peer performance evaluation and feedback	✓	✓	✓	✓✓

- ✓ Present
- ✓✓ Present in high relevance

One of the IPD traits found to be effective in building trust is liability waiver. This IPD trait is very difficult to be applied to a DBB approach. It requires an extremely high level of trust that even IPD project participants do not have and therefore they do not abide by this principle since they find protecting their rights very challenging.

Peer performance evaluation and feedback is an IPD trait effective in building trust but was not included in Group 1 since it did not cover any of the general trust attributes found in the literature. However, this principle is not to be neglected and it is considered a very interesting and innovative trust factor that can be applied to the DBB approach. It can be applied to all phases. In the pre-project planning and design phase, when the designer and the PM are given the right to evaluate each other as well as to evaluate the client representative, they will develop trust-based relationships. In the bidding phase, allowing the designer and the PM to evaluate each other's performance in

the selection of the winner bidder process contributed to the development of trust among the parties involved. As for the construction phase, the implementation of this IPD trait is more critical and relevant since all parties are on board and upward evaluation is vital for creating trust. Normally the client representative is never evaluated by other parties and the contractor does not have the right to evaluate the designer nor the PM. When applying this confidential exercise, the contractor tends to trust the client because his rights are being preserved. Moreover, when all project participants know from the start that their performance will be evaluated by each other, they will watch their conduct and act professionally and as a result trust will be established.

5.4. Discussion of the Results

The results of association of Group 1 to the different phases of a DBB approach showed that from the 13 IPD traits shown in Table 6, four were applicable to the pre-project planning phase, eleven were assigned to the design phase, five were allocated to the bidding phase, and ten were relevant to the construction phase. The share of IPD traits of Group 1 by each phase is represented in the pie chart in Figure 5.

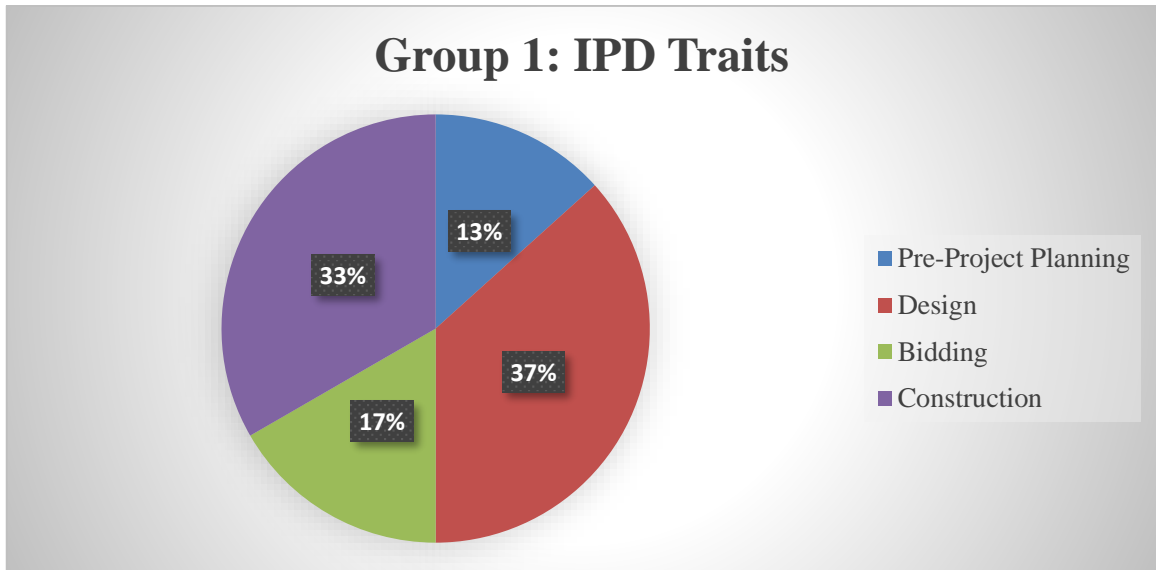


Figure 5: Share of Group 1 IPD traits by phases of DBB project

The four IPD traits assigned to the pre-project planning phase were: Collaborative planning, Transparency, Mutual respect and Collaborative mindset and culture. As for the bidding phase, the five applicable IPD traits were: BIM, Equitable contract, Transparency, Mutual respect and Collaborative mindset and culture. As for the design and construction phases, both had ten common applicable IPD traits: Collaborative planning, BIM, Shared risks and rewards, Colocation, Information sharing, Transparency, Mutual respect, Collaborative mindset and culture, Mutual confidence on each other's competencies and Lean.

However, from these ten common IPD traits, seven were highly relevant to the construction phase and had a greater association in building trust in this phase: Shared risks and rewards, Colocation, Information sharing, Transparency, Collaborative mindset and culture, Mutual confidence on each other's competencies and Lean. The Early involvement of key participant's trait was exclusive to the design phase.

The results of Group 2 allocation revealed that the number of trust attributes associated to the pre-project planning, design, bidding and construction phase

respectively is nine out of seventeen, ten out of seventeen, ten out of seventeen and sixteen out of seventeen as shown in the statics of Figure 6.

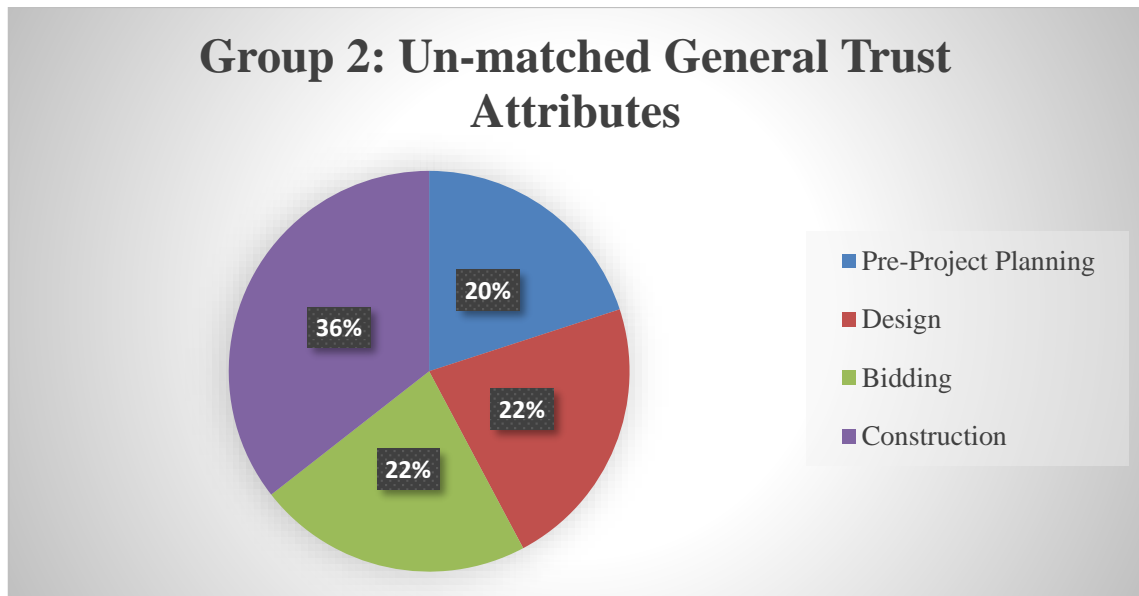


Figure 6: Share of Group 2 Trust Attributes by phases of DBB project

Disposition of trust, Intentional trust, Reciprocity, Integrity, Openness and Organization's leadership are the common trust attributes applicable to the four phases of a DBB project. Compatibility is commonly applied in the pre-project planning and bidding phase. Reputation is common to the pre-project planning and bidding phases. The design and construction phases shared several common trust attributes: Experience, Problem solving, Paying on time, Use of electronic documents, and Project size. Financial stability is applicable to both the bidding and construction phase. It is notable that the construction phase has the highest number of trust attributes that are highly relevant and associated to building trust in this phase. There are nine attributes with a high degree of association: Problem solving, Openness, Paying on time, Financial stability, Organization's leadership, Use of electronic document, Risk allocation and Project size; and 3 attributes exclusively applicable to the construction phase: Adoption of alternative

disputes resolution techniques, Timely adequate responses to RFIs, and Control mechanisms.

As for Group 3 the Liability waiver trait is not applicable to a DBB approach while the peer-performance evaluation and feedback is applicable to all phases of a DBB project with a higher relevance to the construction phase.

CHAPTER 6

SUMMARY, CONCLUSIONS AND FUTURE WORKS

6.1. Summary

In light of the discussion entertained in this research, establishing trust in DBB projects is a forward step towards IPD implementation. IPD as a form of relational contracting presents many advantages over the traditional transactional delivery approach. It increases construction productivity, promotes project teams to achieve higher goals, facilitates team integration, decreases the number of change orders and contributes to cost savings and shorter schedules (Forbes and Ahmed, 2011; Kent and Becerik-Gerber, 2010).

Rowlinson (2017) indicated that the number of construction projects using IPD is very small. Although IPD has been described as the most effective delivery approach to build an asset, DBB remains until this date the most widely used delivery process in the AEC industry (Pishdad-Bozorgi, 2016). In order for IPD to be widely adopted in the AEC industry, IPD projects should overcome several barriers such as financial, legal, cultural and technological barriers (Ghassemi and Becerik-Gerber, 2011). In addition to these barriers, the construction industry suffers from a lack trust between project participants which makes it harder for IPD to be implemented because trust is at the core of relational contracting. Thus, establishing trust among project participants in a DBB delivery approach is a vital step to start thinking of IPD implementation.

Many researchers have tackled the issue of distrust and how to establish trust in construction projects. Pishdad-Bozorgi and Beliveau (2016a) found that IPD and trust

have a symbiotic relationship: “while trust is a cornerstone of IPD, IPD also helps raise trust to higher levels”. Therefore, 15 IPD traits were found to be effective in building trust: Early involvement of key participants, Collaborative planning, BIM, Relational Contracting, Shared risks and rewards, Equitable contract, Liability waiver, Peer performance evaluation and feedback, Colocation, Information sharing, Transparency, Mutual respect, Collaborative mindset and culture, Mutual confidence on each other’s competencies and Lean tools such as TVD, Last Planner and Reliable promising. In addition to these IPD traits, as basket of Relational characteristics, Organizational characteristics and Project characteristics was identified in the literature to be critical to the development of trust.

The first part of the research was to group these trust attributes into three groups. Group 1 constituted of 13 IPD traits covering several characteristics (relational, organizational and project). Group 2 constituted of the remaining 17 characteristics not covered by IPD traits yet essential to the development of trust in a DBB project. And finally, Group 3 was comprised of two innovative IPD traits not previously found in the trust related literature: Liability waiver and Peer performance evaluation and feedback.

The second part of the research was to allocate the trust attributes of each group to the different phases of a DBB project life cycle. The results showed that from the 13 IPD traits in Group 1, 12 IPD traits were applicable to a DBB approach while only one trait which is relational contracting was not applicable. Group 2 consisted of 17 general trust attributes un-matched with any IPD trait: seven Relational characteristics, five Organizational Characteristics and five Project Characteristics. The results showed that all 17 trust factors were applicable to a DBB approach. One of the IPD traits in Group 3 was relevant to the development of trust in a DBB approach.

The allocation of trust attributes of the three groups revealed that the construction phase was the most important phase in establishing trust. Seven IPD traits of Group 1, nine trust attributes of Group 2 and one innovative IPD traits of Group 3 had a high degree of association to the construction phase. It is worth mentioning that three attributes of Group 2 were exclusively applicable to the construction phase.

6.2. Conclusions

The following is a list of the conclusions stemming from this research:

1. IPD delivery approach was described as effective in the establishment of trust in the construction industry. Fifteen IPD traits supported building trust and covered a set of general trust attributes found previously in the literature. Fourteen of these IPD principles were applicable to the different phases of a DBB project.
2. There was one IPD trait that could not be employed in a DBB project and it is exclusively related to relational contracting. An extensive analysis of the allocation of the remaining fourteen IPD traits was done. However, this allocation cannot be achievable without the effort of every single participant in the project from the senior to the site level.
3. From the allocation of IPD traits to the DBB project life cycle, it was noted that the construction phase has the biggest chance to benefit from IPD principles in order to establish trust among project participants.
4. From the allocation of the un-matched trust attributes, the construction industry seemed to have the largest number of trust factors that are highly relevant to the development of trust in this phase. This is reasonable since the construction phase has all project participants on board, it has the biggest share of the money, and it

is the longest phase. Therefore, managing the relationships between people is much more critical than the need for trust.

5. There is room for improvement before going to IPD implementation. Establishing trust in DBB projects leads to better project performances and is a step towards IPD implementation.

6.3. Future Works

Future research may focus more on what should be done in order to overcome the cultural, financial, legal and technological barriers for IPD implementation. Establishing trust is found to be helpful to start thinking of IPD. However, future study may include interviews and surveys with construction practitioners in the ME region in order to see if people accept the proposed trust model and to what extent they are willing to change in their culture and adapt to new concepts and intentions to trust each other.

6.4. Significance of the work

As previously discussed, the construction industry in the Middle East is way too short on accepting and adopting IPD as a project delivery approach. The importance of this work lies in providing an improvement to the DBB approach since it is the most common project delivery approach adopted by the majority of the clients in our industry. More particularly, this research strives to help the current weak situation of delivering projects by offering a model that uses trust-building attributes to establish trustworthy relationships among the different engaged participants and during the whole project life cycle. In addition, the recommendations that are sought in this intended research concerning building trust in a transactional contracting approach e.g. DBB shall have the

effect of having a more integrated environment and an IPD-like project approach, leading to better project performance.

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