35 E-COMMERCE AND VALUE CHAIN MANAGEMENT – THE PROSPECTS AND CHALLENGES FOR THE SOUTH AFRICAN CONSTRUCTION INDUSTRY

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Abstract

The utilization of e-commerce in business has been the subject of widespread and continued debate in recent years. The growth of e-commerce has been phenomenal and it is radically transforming the way companies are doing business in all sectors, and the construction industry is no exception. Value chain management is an important concept in construction as it encompasses the activities that involve the transformation of inputs into outputs and the management of projects from development to final commissioning in order to maximize the value of a project.

This paper looks at the potential applications of e-commerce in the South African construction industry with particular emphasis on their impact on value management as a component of value chain management. The potential applications to be reviewed are the development of electronic tendering procedures; electronic systems for the exchange of information on an ongoing project; and the electronic buying and selling of goods and services for utilization in the construction process. E-commerce applications will invariably play an important role in enhancing the management of the value chain through improvements in the overall process.

Although e-commerce offers tremendous opportunities to the South African construction industry, these opportunities are not without challenges. This paper also highlights these challenges which include the issue of how to create an enabling environment to allow Small Medium and Micro Enterprises (SMMEs) to reap the potential benefits that e-commerce has to offer; security, taxation, legal barriers, accessibility and technical standardization of e-commerce systems.

Keywords: *e-commerce, value management, value engineering.*

INTRODUCTION

The global economy has changed dramatically from an industrial society to an information society. Several information and communication technologies (ICTs) have been developed in the marketplace and these ICTs have presented numerous opportunities and challenges for both developed and developing countries. The Internet is an important information technology that has developed over the years and it is transforming the manner in which several companies conduct their business activities and it has enabled the evolution of electronic commerce (e-commerce). The benefits of e-commerce are several:- consumers are able to purchase goods online; professional services for example financial services can also be accessed online; time-savings; the opportunity to participate in a global marketplace unrestricted by geographical barriers or boundaries; accessibility to information improving the competitiveness of firms, levelling the playing field and leading to improved customer service and satisfaction.

Despite these advances in information and communication technologies, the construction industry has not maximally embraced these opportunities offered for improvement of construction processes. There is continued inability of the construction industry to satisfy its clients (Austin and Thomson, 1999; Rwelamila, 2000) and time, cost and quality overruns are continuously occurring in projects. In order to deal with these problems, it is important to focus on the value of the project throughout the project life cycle and this is possible through value management.

Value management is an important aspect because if implemented successfully, it entails establishing the client's requirements in order to provide the best possible solution and achieve value for money and it can assist in alleviating some of the problems mentioned in the preceding paragraph.

It is suggested that the use of ICT's such as e-commerce can have important implications for the construction industry, in terms of improving the value management processes within the project life cycle, with a view to enabling optimum value for money to be attained within the project.

E-COMMERCE IN CONSTRUCTION

The three main areas of application of e-commerce within the construction industry are project information exchange, e-trading and e-tendering (Construct IT, 2000).

- **Project information exchange** deals with the electronic exchange of documents. Several documents can be exchanged electronically, for example, drawings, architects instructions and notices.

- **E-trading** deals with electronic buying and selling of goods and services. Sellers can have their own websites with their products and e-trading allows companies to continuously update their products and prices.

- **E-tendering** deals with the electronic preparation and exchange of tender documents (for example bills of quantities, drawings and related tender documentation).

Due to the proliferation of numerous definitions of e-commerce and related topics, a few working definitions are provided hereafter in order to provide a common understanding of the terminologies used in this paper.

Electronic commerce

For purposes of this paper, the term e-commerce is considered synonymous with the term e-business. Construct IT (2000) have defined e-business as "the use of electronic means for the conduct of business, not only for buying and selling but also for servicing customers and collaborating with business partners".

Low and Antwi (2000) provide an extra dimension into the above definition that goes beyond commercial activities by citing the potential use of e-commerce in organizational management. They cite the definition of e-commerce adopted by the Organisation for Economic Co-operation and Development as follows: "E-commerce is the electronic exchange of information that support and govern commercial activities including organizational management, commercial negotiations and contracts, legal and regulatory frameworks, financial settlement arrangements and taxation."

The second definition is adopted in this paper because of the additional emphasis it presents on the impact on organizational management and thereby proving a more holistic picture of e-commerce and the context of its application within the construction industry.

It is also important to take cognizance of the different types of e-commerce namely, business-to-business; business-to-consumer; government-to-business and government-to-consumer as illustrated in Figure 1.

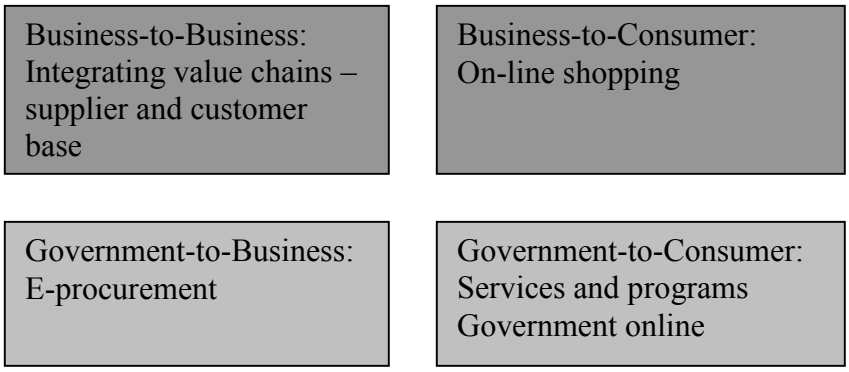

Figure 1: Different types of E-commerce
Source: Republic of South Africa – Department of Communications (2000)

VALUE MANAGEMENT AND VALUE ENGINEERING IN CONSTRUCTION

Value management is a service which seeks to illustrate a client's requirements explicitly through utilizing functional and problem solving tools. The importance of properly illustrating the client's requirements cannot be overemphasized. Hogg (1999) in a detailed discussion on value management reports that the RICS (1995) argues that value management must be undertaken as part of the process of establishing the client's business case to ensure that the project addresses real needs and adds value and better ways of providing the same performance, at lower cost, should be pursued – alternatives should always be considered – value engineering should be an automatic part of every project and not an option.

The following paragraphs illustrate the difference between value management and value engineering.

Value management

This paper adopts the definition presented by Fong *et al.* (1998) and Green and Popper (1990) who concur that the most precise definition of value management is given by the Society of American Value Engineers (SAVE) as "the systematic application of recognized techniques which identify the function of a product or service, establish a monetary value for that function, and provide the necessary function reliably at the lowest overall cost."

Value Engineering

Value engineering is the value techniques applied during the design or 'engineering' phases of a project (Fong *et al.*, 1998).

How are value management and value engineering implemented?

In order to understand the potential application of e-commerce in value management, this paper reviews the issues involved in implementing value management. It has been widely acknowledged by several authors (Fong *et al*., 1998; Kelly, J. and Male, S., 1993; Rwelamila, 2000) that value management begins with the job plan.

Fong *et al*. (1998) argue that generally there are five distinct phases to the value management job plan namely:- information phase; speculation phase; evaluation phase; development phase and presentation phase.

In this section, these phases will not be described in detail but instead they will be described in the section of this paper that deals with the linkage between value management, value engineering and e-commerce.

Figure 1 illustrates the various stages in the project life cycle where value management and value engineering are implemented.

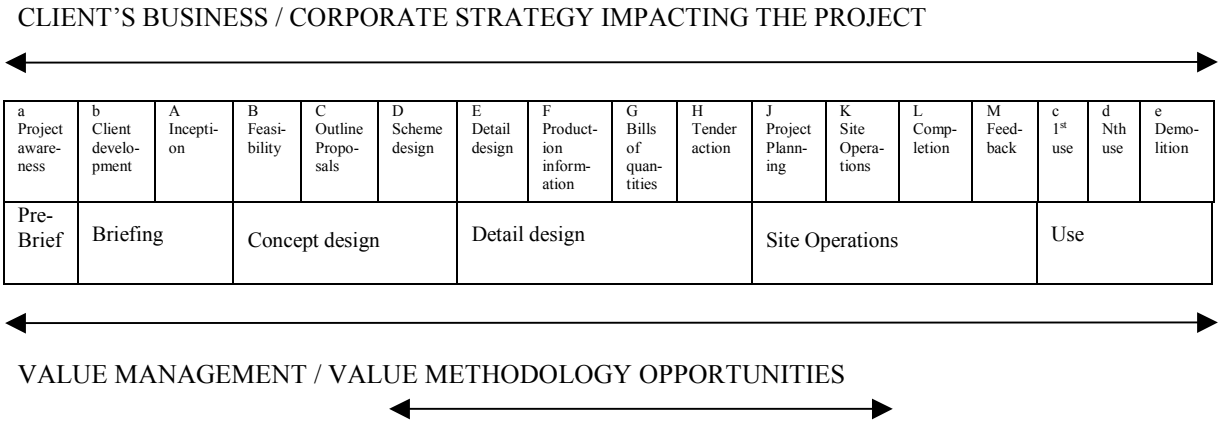

Figure 2: Value Management in Client's Business
Source: Kelly and Male (1999)

Value management is implemented throughout the whole project life cycle whereas value engineering is implemented from scheme design until site operations.

OPPORTUNITIES FOR E-COMMERCE IN VALUE MANAGEMENT AND VALUE ENGINEERING

This paper suggests that e-commerce can be instrumental in improving value management and value engineering in the project life cycle. In order to look at the potential applications of e-commerce in the value chain, each phase of the value chain will be looked at and the potential application of e-commerce will be assessed.

- **Information phase**

The main objective of this phase is to identify the areas within the building design that offer the greatest potential for the elimination of unnecessary cost (Green and Popper, 1990). This phase seeks to identify the client's requirements and establish which elements incur the most cost.

E-commerce can be applied to improve performance and add value in this phase. For example, if there is a system for project information exchange, the designers and estimators can speedily exchange documents and establish which building element is most costly. With electronic project information exchange documents can be exchanged accurately and in a timely manner and thereby reducing the costs of physically exchanging the documents.

- **Speculation phase**

After establishing the key project parameters, in the information phase, this phase seeks to identify the alternative approaches capable of improving efficiency of the design. In this phase, through electronic project information exchange, documents can be stored and archived, project information can be readily integrated enabling availability of information to allow the quick generation of alternatives. E-trading can also be utilized in this phase to analyse cost/price alternatives and to assess the availability of materials online.

- **Evaluation phase**

During this phase, ideas generated in the speculation phase are evaluated and examined in terms of their feasibility and cost (Fong *et al.*, 1998). In a similar way as applied in the speculation phase, e-trading can be utilized to analyse cost alternatives and materials availability.

- **Development phase**

The approach selected during the evaluation phase will be fully developed into implementation in this phase. Fong *et al.* (1998) state that the alternatives are carefully examined in terms of technical durability, buildability, initial cost implications, replacement costs, annual costs and also the life cycle costs. Furthermore, the value management team can apply computerized cost models, life-cycle cost analysis or energy use modelling to assist the estimation of each alternative.

E-commerce would also be an important aspect in this phase through electronic project information exchange. This system would provide the ability to quickly cross-reference other correspondence when examining the alternatives.

- **Presentation phase**

The aim of this phase is to present the selected alternatives to the project stakeholders and/or decision-maker. Green and Popper (1990) argue that this is the most important stage as a failure to communicate the merits of the proposal could well result in a 'roadblock' response from the initial design team.

Once again the electronic project information exchange systems could be useful in this phase. Firstly, these systems can allow the provision of integrated project information to the stakeholders to enable the information to be available holistically and not in a fragmented manner. Secondly, there are reduced costs in distributing the information electronically. Thirdly, it also allows the value management team the opportunity to check with other previous correspondence that may be stored as documents within the system and ensure that the information they are providing is accurate.

Value engineering and e-commerce

E-commerce has several possible areas of application in the value engineering phases. From scheme design to site operations, e-commerce can be applied in a variety of ways.

- In the tender action stage - H (see figure 2), e-tendering opportunities exist. Government to business e-commerce (see Figure 1) can occur at this stage. There is a need to improve the processes in this stage in order to improve value for money in the subsequent stages of the process. The need to secure the tender that offers best value of money is of paramount importance to the whole construction process. The traditional means of tendering have certain disadvantages:
  - they can be costly to the client and to the prospective tenderers due to the volume of the tenders.
  - to the client, there is the additional problem of how to manage the tenders received and how to communicate any changes in the tender documentation to the prospective tenderers.
- The electronic exchange of tender documents can improve this process of tender, preparation, selection and evaluation significantly. Prospective tenderers can receive tenders online and they in turn can source for sub-tenders possibly in the form of subcomponents such as subcontractors and materials before submitting their final tenders to the client. All these opportunities present potential cost and time saving benefits and improved tender management of the tendering process.
- In the site operations stage - K (see figure 2), the opportunity for electronic buying and selling of goods exists. This can take the form of business-to business e-commerce and business-to-consumer e-commerce (see figure 1). This would allow contractors to request for quotations online and consequently evaluate them online. Electronic catalogues and online auctions are important components of this electronic buying and selling of goods and services. The implication of electronic buying and selling is that both buyers and sellers would have access to wider markets that would not have been easily accessible without electronic means. In effect, this should improve the competitiveness of the markets and ensure that the client receives best value for money.

It is important to note that these two aspects - e-tendering and e-trading, have distinct benefits for Small Medium and Micro and Enterprises (SMME's) in South Africa because it allows them to have the same access to information as large companies thereby improving the competitiveness of these SMME's.

CHALLENGES IN IMPLEMENTING E-COMMERCE IN SOUTH AFRICA

Despite the probable applications of e-commerce in value management and value engineering processes mentioned in the preceding section, there are several challenges to be faced in the development and implementation of e-commerce systems in South Africa.

- **Security**

In terms of security, one of the main areas that needs to be addressed is that of signatures. There are no regulations or standards governing what constitutes a valid signature in the e-commerce environment. The issue of the validity of electronic signatures requires urgent attention before e-commerce can take place between different parties.

- **User acceptance**

Lack of trust in technology can present a problem as well as lack of knowledge amongst both the buyers and sellers. Resistance to use new technology can also be an issue.

- **Accessibility issues**

There is limited accessibility to e-commerce systems in South Africa due to lack of access to computers, prices charged for access coupled with upgrading costs. These are prohibitive factors in most developing nations. In South Africa there is also increasing emphasis on the need to create an enabling environment to allow SMMEs to participate in this electronic marketplace. The challenge is not only to make it accessible but also how to make it affordable for the entrepreneurs in the SMME sector.

- **Low levels of computer literacy**

There are low level of understanding of information technology in South African construction industry and this presents a problem. Computer literacy is absolutely essential if e-commerce systems are to be implemented and utilized effectively.

- **Low bandwidth**

In South Africa, bandwidth is one of the main problems hindering the uptake of e-commerce. Leased lines have a higher bandwidth but are very expensive especially for the SMMEs.

- **Lack of technical standardization**

Several program languages and program interfaces exist in the marketplace and this presents a barrier.

- **Legal barriers**

If e-commerce is to be implemented for construction contracts not only within South Africa but globally there are legal challenges that will be encountered. Different countries have different legal systems and this could present a problem when trying to enforce contracts in different countries.

- **Taxation**

The use of the internet for trading presents a situation whereby there could be difficulty in defining jurisdictions because of the lack of clear geographical boundaries. The problem of administration and enforcement of taxation can also arise (Republic of South Africa - Department of Communications, 2000).

CONCLUSION

This paper has highlighted that the use of e-commerce systems can have distinct areas of application in the value management and value engineering process thereby providing improvements and adding value to the client. However, despite evidence to suggest that e-commerce in construction would have these benefits, there are still low levels of adoption of the use of electronic networks in construction. Lack of infrastructure, prohibitive costs of access to infrastructure where it is available, poor quality of infrastructure, shortage of relevant skills, low levels of literacy and inadequate investment in technological development are hindering progress toward exploiting the new generation of ICTs in developing countries (Republic of South Africa - Department of Communications, 2000).

RECOMMENDATIONS

It is important to note that e-commerce is still in its embryonic stages and the challenges mentioned in this paper are not steadfast. The current status quo can be improved through government intervention to ensure that the existing legislation is adapted to enable e-commerce transactions to be legally enforceable.

In order for South Africa to be competitive in the global arena, the infrastructure must be in place to allow for the development of a trading environment and taxation policies that are acceptable internationally but at the same time considering the local conditions and requirements. Improvements in education and information dissemination on e-commerce are also imperative and these will serve the role of both education and *building confidence* in electronic commerce. In South Africa, a Green Paper on e-commerce was launched in the year 2000 and the White Paper will be launched in the year 2001.

In addition to the above improvements, it is crucial to note that the ultimate responsibility rests on the construction industry to embrace these opportunities offered by e-commerce and utilize them to improve value for their clients and avoid “lagging behind” in this rapidly changing information society.

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