

# A STUDY ON ANALYSIS OF DELIVERY & CONTRACT SYSTEM FOR INTRODUCTION OF THE INTEGRATED PROJECT DELIVERY (IPD) TO KOREA - Focusing on Delivery and Contract of Public Works -

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**ABSTRACT:** Recently, much attention has been increasingly paid to the efficiency of the delivery system in order to manage construction project in a smooth and effective way. The integrated plan in consideration of the life cycle of building is required for the effective and integrated management of information in a huge amount. To this end, collaboration between each field is indispensable from the beginning of project. But there is a limitation that the designer and the constructor sign the contract separately in the conventional delivery system. In the US, the recent trend is that the Integrated Project Delivery (IPD) has been introduced to improve the effectiveness of project management in an increasing number of the cases where project is implemented by utilizing the IPD. In Korea, there is also an increasing need to introduce the IPD for the integrated project management. Consequently, the purpose of this study is to examine and analyze the laws and the contracts that are applied to domestic cases of placing order and signing contract based on the concept and principle of the IPD before the actual introduction of the IPD. Based on such examination and analysis, this study intends to figure out the constraints to the introduction of the IPD. It is expected that the results of this study will be used as basic data for IPD-related study in the future.

*Keywords: IPD (Integrated Project Delivery), Delivery Systems, Contract Method, Improvement of Construction Legal Foundation*

## 1. INTRODUCTION

As construction project has recently become complicated and large in size, the effective project management has a significant influence on success of project. Since the method to manage project is determined by the delivery system, much attention has been increasingly paid to the efficiency of the construction project delivery system. The conventional delivery system that focuses on placing order for public works has put priority to securing fairness and objectiveness. As a result, efficiency has been considered to be the secondary issue. However, according to the recent trend home and abroad, a new delivery system is required to be introduced and expanded for effective project management, let alone for securing fairness.[1]

In Korea, a new delivery system is also necessary to satisfy the overall requirements on plan to reduce squandering and inefficiency on top of securing public interest and on demand to implement project successfully such as quality improvement, reduction of term of works and risk reduction. In addition, as the Korean government has strategically promoted the environment friendly policy such as “Green Growth” policy, it is required to make the integrated plan that focuses on sustainability in consideration of the life cycle of building from the initial planning stage of the project. Therefore, collaboration between each field is

indispensable to the systematic and integrated management of the information in a vast amount that is generated in the project that has become complicated and diversified. However, designer and constructor sign contract separately in the conventional delivery system, which hinders continuity of each work stage of the project. For this reason, it is difficult to manage the project in the integrated way, especially to have a smooth collaboration in the initial stage. This imposes a limitation on improvement of project productivity.

As a consequence, a new delivery system of the Integrated Project Delivery (IPD) has been suggested recently in the US. The IPD has the core values of integration and collaboration, aiming at improving the efficiency of project management. There have been more and more cases of applying the IPD. At the same time, the IPD has been highly evaluated as an ideal contract system that can ensure the win-win relationship for contract parties including the project owner, compared to the conventional delivery system.

In this study, we will analyze the characteristics of the IPD to derive core values of the IPD. Based on the core values, we will examine and analyze the relevant laws and the contracts that are applied to placing order and signing contract domestically. Therefore, the purpose of this study is to figure out the institutional constraints that can be considered in the process of introducing the IPD in the future.

## 2. Background of the IPD Emergence and Concept of the IPD

### 2.1 Background of the IPD Emergence and Definition of the IPD

Recently, the amount of information on construction project management has become enormous. As sustainability is applied to environmentally friendly building, the amount of information related to project management factors has become immense compared to the one in the past. In addition, when the information that became huge is not managed effectively from the initial stage of planning for the project, it is difficult to implement the project successfully, which leads to decrease in productivity. This may result in difficulties of generating profit, which is the ultimate goal of the construction project. For management of such risk, it is required to establish the efficient process where parties concerned should cooperate with each other from the initial stage of the project to manage the relevant information in the integrated and effective way.

However, the conventional delivery and contract system such as the Design-Bid-Build Contract (general contract) is fragmented according to contract time and contract party. Therefore, there exists limitation on collaboration and integrated management in the initial stage of the project. For this reason, the American Institute of Architects (AIA) of the US suggested the new integrated delivery system of the IPD to overcome the limitation on inefficient contract system such as fragmentation of parties who do the work, insufficient information management system, and lack of collaboration in the beginning.

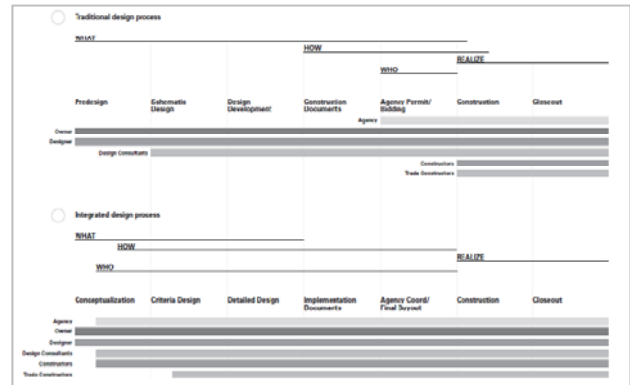
According to definition by the AIA, the IPD means the delivery system where the parties of the project such as owner, designer and constructor come together as a team to integrate business structure and work into one process for implementation of the project and to share the responsibility and the achievement jointly.[3]

In other words, the contract parties should stay away from the system where they do their own work as planning, designing, execution, and maintenance stages are fragmented. They should join hands as a team to participate in the beginning of the project and to implement the project in a harmonious mutual collaboration throughout the life cycle that stretches over all stages of the project. Currently, the IPD is partially applied in the US and has been gradually revised and developed further with a view to verifying the possibility that the IPD is used and completed as the integrated delivery system.[5]

### 2.2 IPD Process

One of the main features that the IPD process is set apart from the conventional delivery system is the significant change in the timing for parties concerned participating in the project. This means that design consultant and constructor for design and engineering get involved in conceptualization, which is the earliest stage of the

process as shown in the Fig. 1, and that trade constructor, who is a specialty contractor, takes part in the criteria design stage that corresponds to the conventional schematic stage



**Fig. 1** Comparison of Conventional Delivery System with IPD Process [3]

In addition, as all of the participants work together starting from the design stage, the time and workload tend to increase for setting the goal of the project and subsequently making the work plan. But as the prior simulation is used such as the BIM tool, it is possible to make design in higher degree of completion than the conventional delivery system. Based on such design, a thorough planning can be made in advance. As a result, the “implementation documents” stage of the IPD can be shortened further than the “construction documents” stage of the conventional deliver system. This means that the IPD has the advantage that collaboration enables efficient planning and management of project and proactive management of delay; for example, design change in the “construction” stage, which helps reduce the term of works.

### 2.3 Definition of Roles Played by Major Participants of the IPD

The principle of organizing a team for the IPD is that parties concerned should participate in the project in an active manner and on the equal footing. But multiple participants have their own weight that is different from one another when they organize one team and participate in each field of the project. Therefore, it is possible to divide participants to key participants and partners who support them. Below are the roles that the key participants should play according to definition by the IPD.

The designer should establish the design process that can reflect the characteristics of the project and allow the IPD to get involved effectively in the project as the design process gets more complicated than the conventional delivery system and subsequently the amount of information becomes enormous. Furthermore, the designer should effectively allocate and control design partners, including the structure designer, and properly reflect opinions from participants of other fields in the design process.

**Table 1.** Comparison of Traditional Delivery System with the IPD[3]

<b>Traditional Project Delivery</b>	<b>Factors</b>	<b>Integrated Project Delivery</b>
<input type="checkbox"/> Fragmented, assembled on “just-as-needed” or “minimum-necessary” basis, strongly hierarchical, controlled	Terms	<input type="checkbox"/> An integrated team entity composed key project stakeholders, assembled early in the process, open, collaborative
<input type="checkbox"/> Linear, distinct, segregated; knowledge gathered “just-as-needed”; information hoarded; silos of knowledge and expertise	Process	<input type="checkbox"/> Concurrent and multi-level; early contributions of knowledge and expertise; information openly shared; stakeholder trust and respect
<input type="checkbox"/> Individually managed, transferred to the greatest extent possible	Risk	<input type="checkbox"/> Collectively managed, appropriately shared
<input type="checkbox"/> Individually pursued; minimum effort for maximum return; (usually) first-cost based	Compensation/ Reward	<input type="checkbox"/> Team success tied to project success; value-based
<input type="checkbox"/> Paper-based, 2 dimensional; analog	Communications/ Technology	<input type="checkbox"/> Digitally based, virtual; Building Information Modeling (3, 4 and 5 dimensional)
<input type="checkbox"/> Encourage unilateral effort; allocate and transfer risk; no sharing	Agreements	<input type="checkbox"/> Encourage, foster, promote and support multi-lateral open sharing and collaboration; risk sharing

The constructor takes the responsibility for examining term of works, process planning, cost estimate, construction method, and constructability based on the design results in the design stage in order to make contribution to completion of effective and valuable design.

The owner should get involved in and actively work out the solution to issues on the project in order to manage the IPD team organically and effectively. Furthermore, the owner should ensure the effective implementation of the project by establishing and managing the efficient decision-making organization and making a quick decision over issues on the project. In particular, the owner should participate actively in all stages of the project and maintain the mutual cooperation relationship with the constructor and the designer.

### 3. Basic Principles for Execution of the IPD

#### 3.1 Comparison of Conventional Delivery with the IPD

As shown in the Table 1, the IPD has the biggest difference from the conventional delivery system in terms of timing of team organization, team members, party of and method for risk management, and method to share profit from the project.

In addition, team members for the IPD basically include all of the participants concerned in the project. But in consideration of the characteristics of construction industry, it is believed to be required to make some adjustment in collaborators (partners in each field), excluding the key participants, depending on the characteristics of the project. The relationship among the participants who organize an IPD team should be based on the horizontal and equal relationship, rather than on the vertical and hierarchical relationship. And the active collaboration should be made based on mutual trust. After the team is created, all of the participants should get together in the initial design stage to establish goals

of the project in consideration of owner’s demand, project schedule, project cost, and site conditions and to make the detailed plan for work by making decision reasonably.

At the same time, all of the participants should share profit from risk and achievement of the project. By doing so, they should be able to prevent the case where project is not implemented smoothly due to excessive competition among them and to implement the project for the single purpose of making the project a success.

#### 3.2 Basic Principles for the IPD

The first priority for the IPD should be given to maintaining the amicable collaboration among the participants throughout the life cycle of the project in order to achieve the primary goal of making the process a success.

The Fig. 2 shows the basic principles for the IPD, which aims at achieving the goals of optimizing the project performance by managing the project effectively, increasing the values from the project achievement, and maximizing the effectiveness of construction process by making a thorough plan in advance.

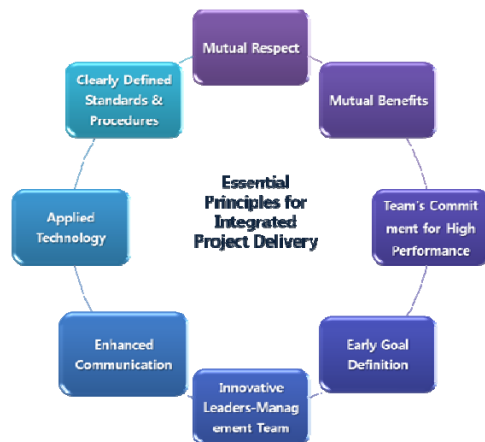


Fig. 2 Basic Principles for the IPD

Based on the principle of mutual respect, the participants of the project should organize a single team early for the IPD project to consider issues in the initial state on “who” will and “how” they will take responsibility for design and construction for the project. By doing so, they can achieve the goal of solving the problems together and early on making decision, which is necessary in the design state, and on design change, which may happen in the construction stage. This is the core value of the IPD.

In this study, we made the detailed analysis of relevant data based on the basic principles and the core values in order to understand the current conditions and the recognition in the domestic construction industry. After integration of the analysis results, we defined the “IPD main concept” for introduction of the IPD that includes the eight items: establishing the IPD team in the initial stage of the project as required by the IPD, having the mutual respect among the participants and the cooperative work (communication), making decision in an innovative and efficient way, setting goals of the project early, sharing profit from the project, utilizing the sophisticated technology such as the BIM, making an intensive and integrated project plan, and requiring the project owner to have the capability of leading the project. Based on these items, we investigated the recognition by construction engineers.

#### 4. IPD Case Studies

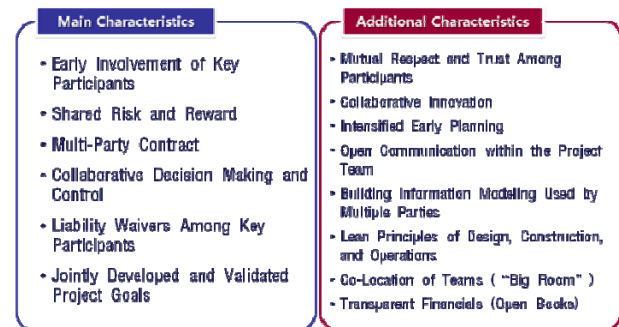
##### 4.1 Evaluation Factors of the IPD Case Studies

The AIA of the US classified the evaluation factors to the “main characteristics” and the “additional characteristics” that can improve the value of the IPD results as shown in the Fig 2 in order to evaluate the project that was implemented by using the IPD. In addition, the association defined the key participants as the owner, the architect and the builder who signed the primary contract. The key to a successful IPD is that design consultants and subcontractors join the IPD team

**Table 2.** Case Studies of the IPD Project

Project	Contract Type	Early Involvement	Project Characteristics
Autodesk Inc. AEC Solutions Division Headquarters	Multi-Party	Yes	<input type="checkbox"/> Incentive Compensation Layer (ILC) <input type="checkbox"/> -20% to +20% Incentive
Sutter Health Fairfield Medical Office Building	Multi-Party	Yes	<input type="checkbox"/> Saving construction cost (\$110,932) <input type="checkbox"/> The Integrated Form of Agreement (IFOA - a “relational” contract)
Cardinal Glennon Children’s Hospital Expansion	Multi-Party	Yes	<input type="checkbox"/> Saved \$400,000; The incentive pool was distributed (Owner 40%, Design team 20%, Builder and lean partners 40%)
St. Clare Health Center	Multi-Party	Yes	<input type="checkbox"/> Decision making structure was established by the IFOA to collaboratively discuss issues and make the more difficult decisions.
Encircle Health Ambulatory Care Center	Multi-Party	Yes	<input type="checkbox"/> Sustainability Goal : LEED Silver <input type="checkbox"/> Sustainability Achieved : LEED Gold
Walter Cronkite School of Journalism, Arizona State University	Design-build	Yes	<input type="checkbox"/> a two-way owner/designer-builder contract <input type="checkbox"/> the owner’s programmatic requirements could be met was to follow IPD principles

based on the multi-party contract in the initial stage of the project, following the joining agreement, to make sure that all of the project participants cooperate for the sake of successful project.[5]



**Fig 3.** Evaluation Factors of the IPD Project

Another key to a successful IPD is that the participants who execute the IPD have a broader understanding of their role before doing their work as there has been some change in the roles and the relationship that all of the participants should take and have, compared to the conventional delivery system.

##### 4.2 Analysis of the IPD Case Studies

The Table 2 shows the IPD case studies collected and analyzed in this study. In most of the cases, contract was the multi-party contract or the three-way contract signed among the owner, the designer and the constructor. In all of the cases, all of the participants got involved in the project in the initial stage. Moreover, some cases, including that of Autodesk Inc. AEC Solutions Division Headquarters, showed reduction in project cost. And the participants were rewarded with incentive for the achievement that they made.

All of the participants centering on the key participants were encouraged to make efforts to achieve the common goal of successful project by sharing information on major issues to implement the project plan and perform their duty, creating an organization to

make decision, and sharing risks coming from the decision that they made.

However, there is a limitation that the IPD case studies are not an example of the perfect IPD project but an example that has important elements of the IPD because there are currently a few cases where the IPD is used to place order and the IPD is in the transitional stage before it takes root firmly. Despite such limitation, the case studies are meaningful in that they helped examine application of the important elements of the IPD and the effects of such application

## 5. Analysis of Data on Delivery and Contract of Domestic Public Works

### 5.1 Analysis of Legal Provisions Related to Delivery and Contract

In this study, for analysis of the articles of laws related to delivery, contract and participant of public works project, we collected and examined the *Enforcement Decree of the Framework Act on the Construction Industry*, the *Enforcement Decree for the Construction Technology Management Act*, and the *Act on Contracts to Which the State is a Party*. Based on the IPD main concept defined above, we analyzed the major laws related to the domestic construction industry as shown in the Table 3. Afterwards, we compared the analysis results with the

**Table 3.** Analysis of Major Domestic Laws

Law	Articles	Main Features	Remarks Related to the IPD
enforcement decree of the framework act on the construction industry	Clause 3 of the Article 21	□The ordering organization should make sure that various processes of construction work such as plan, design, construction, supervision, maintenance, and management are implemented economically, efficiently and organically.	□It is required to adopt the IPD, which is the efficient process for successful management of project. The ordering organization needs to be positive about introduction of the IPD.
enforcement decree for the construction technology management act	Article 16	□The article stipulates the business scope and the scope of participating in the contract for general constructors and specialty contractors.	□In reality, it is difficult for specialty contractors to participate in the project exclusively without cooperation from general constructors. □It is expected that project participants including general constructors will have difficulties in establishing the relationship of mutual equality.
	Article 33	□The contractor of the project should listen to the opinions by the subcontractor on construction method and process of the construction work.	□The article is considered to be the legal provision that encourages specialty contractors to participate aggressively in the process of introducing the IPD. And it is required to define the timing of the participation and such matter in detail.
act on contracts to which the state is a party	Clause 1 of the Article 5	□In principle, the contract should be concluded on the equal footing. And the contract parties should implement the contract based on the principle of good faith.	□It is required to have guidelines for contract in the realistic, specific and equitable terms, rather than in mutual equality between ordering organization and contract party theoretically.
	Article 15	□It is obliged to make payment for contract and business.	□There exist penal provisions for mistake in project performance or in implementation process. But the regulations on rewarding successful results are insufficient.
	Article 26	□This article stipulates liquidated damages due to non-fulfillment of contract.	

IPD cases of the US from the previous studies. By doing so, we figured out the constraints or barriers that could be worrisome in the process of introducing or implementing the IPD domestically with a view to identifying the way for improvement.

First, the will of the project owner who makes plan for construction project is critical to adopting the IPD successfully. The Clause 3 of the Article 21 of the *Enforcement Decree of the Framework Act on the Construction Industry* stipulates the obligation that ordering organization should follow for the efficient construction work. Based on the article, it can be inferred that it is required to have the will to introduce the IPD to the public sector in the first place and in stages since the IPD has the advantage for effective management of enormous information and project.

The Article 16 of the *Enforcement Decree for the Construction Technology Management Act* stipulates the work scope and the contract scope for general constructors and specialty contractors. In reality, the article is considered to undermine establishment of the equitable relationship between general constructors and specialty contractors. And the chances are that such article will be the factor that hinders successful introduction of the IPD that values collaboration between participants on the equal footing.

Furthermore, the Article 15 and the Article 26 of the *Act on Contracts to Which the State is a Party* have the

penal provisions that include payment for contract implementation and liquidated damages in case of insincere implementation of contract on the part of contract party. Such articles are considered to be unreasonable for the IPD that encourages sharing of achievement and risk from project. Consequently, on top of the penal provisions, it is necessary to have legal regulations on incentive that aims at inspiring project participants to have the willingness to achieve goals.

### 5.2 Analysis of Standard Contract Documents Related to Delivery and Contract

In this study, for investigation on constraints to adopting the IPD domestically, we collected the standard contract documents that included the “stand contract document of the building design,” the “standard contract document of the construction work,” the “standard sub-contract document of the construction work,” the “standard sub-contract document of the engineering work for construction,” the “general condition for contract,” and the “general condition for service contract.”

The standard contracts collected for this study are the two-way contract that is generally signed between the party A and the party B such as between owner and designer or owner and constructor. And a different contract is applied in a different way depending on the contract party. However, the chances are that there can be loss of time in the process of selecting the main party for work in each stage of the project and concluding the contract before the selected contract party establishes the contract with its partner, which may cause loss in the whole term of works in the project.

In addition, the parties such as constructor and designer, who take part in each stage of the project under the different contracts with the project owner, participate in a single project but do a separate work in each stage of

the project due to the different contracts. For this reason, it is reckoned that collaboration becomes difficult, work continuity and project consistency become insufficient, and integrated management of information that is generated in each stage becomes difficult.

As a result, it is necessary to introduce the multi-party contract, which is not a common bilateral contract but a single contract that three or more contract parties sign to achieve a single goal, with a view to organizing the IPD team based on the principle of contract in mutual equality to ensure an amicable collaboration among the participants from the initial stage of the project. It is also believed to be required to consider development of specific contract guidelines that are suitable for the domestic construction industry.

### 5.3 Institutional Constraints to Domestic Introduction of the IPD

The Table 5 shows the institutional constraints that are expected in the process of domestically introducing the IPD that was derived in this study. Since we conducted the preliminary study on the IPD in Korea, we derived the institutional constraints in the declarative and theoretical perspective, rather than suggesting the specific and detailed constraints and deriving the priority order.

The derived constraints include difficulties of establishing the relationship of mutual equality due to dependent work scope for general constructors and specialty contractors, difficulties of active collaboration due to fragmented work among participants as they have separate contracts depending on contract party, insufficient regulations for rewarding the project achievement (providing incentive), and necessity of the government establishing institutional regulations and actively applying them especially to public works

**Table 5.** Institutional Constraints to the IPD Introduction

Main Concept	Main Features	Institutional Constraints
Mutual respect and collaborative work among participants (communication)	<input type="checkbox"/> It is required to organize a more effective team based on mutual trust, compared to the conventional delivery system.	<input type="checkbox"/> It is difficult to have continuous work and collaboration as separate contracts are concluded depending on party who does work.
	<input type="checkbox"/> The participants should work in the cooperative relationship on the equal footing.	<input type="checkbox"/> It is difficult to establish the relationship of mutual equality due to dependent work scope for general constructors and specialty contractors.
	<input type="checkbox"/> It is required to establish an amicable atmosphere among the participants.	<input type="checkbox"/> It is necessary to consider the necessity of the multi-party contract based on the principle of mutual equality for the IPD.
Sharing of profit from project	<input type="checkbox"/> All of the members or the team should benefit (profit) from the IPD.	<input type="checkbox"/> It is required to stipulate the principle and detailed regulations on reward based on performance against target of the project.
	<input type="checkbox"/> In the IPD, individual achievements lead to success of the project.	
Organizing team early and owner's capability to lead the project	<input type="checkbox"/> The ordering organization should organize the professional team that leads the way to make the project a success in the early stage of the project.	<input type="checkbox"/> The ordering organization should establish institutional regulations on the IPD in public works for effective management of the project and actively apply them.
	<input type="checkbox"/> The IPD team should identify its business and role and make contribution to goal and value of the project.	

## 6. CONCLUSIONS

As project has recently become complicated and large in size, it is required to manage enormous project information throughout the life cycle of the project. For the effective and integrated management of information and project, we analyzed the characteristics of the IPD suggested by the AIA of the US to derive the basic principles and the core values and define the IPD main concepts for introducing the IPD domestically. In addition, we analyzed the IPD case studies in the US to make analysis of the effects of applying the IPD elements. Based on such analysis, we could derive the institutional constraints that were expected in the process of adopting the IPD after collecting and analyzing the relevant laws and contracts related to delivery and contract of public works.

First, the IPD requires all of the participants to get involved in the project in the early stage and to cooperate to work in an amicable atmosphere. But as separate contracts are concluded between different parties depending on work, it is difficult for the participants to have active collaboration, which hinders consistent implementation of the project, resulting in undermining continuity of work. For this reason, it is believed to be required to consider the multi-party contract that is based on the principle of mutual equality in the process of introducing the IPD.

Second, the IPD system values a proper rewarding to share benefits from the IPD and encourage the participants to have the will to implement the project. The relevant laws and contracts have penal provisions such as liquidated damages but insufficient regulations on reward for project performance. Consequently, it is necessary to have the regulations on appropriate and reasonable procedures and methods.

Third, for successful introduction of the IPD, it is required to raise awareness of the IPD process. And the government is also required to establish institutional regulations and apply them especially to public works.

The purpose of this study was to conduct the basic research before the full-scale research on the IPD in Korea. It is necessary to continue the research on deriving the detailed constraints that are expected to be obstacles to domestic introduction of the IPD in the future.

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