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Analysis of Research Trends on Benefits of Implementing Integrated Project Delivery (IPD)

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ABSTRACT

Projects have different conditions, objectives, and features, and accordingly selected contractual models for them are also different. Contract models, besides being effective on different features of the project, have a vital role in its success too. In recent years, various models of types of contracts have been used by employers/clients, consultants and contractors, but because of lack of integration of stakeholders due to fragmentation in contracts, it is appropriate to codify a modern approach to contracts as Integrated Project Delivery (IPD). The benefits of using IPD have been considered by professionals in the field of construction in a number of countries. In this research, the trend of studies in the field of benefits of IPD has been analyzed through a comprehensive literature review. Collected articles were investigated by using qualitative analyses, and finally by using descriptive statistics. The results are presented in the form of statistical tables and diagrams. The purpose of this analysis is to give researchers a better view of available sets of comments of the benefits of applying this executive system and will underlie future studies to improve contract models. Awareness of the obtained benefits of implementing IPD in different parts of the world results in more familiarity of construction practitioners and may assist in improvement of construction conditions significantly.

Keywords: Integrated Project Delivery; IPD; Benefits; Modifications of Contract Models; Trend

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ANALYSIS OF RESEARCH TRENDS ON BENEFITS OF IMPLEMENTING INTEGRATED PROJECT DELIVERY (IPD)

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Abstract

Projects have different conditions, objectives, and features, and accordingly selected contractual models for them are also different. Contract models, besides being effective on different features of the project, have a vital role in its success too. In recent years, various models of types of contracts have been used by employers/clients, consultants and contractors, but because of lack of integration of stakeholders due to fragmentation in contracts, it is appropriate to codify a modern approach to contracts as Integrated Project Delivery (IPD). The benefits of using IPD have been considered by professionals in the field of construction in a number of countries. In this research, the trend of studies in the field of benefits of IPD has been analyzed through a comprehensive literature review. Collected articles were investigated by using qualitative analyses, and finally by using descriptive statistics. The results are presented in the form of statistical tables and diagrams. The purpose of this analysis is to give researchers a better view of available sets of comments of the benefits of applying this executive system and will underlie future studies to improve contract models. Awareness of the obtained benefits of implementing IPD in different parts of the world results in more familiarity of construction practitioners and may assist in improvement of construction conditions significantly.

Keywords: Integrated Project Delivery, IPD, Benefits, Modifications of Contract Models, Trend

1. Introduction

In the traditional form of contracts, construction and design groups act separately. This separation results in several changes at different stages of project life cycle [1]. It can be stated that in today's world, because of complexities of the construction industry, the traditional form of contract has resulted in increasingly high expense to project stakeholders. On the other hand, realization of project objectives, based on predicted conditions, is very important [2]. Integrated Project Delivery (IPD) is a project delivery approach, which integrates people, systems, business structure and uses experiences and insights of all

participants in optimizing project results, enhancing value for owner, reducing wastes and increasing productivity at all stages of construction [3]. IPD method has six features that have significant differences with tradition method of project implementation, including: 1) Multilateral contract: it is a contract that includes all project stakeholders. 2) Sharing risks and rewards: this feature results in increased motivation. 3) Initial presence of key stakeholders: it causes creating understanding and reducing claims at initial stages, and consequently minimizes changes. 4) Common decision making and supervision: it will increase the chance of project success. 5) Sharing

responsibilities among key stakeholders: it results in active presence of stakeholders at all stages of project life cycle. 6) Developing project objectives commonly to meet all objectives of project stakeholders: it is one of the most important criteria of measuring project success [3].

Studies have shown that this method is usable for any type of project, but as this method has not been implemented widely, this hypothesis is not approved yet [4]. In some projects, because of lack of sufficient knowledge, using IPD has not been implemented. In reviewing most projects in which IPD has been implemented, the IPD contract model is the results of changes that were made in traditional project delivery model, and organizing project team was such that time reduced and performance improved, and risks for all stakeholders minimized, and finally a win-win result is obtained for stakeholders [5].

Among the IPD objectives, there is more coordination and trust building among team members to predict project results at initial stages. For that, some tools are applied to improve information sharing process. Also, these tools, by creating better coordination in different systems during project life cycle, result in promoting energy sustainability and efficiency [6]. In order to implement IPD properly, architectural, engineering, and contract teams will also need full familiarity with this method [7]. Several successful projects have benefited IPD at different stages, but because of several reasons such as novelty of this method, lack of sufficient familiarity, governing laws in countries at private and public section, etc. its implementation is still slow [8, 9].

Till now, there is no research in the field of the trend of studies of benefits of IPD implementation. Therefore, in this research, different statistical tables and diagrams will show the trend of benefits of using IPD in different countries and during several years. Obtained statistics and results and presented analysis in this research, in the field of future strategies and using benefits of IPD, will create an opportunity for researchers for further development of this newly born knowledge.

2. Literature Review

In any system of project implementation, contract is very important, and it is known as contract management [10, 11]. For example, in the mid-twentieth century, conventional contracts were used [12]. Despite construction industry complexities, during years after that, other implementation systems were also created [13, 14]. But available systems did not have the required capability of creating interaction among different stakeholders in projects. Therefore, investors face several problems such as increase of various unnecessary expenses. For example, a part of these expenses were due to construction inconsistencies and duplications. Through integrating different stakeholders in the project by IPD method, available conditions can be improved significantly [1].

Recognizing benefits of applying IPD, causes creating motivation among construction industry investors for better selection of contract implementation system, because IPD can result in forming a contract among owner, design team, contractor and other key participants. IPD method allows owner, contractor, architect, engineer, commercial contractors, and consultants cooperate during the whole period of the project [2].

Managers, end users, contractors, and suppliers present there from the beginning of design, and decisions are determined from the beginning while they are clear, transparent and reliable. In many cases, changes are specified in prior to construction, in which the designers will state their comments about consequences of decisions. Through that, risks and rewards are shared in balance among project team members along project life cycle [1].

Among important benefits of implementing IPD is taking advantage of knowledge and skill of each of team members, which are usable during project life cycle. Responsibility of IPD implementation should be assigned to the most capable team member, and all selections should be completed based on the best results for project. Among other important cases, are sharing project information among construction and design team from the beginning of the project, which results in reducing many problems during project implementation [15]. Proposing effective sessions with the presence of all stakeholders, causes significant influence on decisions and integrated communications. Meanwhile, attention of team members is evaluated, which itself is one of the important factors for project success [7]. Reviewing key problems and their priority in order to maintain high standards of quality in projects is also among other achievements of such information sharing, and certainly is associated with reduction of risks, errors and extra expenses, while it increases profits for the project. Of course during these sessions, behavior of team leader is very important and effective [16].

According to conducted studies and comparing IPD with traditional methods, the results show that there is significant

improvement in performances, for example in enhancing the speed of projects delivery. The IPD emerging system with proper performance can be an appropriate guidance in final decisions in choosing a delivery system for shareholders [17]. Construction contracts are very important in success of projects, but performance of current contracts is not satisfying [18]. This issue raised that despite of importance of changing contracts, why speed of IPD implementation, as a valuable approach, is not very satisfying? Reviewing the trend of benefits of IPD refers to the high value of this method.

3. Research Methods

Research methodology in a scientific study is to define the process of regular searches to achieve a given and particular situation [19]. In this study, the literature review method is used as a qualitative method to analyze research trends on benefits of IPD implementation in different parts of the world. In such studies, data are measured by tools such as taking notes, cards, tables, etc. which is considered as qualitative studies [20]. In order to facilitate conducting such qualitative analysis, the Nvivo software has been used. Then, through searching by several keywords, 156 general articles in the field of IPD were investigated. Among the reviewed set, 55 articles investigated benefits of using IPD. In the next section, obtained data are classified, and the obtained descriptive statistics are extracted as tables and diagrams.

4. Analysis & Results

In analyzing the studies that review trends of an issue, data classification based on various criteria is common. Such articles describe and study changes made in a special field or profession on a certain time period [10, 21]. On the other hand, in the

field of construction, because of vastness and complexity of different factors, various classifications can be proposed. But what the researcher proposed was considering general and verifiable issues. Therefore, the following presented summary was analyzed. At first, in order to collect articles, as presented in the Table 1, several scientific databases were investigated, which the number of found articles in each of them is shown.

Database Name	Number of papers
ASCE	30
ScienceDirect	14
AIA	4
SMPS Foundation	1
Dissertation	2
Civilica	1
Taylor&Francis	3

Table 1: Databases and the number of found articles in each

Some of these databases, because of specialty of the issue, include more articles. Such as ASCE database, which has more articles with more variety in different years. All investigated databases are among the most prestigious scientific ones and are popular among researchers. The studies conducted the extent of IPD are in different fields. IPD has been implemented in health projects more than other types.

Following, dispersion of articles during different years is presented in the Table 2.

Continents	Number of papers	Years
America	2	2007
-	0	2008
America	4	2009
Europe, America	6	2010
Africa, America	5	2011
Asia, America	8	2012
America	8	2013
Australia, Europe, Asia, America	18	2014
Asia, America	4	2015
-	0	2016

Table 2: Continents presenting articles in different years

According to the information provided in this table, in the early years, the number of articles in this field was less because of lack of information from real cases having IPD implementation experience. It seems that in 2008, the benefits of this method were not investigated in any research. But by the progress of studies in recent years, especially in 2014, significant growth in the field has occurred. Researchers such as Lee, Tommelein and Ballard in 2013 emphasized this point that between 2009 and 2013, the IPD was starting to be evaluated in other countries in addition to the USA [22]. Researchers such as Chunyan MA, Xiaodong LI and Yangyang MENG in 2014 emphasized that after coming up with some initial instructions for IPD implementation in the USA in 2007 researchers in Asia started investigating various dimensions of IPD, especially its different benefits, and to study conditions of its implementation in their own countries [23]. Researcher such as Al Subaih emphasized that in 2015, East Asian countries and Middle East countries also published cases of implementing IPD [24]. Sometimes these cases were at stages of projects maintenance. The obtained results in these cases were significant. In the Diagram 1, different applied domains in the field of

construction were considered by the researcher.

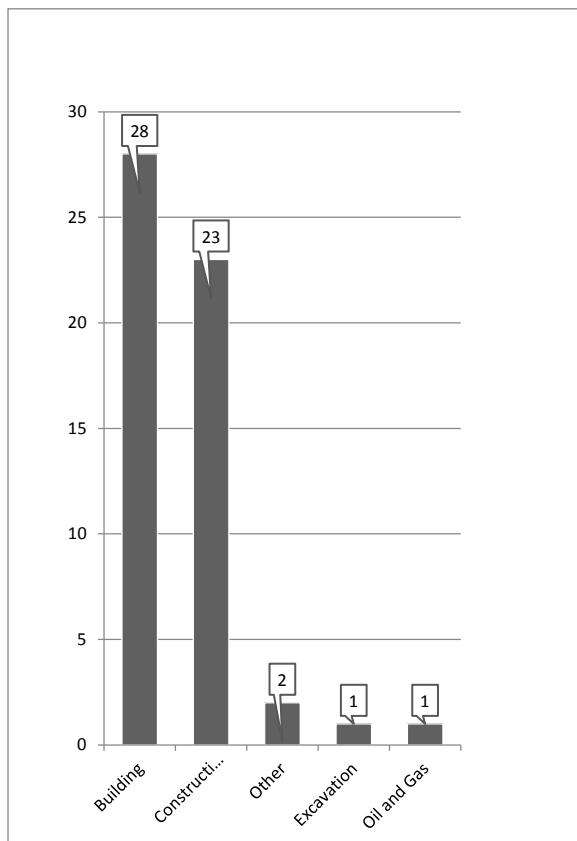


Diagram 1: The number of articles focused on different construction sectors

This diagram shows that, in terms of application domains, building sector has been the focus of most of the research articles. Construction industry, despite high volume of application, has less share in studying the benefits of IPD and its application in different sections. Presence of oil and gas industry as well as excavation is also notable in this diagram. It indicates high capabilities of IPD to be implemented in various industries.

In the Diagram 2, articles are evaluated from the viewpoint of studies focused on case studies or theory-based research.

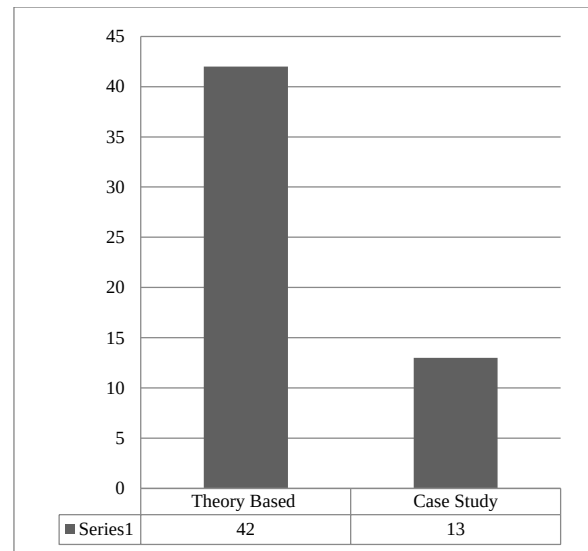


Diagram 2: The number of articles on IPD benefits in case studies and theory-based researches

Case studies articles are important in that their results are adaptable with other similar projects. Most of the case studies have been implemented in the USA. Since this method is emerging and in order to implement it, special conditions and regulations are required. Theory-based articles focus on identifying benefits of IPD implementation. Some of the proposed benefits inherently are raised in the IPD itself, and some others are obtained through comparisons with other methods. But what is very special are the benefits extracted from the case studies. In studies based on case studies, besides implementing IPD in a sample project, its benefits are also presented, including reducing costs and time.

In the Diagram 3, articles with quantitative data analyses are presented.

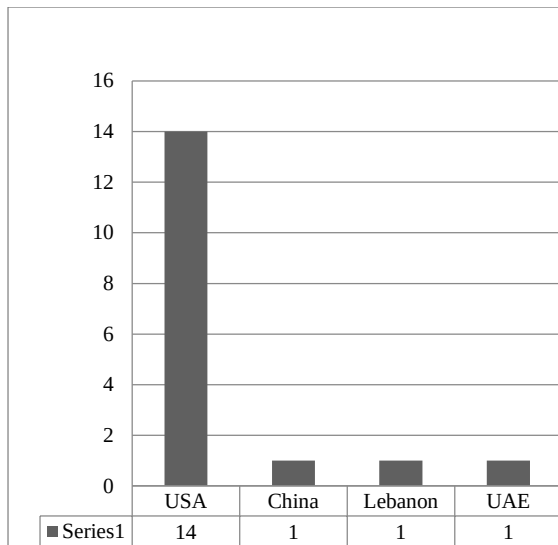


Diagram 2: Articles with quantitative results

This diagram illustrates that studying quantitative results to present correct solutions of IPD implementation for project stakeholders are important. According to high volume of articles on implementation of IPD in the USA, extracting quantitative results was also more in this country. Countries such as Lebanon, Emirates, and China also by comparing IPD with other methods, found quantitative results. Such results help investors to choose the correct method of implementation.

What can be seen in available articles is that no one have specifically analyzed the research trends of benefits of IPD; however some have considered what benefits are taken from IPD implementation in different case studies [25]. This analysis has identified that some countries have different rules in implementing IPD. The USA has made significant progress in this field mainly through case studies. A small number of studies from other countries have also analyzed benefits of IPD implementation on maintenance of projects. Collecting quantitative results of IPD benefits is also an effective and useful step toward helping the construction investors in selecting

proper contract type as one of important benefits of IPD is sharing rewards and risks in projects.

Researchers, in investigating the trend of IPD benefits, have tried different techniques. Some raised inherent benefits of IPD through theoretical studies. The others investigated benefits resulted from real case studies implemented around the world. The mentioned cases are presented in the following table:

Data Source	Benefits
Theoretical Articles	Inherent benefits, including: reducing workload, more usage of information, less request, reduction of construction time and cost, increasing safety, optimal management of material, early order of material, and reduction of tensions [26]. Benefits that involve economic, cultural, social, and political aspects [1].
Case Study Articles	Quantitative benefits extracted from real case studies, including: reduction of change orders [2], saving costs [6], better performance of risk management [22], accelerating project delivery [17], and improving quality [27].

Table 2: Type of data sources investigating the IPD benefits

All these data sources highlight the need for more in-depth exploration of the IPD implementation benefits; as well as restoration and updating the available laws especially in the early project planning and design stages.

5. Discussion & Conclusion

In this research, an analysis of the research trends on the benefits of implementing IPD was studied. Efforts to create an IPD system started from the 1990s, and which in 2007 resulted in the presentation of the IPD system. In 2014, the highest volume of studies about benefits of the system had

been conducted [7]. The greatest number of articles has been written in the USA. Most of the studies have been case studies implemented in the USA. Only few studies have been accompanied with quantitative data. The main application of this system has so far been in the field of construction, particularly the building sector. From analysis of the studies to date, it can be seen that most utilization of the IPD in the field of building has been in the health sector projects. Only a small number of studies have focused on the benefits of IPD. In addition it can be concluded that most of the articles written in countries other than USA, have studied the benefits of IPD from a theoretical perspective and have not come up with empirical data.

The governing laws of countries, especially in the public sector, are considered among barriers of proper implementation of IPD. Cooperation and effective team work are among the most important principles of implementing IPD is. China, in addition to legal barriers in implementing the IPD, was faced with problems of team work and lack of efficient appropriate culture in this field. Researchers have attempted to formulate guidelines in the field of developing this culture in order to create proper motivation for coordinating team work, interaction and information sharing [23]. African researchers, such as Ghana, investigated the benefits of IPD in projects that need a high degree of team participation. Also, they considered that integration done in group work, are very effective in increasing efficiency of working teams of projects, and leads to more successful delivery of projects [28]. In some case studies, despite applying IPD, because of lack of sufficient knowledge of stakeholders about its proper implementation instructions, desirable outcome is not obtained. Case studies offer

valuable experiences to contractors and owners in the field of mutual participation. But in some projects, the IPD has not been implemented at all stages. For example, in some, it has only been used in the post-construction stages. It is recommended to explore IPD effects in all project life cycle stages rather than a specific phase.

In this research, articles in the field of benefits of IPD were reviewed. In total, 55 articles, in which benefits of IPD have been discussed, were studied and data extracted. Researchers such as Gerber et.al in 2010 emphasized this point that investigating benefits of IPD is very important [2] as it can simply enhance project implementation processes. Among the most important barriers that are problematic in different stages of projects, are changes during implementation due to lack of required coordination among project stakeholders. But desirable results of cooperation through IPD, eliminates or minimizes changes and claims, and finally, results in achieving projects within estimated budgets and time constraints. What is obvious in the conducted studies reviewed is the attention and interest of the professional community to use modern methods such as IPD has been increasing.

The results of this study provide possible lines for future research to investigate the benefits of the IPD approach in a more comprehensive way, particularly in projects. Since implementing the IPD method needs reviewing and codifying different contracts and codification of a multilateral contract, researchers should investigate the field of creating these changes according to needs and conditions of different countries. Governing laws in countries should be investigated by researchers to evaluate and review limitations available in these laws to implement IPD. According to the research

to-date, governing laws in public sections are considered as serious barriers for effective implementation of IPD in most countries. Moreover, investigating how to implement IPD and its processes should be proposed according to available equipment and capabilities of each countries based on their culture and region. Among other possible future studies in this field, is studying the benefits of IPD in projects that use Building Information Modeling (BIM). It is because BIM is a tool for better realization of IPD. Research has shown that IPD and BIM, in design and construction processes, have significant and positive effect on costs and profit, planning, investing, safety, productivity, and communication [29].

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