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Virtual Team Concept and Construction Project Delivery Systems: A Compatibility Analysis

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Abstract
The concept of virtual teams (VT) is gaining increasingly more attention in the construction industry. The recent advances in information and communication technology (ICT) have increased the effectiveness of virtual teams in different construction management operations. However, the question remains – "are virtual teams appropriate for every construction project?" There is not much information available on this issue. In this paper we attempted to explore the applicability of virtual teams (VT) concept to various construction project delivery systems (PDS) by performing a compatibility analysis. A VT and PDS compatibility model is developed and analyzed using three case studies taken from real life construction projects. On the basis of this model, recommendations can be made regarding the suitability of a particular project delivery system for implementation of the virtual team (VT) concept.

Keywords
Virtual Team, Project Delivery System, Compatibility Analysis, Project Management

1. Introduction

In the 21st century, the construction industry faces many challenges ranging from reduced skilled labor pool to rapidly changing technologies. While low construction cost continue to be the primary factor in maintaining a competitive advantage, construction companies also recognize the need to address the latest technical knowledge and skills. This has led to an increased emphasis on the role of organizations in construction projects, where companies must view reducing cost as a major component of their responsibility within the organization. The nature of work in the construction field is also changing from individual work to multi-form activities. The change towards increased multi-form-based responsibilities has paralleled the growth of communication technologies that can be used to support the allied work teams.

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Effective teams are crucial to the success of a construction project. In most construction projects, design and construction are separate functions belonging to different departments or different companies, and a construction site can be in a different geographical location with respect to the design function. The growing popularity of inter organizational alliances together with a growing tendency to flatten organizational structures, and globalization have enhanced the need for firms to coordinate activities that span across geographical as well as organizational boundaries (Townsend et al,1998).

Virtual teams are composed of coworkers geographically and organizationally linked through telecommunications and information technologies attempting to achieve an organizational task, they are multi-site, multi-organization and dynamic. Today the phenomenon of virtual teams and virtual organizations (VOs) is becoming popular, team members can work dispersedly in different locations. They can meet by phone, fax, mail, teleconferencing or compressed videos. The use of virtual teams has the following advantages:

1. Virtual teams allow dispersed organizations to maximize their expertise without having to physically relocate individuals. In construction field, the required talents and the three essential entities; designer, constructer and owner in a specific project may be located in different places, however virtual teams can link them together to work on the same project.

2. Virtual teams can improve productivity, reduce travel cost, and make improvements in decision-making and problem solving skills (Lipnack and Stamps, 1997; Townsend 1998). Virtual team can be used to unify varying perspectives of different cultures and business customers to avoid counterproductive ethno-centric biases (Solomon, 1995).

2. Technology used in Virtual Teaming

Generally two types of technology are used in forming a virtual team—Information and Communication Technology (ICT) and management technology. Both types of technologies are crucial to the success of a virtual team although they cannot guarantee the success of a virtual team, as the technologies are necessary but not sufficient.

Virtual teams are based on the information and communication technology. The ICT offers a platform for the participants of teams to work together towards the completion of the projects without regard to geographic location. Varieties of communication technologies that can enhance the management of data, the technologies have been widely applied in virtual team depending on different demands of communication. This means all the technology must be tailored to meet the need of a specific project.

Like other new technologies, the virtual team technology cannot solve all the questions met in practice; it has its own advantage, disadvantage and suitable environments to survive. Unfortunately in current research papers attention is seldom focused on what kind of environment (construction delivery system) is suitable for virtual teaming. In this paper the characteristics of virtual team technology and relationship between design and build functions in different construction delivery systems are discussed. An evaluation model for applicability of virtual teams is introduced.

This paper tries to answer the following questions:

1. Can virtual team be applied in all construction projects regardless of the delivery system being used?
2. A subsequent question is, which project delivery system is appropriate for the application of virtual teams in a given project?

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Answers to these questions will be provided through the analysis of the relationships among the features of virtual teams, project characteristics and project delivery systems from a technical point of view. The social and legal dimensions, although as relevant as technical, are outside the scope of this paper and will not be included.

3. Factors involved in Virtual Team Application

3. 1 Virtuality

Let us define "virtuality" as an index representing the degree of involvement of virtual teaming concept or technology in construction projects. Construction projects have widely varying project characteristics and for that reason the application of the virtual team concept can lead to varying degree of virtuality in a given project. A higher virtuality index would indicate a better application circumstance (higher appropriateness) for virtual teams. Many factors may affect the selection of the project delivery system, among them the project characteristics and virtual team characteristics of the project are the most important ones and will be explored in this paper with the objective of developing a model.

3.2 Project characteristics

Project characteristics include the following factors:

The scope of the project

The clarity of scope of the project is very important influencing the virtuality of the project. If the scope of the project is not well defined, more communication and cooperation are needed to compensate for the vagueness; the application of virtual team technology can bridge the gap.

Budget

The competitive construction field has led to the trend of tight construction budget. The tight budget sometimes will kill the application of virtual team technology especially in some small size construction projects.

Schedule

Time is one of the main constraints in construction projects. In traditional project delivery system the project duration is longer due to the sequential procedure of the project phases, fast tracking method may reduce the duration depending on the better coordination between the designers and builders.

Complexity

Here the complexity is used to distinguish between repetitive routine design and complex unique design. Complexity can influence the selection of virtual team by stressing more effective cooperation between the designer, owner and builder on the project. With higher complexity, the need for virtual teams would be greater.

3.3 Virtual Team characteristics of a project

Virtual Teams and their characteristics have been defined in many different ways in the literature. In this paper a very limited definition is adopted and only two characteristics, geographic location and synchronicity are considered for the development of the model. If diverse geographic locations are involved for the execution of the project, it is imperative that VT concept will be useful. Likewise, if synchronous functioning is needed, VT concept will be more appropriate.

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4. The Evaluation Model of Virtual Team Application

Many construction projects are naturally suitable for application of virtual team concept. As discussed above, virtual team can offer opportunities for enhancing effectiveness of management. However, the problems are: are all construction projects, or for the purpose of this paper, delivery system suitable for the application of virtual team technology?

To answer this question, a model is developed. The first process will focus on the project characteristics and virtual team characteristics. Then, different project delivery systems will be considered for analysis and for assigning "virtuality" scores to each delivery system. This will provide a way to select the appropriate delivery system based on a consideration of the virtual team concept.

Different project delivery systems have different degree of applicability or appropriateness of virtual teaming. Dividing construction contracts by project delivery systems offers a clearer view about the relationship among the owner, the designer and the contractor (constructor) than by risk sharing concept. The design team and construction (build) team can be organized or combined in many different ways and different relationships between the two entities create different delivery systems: In the design-bid-build system designer and contractor are separate participants while in a design-build system designer and contractor are in the same entity. Thus based on the assessment of "virtuality" an appropriate project delivery system can be determined. In the second process of the model, the project characteristics are introduced, and both project characteristics and the features of different project delivery systems are considered to evaluate the applicability of virtual team technology. To understand the model in detail, three different projects are analyzed in the following.

5. Case Studies

Case 1: (BOT project) Channel Tunnel project (UK –France)-BOT Project. The 50-km channel tunnel comprises two 7.3-m diameter rail tunnels and a 4.5-m diameter service tunnel linking Great Britain and France. The project contract was awarded on BOT basis in 1987 and successfully completed in 1995. The project cost was 9.2 billions and the concession period is 55 years (1987-2042).

The project company, Eurotunnel, consists of Britain's Channel Tunnel group, a consortium of British banks and contractors, and France's France-Manche, a consortium of French banks and contractors. The organization structure is shown in Fig.1.

This is a typical BOT project: the owner (government) contracts with a single entity to perform the design, construction and operations of a whole project under a BOT contract, which offers the owner a single point of responsibility for design and construction services. In this system a specially founded company Eurotunnel perform takes the responsibility of designing, constructing and operating the project.

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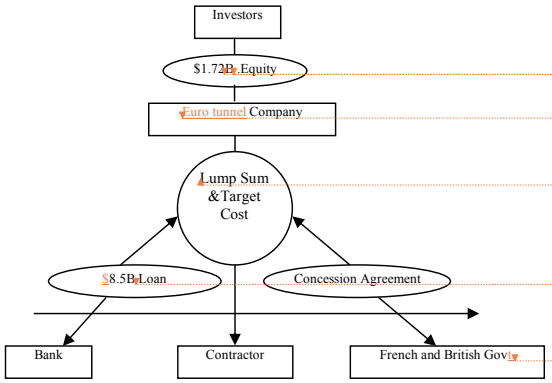

Fig. 1: The Organization Structure of Case 1

The complexity of the project is very prominent, with a large number of uncertain and complex factors: organizational complexity, a large number of suppliers, companies in the construction consortium, and companies in the operating company consortium. Resource complexity includes a large number of resources consumed in the construction. These uncertainty and complexity of the project greatly influenced the scope of the project.

The virtual team characteristics of the project are apparently strong. Suppliers, designers and companies in the construction consortium are from different countries and areas. Geographical dispersion existed among the designers, builders and suppliers. With the help of virtual team concept the Eurotunnel Company could integrate the different parts involved altogether, which would greatly cut the project cost by cutting the travel and moving expenses, etc., at the same time pooling the highest qualified companies in the area.

What needs to be mentioned is that, the Eurotunnel Company was specifically founded for this project, it is a temporal organization started as the project started and disbanded as the project was transferred to the government.

The application of virtual team concept in this project can also increase the opportunities of innovation in construction. Virtual team is more sensitive to the changes and opportunities in market, the BOT entity could respond to the latest demand of government in a timely manner.

Case 2: (Turnkey Project) Hainan Zhongyun Retirement Community in southern China

The Organization Structure of case 2 is shown in Fig.2.

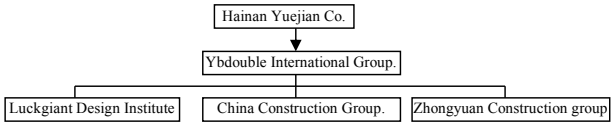

Fig. 2: The Organization Structure of Case 2

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The 60-acre campus consisted of 290 independent-living units and 49 cottages designed in the Southern China tradition, with the services and amenities of a resort and retirement community rolled into one. The owner appointed an external organization to carry out and manage the design and construction phase of the project. The management contractor tender out the construction project in the form of work packages to different subcontractors as work package contractor. The subcontractors only have a direct contractual relationship with the general contractor.

In the project, designers and contractors are from different companies and are geographically dispersed, as both the designer and the builder are employed by the general contractor, the two groups can work synchronously and construction time can be effectively reduced. What is more, with the owner's involvement the general contractor can have the capability to customize services. So the virtuality of the project is high and the application of virtual team is easier than that of the DBB system.

The previous two projects belong to the design-build system, that means the designer and builder are in the same unit. In this system, the owner contracts with a single entity to perform both design and construction under a single design-build contract, which offers the owner a single point of responsibility for design and construction services. In this system portions or all of the design and construction may be performed by a single design-build entity or subcontracted to other companies. The single-point responsibility inherent in the design-build process are in keen need of communication as all the advantages of the design-build system are based on the hypothesis of the perfect communication between the designers and builders. Unfortunately in current construction field the communication between designer and contractor is far from satisfactory. Generally designer and constructers are separate entities even when designer and builder come from the same company they belong to different department; there still exist a possibility of conflicts according to the different work characteristics and department benefits. The real problem hindering behinds the problems is the lack of the environment of communication and coordination and building trust. Virtual team can offer solutions for the problem by creating a virtual environment for the designer, and the contractor to work synchronously.

One of the most prominent advantages of the design-build system is the shortened duration, which is based on the assumption of the commencement of procurement and initial construction prior to the completion of design. However this is really a risky step in construction, as the initial design may cause lots of uncertain and unclear in the drawings. Some problems can be solved by communication and discussion between designers and contractors in virtual teams as they are in the same entity. In a virtual team atmosphere, the contractor can pool high quality competencies in both design and build areas with each participant contributing their high quality competencies.

The Application of virtual team can enhance the productivity of designers as the designers can also work on other business outside the context of the virtual team. This is really attractive to the companies as more productivity can be achieved through the virtual system. The application of virtual team can also raise the opportunities of creating innovation in construction field as virtual team is more sensitive to the changes and opportunities in market. When applied in virtual team the design-build entity can respond to the latest demand of owners as soon as possible. In some complex innovative construction projects the coordination of designer builder is crucial to the success of the whole project; virtual team technology can bridge the gap by creating a virtual environment for the decision making of the designers and builders. From the discussion above we can find that that the design-build system has all the characters a virtual team needs and the system is suitable for virtual teams.

Case 3: (Design-bid-build Project) Consolidated Car Rental Facility at Fort Lauderdale-Hollywood International Airport (FLL), Fort Lauderdale, Florida, U.S.A. The Organization Structure of case 3 is shown in Fig.3.

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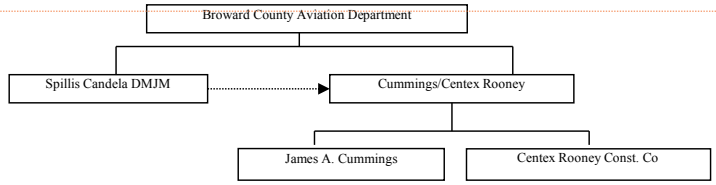

Fig. 3: The Organization Structure of Case 3

The contractor-Cummings/Centex Rooney is a joint venture of James A. Cummings, Fort Lauderdale, and Centex Rooney Construction Co., Plantation. This is the traditional design-bid-build form in which owner has a direct contractual relationship with the designer and contractor, they are in different entities, the client assumes responsibility for design and the contractor is involved only in construction.

The project characteristics are clear: a defined scope for the project, tight schedule and budget. Unfortunately the virtual teaming characteristics of the project are weak. Although geographical dispersion existed between the designer and builder, there is no contractual relationship between designer and constructor, and design, bid and construction are in a sequential procedure, the designer and builder do not work synchronously. There is a low possibility of taking advantage of virtual teaming technology to apply fast tracking method to reduce construction duration. In this case, to be fair, owners hire independent design teams then circulate the completed plans to other contractors for competitive bidding. From the discussion above we can find that it is hard to fully utilize the advantage of virtual teams in the design-bid-build system.

The results of the discussion are shown in the Tables 1, 2 and 3.

Table1: Project Characteristics of the Three Cases

Project Characteristics	Case 1 (BOT)	Case 2 (Turnkey)	Case 3 (DBB)
Scope	Clear	Clear	Clear
Size	Large	Medium	Small
Duration	Short	Short	Long
Complexity	High	High	Low

Table 2: Virtual Team Characteristics of the Three Cases

VT characteristics	BOT (case 1)	Turnkey (case 2)	DBB (case 3)
Geographic location	√	√	√
Synchronous functioning	√	√	×

Table 3: Applicability of VT and PDS

	DBB	DB	BOT	TK
Virtual Teaming Applicability	Low	Medium	High	High

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From the tables above we can find that in selecting a proper delivery system for a project with high virtuality, design-bid-build system has the lowest fit for virtual team, and BOT and TK systems have higher ones.

6. Other Delivery Systems

Virtual teams can also be applied to other delivery systems such as build-own-operate-transfer (BOOT), and design-build-operate-maintain (DBOM) contracts. In these systems designer and contractor are in the same entity as the design-build system. In these delivery systems the contractor and designer have a closer relationship than in most ordinary design build projects, as most of the BOOT and DBOM projects are mega projects operated by joint ventures. The joint venture hires both the designer and builder and the two parts are responsible for the same joint venture. So according to the technical criteria from project delivery system and virtual team characteristics the BOOT and DBOM delivery systems may have a higher virtual teaming applicability or virtuality than that of the only design-build systems. In practice, social and legal dimensions need to be considered as well in determining virtuality.

7. References

Larsen, K.R.T., and McInerney, C.R., (2002). "Preparing to work in the virtual organization" J of Information & Management, Vol.39, pp.445-456

Chinowsky, P.S. and Rojas, E. M., (2003). "Virtual team: Guide to Successful Implementation" *J. of Management in Engineering,* Vol.19, pp. 98-106

Lurey, J.S., and Raisinghani, M.S., (2001). "An empirical study of best practices in virtual teams" *J. of Information & Management,* Vol. 38, pp.523-544

Johnson, S.C., and Suriya, C, and Yoon,S.W, and Berrett,J.V., and Fleur,J.L., (2002). "Team development and group process of virtual learning teams" *J. of Computer & Education*, Vol.39,PP.379-393

Kayworth, T. and Leidner, D., (2000). "The global virtual manager: A prescription for success" J. of European Management, Vol. 18, pp.183-194.

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characteristics and some original virtual team concept has been applied in project execution although the concept was not clearly forwarded at that time.

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Or can virtual teaming technology fit all construction projects?

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In risk sharing system projects are divided by risks between contractor and owner, and it is hard to configure any organizational hints. In construction field, design and construction community holds one of the most important roles.

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What is more, the coordination problems between designer and contractor are common in current construction industry and are the most promising field to be solved by virtual team. So once

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