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Leveraging the Virtual Concept to Improve Value Delivery: Some Lessons from Hong Kong

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ABSTRACT

This paper reports on some lessons learnt from empirical studies done in Hong Kong on the application of the virtual concept to improve value delivery. Selected cases in the construction industry are presented, focusing on the: nature, improvements, or failure and challenges encountered for analysis. Although, the virtual concept may have the potential to improve on efficiency and provide cost savings, there is the need to account for critical issues like local dominant attitudes and work environment, compatibility of applied technology, comprehensive risk and change management, and adaptation of technology to the specific needs of the industry to improve the chances of attaining any perceived value expectations from the concept.

INTRODUCTION

Various commentaries and predictions have been made on the application of modern information and communication technology (ICT) in business operations in recent years. Virtual organizations which rely to a great extent on ICT were widely expected in the early 90's to completely overthrow the traditional concepts of doing business (see e.g. Davidow and Malone, 1993; Mandel et al, 2001).The so-called 'dot-com' bubble burst around the turn of the last decade, however to a greater extent eroded confidence in such companies (see e.g. Mandel et al, 2001). This shaken confidence may perhaps require rethinking, as displayed by recent events like that of the 'dot-com' search engine company, Google. It now has an estimated market capitalization of about 27 billion dollars, which is greater than that of General Motors and Ford Motor Co. (see e.g. Shinal and Kopytoff, 2004). Such value delivery 'bursts' and transformations (like Google's) bring to the fore what modern ICT leverage has to offer in business. One may as such extend such instigations into industries like the construction industry. Thus in other words, in linking this scenario of potential success and failure of virtual operations in value delivery to the construction industry what specific lessons may be learnt in the application of such concepts? Mandel et al (2001) have specifically given account of the gained benefits and losses of internet leverage across industries with little in-depth focus on construction industry. However, there has been a number of commendable research efforts on the growth of Information Technology (IT) use and success in construction. Such studies have in no doubt provided useful information on the extent of awareness, usage, perceived benefits and challenges of IT in construction, however, most of these studies appear to offer broad survey perspective in the leverage of IT (see e.g. Howard, Kiviniemi, and Samuelson, 1998; Rivard, 2000) or are software development and description oriented (see e.g. Craig & Zimring, 2002). Given the young age of this area of research there seems to be little empirical studies in the focused leverage of the virtual model in construction value delivery. This paper will attempt to explore and discuss the empirical application of the virtual concept in value delivery in construction in Hong Kong, and then present some lessons that were learnt from the delivery of value via this concept. First, the paper's major concepts and then the readiness of Hong Kong's environment for the virtual concept are reviewed, before the cases are presented and analyzed.

VIRTUAL CONCEPT AND CONSTRUCTION

Various inconsistent definitions of the virtual concept may be found in literature. However, this paper will adopt this operational definition for the term virtual:

- When specifically applied to the organization or construction project to mean the combination of skills by firms/teams/groups/ individuals (outsourced or otherwise) who depend on modern ICT to imitate the real world or operate independent of time and space, and collaborate to achieve common goals (see e.g. Davidow and Malone, 1993; Duarte and Snyder,1999; The Free On-line Dictionary of Computing, 2003).

In contrast to the virtual concept, traditional construction models may rely on traditional methods (e.g. physical face-to-face, postal mail delivery, etc) for communication; leverage physical interactions and use the hardcopies of relevant documentations, designs, and drawings in the delivery of value from construction conception to asset disposal(see e.g. Barima, 2001). Thus one may see the two concepts (i.e. virtual and traditional construction) from the perspective of two opposite poles with the potential hybrid combinations of the extreme scenarios of both concepts in between them possible(see e.g. Barima,2001). Although value delivery could also have varied definitions, the interest of this paper is in the effectiveness and efficiency in delivering tangible or intangible construction products from conception to asset disposal. With the major concepts of this paper defined and illustrated, the next section sets into context the readiness of the broader local Hong Kong environment for virtual operations.

THE READINESS OF THE LOCAL HONG KONG ENVIRONMENT IN VIRTUAL VALUE DELIVERY

The telecommunications infrastructure and ICT access for Hong Kong is among the best in the world. Broad-band access covers over 90% of households and commercial buildings (Hong Kong Digital 21, 2003a,b). The administrative government has also provided legal, sustained technical and neutral tax environment, and whips up public awareness to encourage the usage of electronic commerce (see e.g. Hong Kong Digital 21, 2003a,b). To demonstrate government leadership, electronic procurement services are accessible from over 40 local Hong Kong government departments as well as from more than 200 government bureaus worldwide (see e.g. E-tendering, 2003). With this brief sketch of the readiness of the local environment offered, the next section explores via case scenarios how the local construction industry is reacting to this opportunity. This exploration follows the brief presentation of the applied research methodology.

CASE STUDIES OF VIRTUAL APPLICATIONS IN HONG KONG

Research Methodology

The following is a brief description of the applied research methodology (see also Figure 1 below for an overview of activities). The selection of the cases were done via purposive sampling. The sources for data collection were through semi-structured in-depth interviews, observations, and documents (digital or hard copy). Interview data collection included notes taking and speech recording, and the respondents were given another opportunity to verify any transcribed information. The respondents included chief information officers, directors (in most cases responsible for the operation of the information and technology section of the firms), company chairmen, contracts managers, associate partners, and other suitably qualified persons relevant to this study. A set of questions were prepared to guide the specific themes for the research across the varied cases, and they were inclusively aimed at gathering information on the following:

- The preliminary background information on the case company;
- The extent of leverage of the virtual concept in the firm and any typical major leverage of the concept;
- Any typical challenges and successes/improvement via leverage of the concept in value delivery in the local Hong Kong context; and any lessons learnt.

Case Presentation

The presentation of the cases (1, 2, and 3) will be done as follows:

- First, the description of the background information of the cases involved.
- Second, descriptions of any major usage of the concept.
- Third, improvements and challenges attained via the concept.
- Fourth, the lessons learnt (intra case observations, etc).
- Fifth, cross-cases analysis and discussions, before the conclusions.

Case 1

Case 1 has its headquarters in Hong Kong, and also maintains other international branches (in mainly Asia). This company has an average annual turnover of about 1 billon dollars (US). The company transformed itself through the leverage of an ICT system to enable collaborative value delivery, both within and without of the company's operations virtually. This ICT system links all relevant partners and key actors in the company's value chain for value delivery. Prior to the adoption of this system the company faced the major problem of certainty and visibility within its communication and task delivery processes. For example, top management could barely see the estimating processes and only had to append their signatures to the final tender products; also not all activities including those at varied construction project sites numbering about 60 could be easily visible and accessible to all relevant staff in real time. Further to this the activities and transactions with subcontractors, and other key partners were not only invisible and uncertain, but also involved paperwork and other traditional bottlenecks.

The adoption of the virtual concept introduced the following striking inclusive operational strengths into the value delivery system of the company:

- The electronic aggregation of clustered material and other requests from all projects, to provide the opportunity for bulk purchases, and hence lower costs to improve on net profits.
- Leverage of electronic communication to support concrete production (at the concrete batching plant), transport and delivery to the respective construction sites. Various construction sites communicate their daily demands to the concrete production plant, then via the company's electronic integration with suppliers of relevant material inputs (i.e. cement, aggregates, sand), material requests are fulfilled and paid based on consumption. This leads to the reduction of storage and hence the opportunity to access any associated savings thereof. Further, via the leverage of global positioning systems (GPS), all trucks are scheduled to arrive 'just-in-time' at the concrete batching plant; truck locations are monitored and concrete setting times regularly evaluated for optimization of concrete delivery at placing locations.
- The ability for top management and all key people to track the status of all invoices and payments due, and know in real time any accountable entity.
- Massive savings and improvements in information storage, retrieval and value adding. For example, there are saving in terms of physical space for the following documents (i.e. drawings and pieces of paper) given in terms of total number which may vary in specific time periods relative to projects at hand:
  - Small projects — 8000.
  - Large projects — 35,000 to 50,000.
  - Certain very large projects — about 100,000.

Other pursued opportunities include the integration of the company's electronic systems with those of key suppliers (e.g. fuel) to both generate invoices and also effect payment electronically for obvious savings.

Aside the presented applications of the concept, some challenges encountered by the company include: occasional errors and computer bugs. Although, computer networks security was not much of a problem due to the installation of security systems (firewalls and intrusion detectors) extra consideration has been given this via the adoption of three levels of security to enable the detection and tracing of any intrusions.

Case 1: Intra-Case Observations

The above case demonstrates that a well thought of adoption of the virtual concept within a company's value delivery chain or network could have significant impact upon value creation. Aside efficiency and cost avoidance or savings, such an environment enables openness, certainty, visibility for the various activities, and could also foster learning and proactive risk planning via dealing with potential bottlenecks, which otherwise may be difficult to see in non-visible activities across the value delivery chain. Identified benefits like improved efficiency, cost avoidance, quality of documentation, compare favorable with certain empirical studies in IT leverage in construction (see e.g. Rivard, 2000). This however contrast Arif and Karam's (2001) work which suggested the lack of conviction in the actual reduction of costs in IT use among surveyed architectural practices in South Africa.

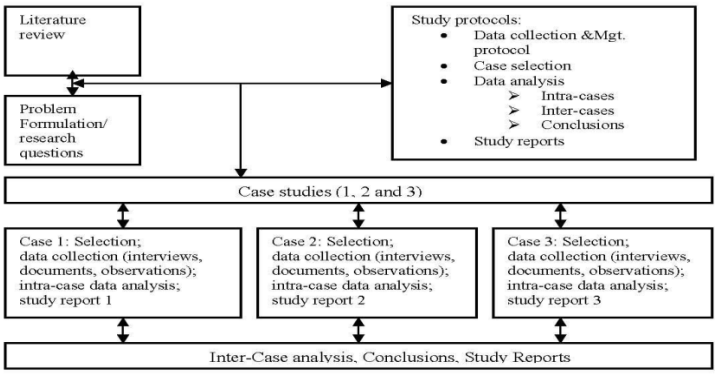
Despite the discussed potential gains, reliance on such concepts may have potential risks (with dire consequences) should the ICT systems fail to deliver. For example computer bugs and errors (as cited above) and security breaches, could affect transactions and multiply errors in critical information supplied and also lead to stolen data across the whole value delivery network. Further, the nature of physical construction activities also calls for caution against radical virtualization. Hence to enhance sustained value delivery, comprehensive risk management must be leveraged to support availed opportunities of the concept.

Cases 2 and 3

This section offers somehow contrasting cases to that of Case 1 in the adoption of the virtual concept in the value delivery systems. Cases 2 and 3 are consultancy and construction firms respectively. They are both international firms with local presence in Hong Kong. The annual turnover of Case 2 is about 272 million dollars (US) and the company handles 7.24 billion dollars (US) worth of construction works annually. This company attempted on three occasions and failed to introduce virtual operations in Hong Kong via the adaptation of the company's world-wide policy of adopting a specific project website platform on projects.

However, the adoption of the concept within its own work environment appears to be succeeding. It links the value creation cycle via the computer networks within the company to deliver varied consultancy

Figure 1. Brief Illustration of Research Activities



value added solutions to its clients. As an international firm with presence in about 20 countries, the potential strengths lie in the in-sourcing of critical staff for specific jobs which the company may not have local capacity for; in addition to attaining time gains via linking and executing activities between the local office in the east (Hong Kong) and say other offices in the west to take advantage of time zone differences.

Case 3 is also the construction arm of an international conglomerate, with annual turnover for the local group in Hong Kong being 500 million HK Dollars (64.25 US million dollars). The expertise of the company covers marine engineering and other fields, and the company has experience in areas like seawall construction, reclamation, breakwater construction, submarine drainage works, dredging, port repairs and maintenance, roads and other drainage works. Although this company currently uses applications like emails, intranets, internet and extranets etc. this is used for 'limited' communication purposes. With a mainly homogeneous workforce of local people and a small expatriate staff, this company also attempted to apply a company-wide policy of adopting the virtual systems for project management and other applications like purchasing, accounting etc, but also failed.

The key question then is why did Cases 2 and 3 fail in their bid to adapt the virtual systems of operations. The following are some of the reasons and observations made. First the intra-case observations are presented, before the overall cross-case analysis are made.

Case 2: Intra-Case Reasons and Observations

Reasons assigned by various project participants for the preference for the traditional systems of communication and project management over virtual tools were mainly due to resistance to change. Lessons learnt by participants include the following:

- Management staff in the local industry may be thinly spread over a number of multiple projects and may move from one site to the other, instead of single management focus per single project as it may be in other places.
- The multiple-layers of subcontracting practice in the local industry. This complex subcontracting structure complicates matters in that as one goes further down the supply chain, ICT usage may be completely non-existent. Further, the layers of 'sub-sub-contractors' who may not have any contact with the client take their instructions from their immediate employers (i.e. sub-contractors). This is one key issue which the company is now trying to deal with.
- The nature of certain types of construction information may generally be difficult to fit them unto say A4 sheets. This may make information dissemination uneasy, as people still prefer to work with two instead of three dimensional paper-based information at site.

The above reasons contrast the gains for virtual leverage within the firm. It appears the within firm acceptance, alignment and context, differ much with the scenario of inter-firm leverage, where for example encountered multiple layers of sub-contracting make control and leverage different. This therefore requires different approaches and this is under review.

Case 3: Intra-Case Reasons and Observations

The following were some of the assigned reasons:

This system failed since the adopted software was not compatible with the existing systems of working and allied tools. The choice was made due to the lack of many competing alternatives to choose from within the local ICT software market. The adopted construction management system which was an American system was seen as inappropriate for the local Hong Kong environment, and it was also an uncommon system. It took quite sometime to adopt the system into the existing systems of work and they tried it for several months before giving up on it.

Cross-Case Analysis (1,2 and 3)

The potential benefits in Case 1 are obvious. The ability of this company in integrating the value chain via virtual means may be due to the following:

the types of companies it is dealing with along the supply chain, and its potential ability to leverage its power or influence over key suppliers; the buy-in from the various parties; better initial knowledge of the local construction environment. There may however be other issues like the approach to the introduction of the technology, leadership through action and example by various top management staff as exhibited, better planning etc.

On the other hand, one issue runs through both Cases (i.e. 2 and 3) and this is the international company-wide policies for adoption of particular technological solutions which might not suite the local environment. Other factors may be due to the non-critical consideration given to the dominant attitudes and work cultures of the industry in Hong Kong to such technology; the suitability of how the new concept fits easily into existing entrenched ways of operation relative to the type and nature of firms which are dealt with. For example, one key problem for consideration is how to deal with the multiple layers of 'sub sub-contracting' latently embedded in the value chain, as some of the latent actors may even not be technology literates, or cannot afford the costs and maintenance of evolving technology, and this makes software and

hardware compatibility another key issue. Solutions may have to be adopted to deal with such scenarios, via say clients (who may need this systems) paying for them in the contract for eventual transfer and ownership after the project (i.e. should they be then relevant due to say the length of the job involved). There is definitely a cost or sacrifice for quality in any case.

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CONCLUSION

Empirical cases which depicted the scenarios of both successful and failed attempts to adopt the virtual concept in construction value delivery were presented and analyzed in this paper. Whilst there seems to be potential benefits to be obtained from the concept, there may however be some critical issues to consider in the adoption and operation of the concept. One of the main issues may be the need to study particular local work culture and attitudes, and tailor systems to those needs instead of just the choice of generic solutions and implementation methods which might have succeeded elsewhere to such scenarios. Others may be the general access to technology, the informal work attitudes and compatibility of applied technology. Further, the nature of works and types of intensive information used in the construction industry instigates caution on the radical extremes of the application of such concepts, and comprehensive risk and change management is necessary to sustain the potential benefits of the concept.

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