Automation in Construction 18 (2009) 875–880

Contents lists available at ScienceDirect

Automation in Construction

journal homepage: www.elsevier.com/locate/autcon

Crucial tactical variables for value delivery in virtual projects

O.K.B. Barima [1]

Department of Real State and Construction, University of Hong Kong, Hong Kong

ARTICLE INFO

Article history:
Accepted 24 March 2009

Keywords:
Critical variables
Project delivery
Tactical issues
Triangulation
Virtual model
Value delivery

ABSTRACT

The use of the progressively, important virtual model in project delivery is currently not well understood. This study fills part of this gap, by examining the critical, tactical elements which can enhance value delivery in projects supported by the virtual model. The research used triangulated research methods to examine the topic. Initial data from qualitative semi-structured interviews (supported by desk studies) were examined further via quantitative survey studies. Triangulated statistical analysis was used to provide deeper understanding of the empirical data. The results were then examined by experts to illuminate the findings of the study. The research found critical, tactical issues under selection, technology leverage and associated factors, training and continuous development, trust, shared understanding, and integration and systemic alignment as elements which require attention in virtual project value delivery. The integrated perspective which accounts for all the key elements in value delivery is recommended to support research and practice.

1. Introduction

The examination of critical success factors (CSF) in project delivery forms one significant body of knowledge, in the project management literature [1]. The CSF concept often seeks to examine the few critical items which can enhance the probability of success in projects [1–4]. Hence, the CSF concept is based on the assumption that identifying and managing certain, key factors in project delivery can improve the likelihood of attaining success in projects.

As a potentially, useful concept, the examination of critical variables in project delivery has focused (overly) on 'success in projects' [e.g.,1,2]. However, since achieving success in projects may not necessarily result in value delivery, it is important for scholars to give attention to other important, dependent constructs like value in projects. Further, the focus of most published studies has been on traditional, physical project delivery [e.g. 2,3]. Little attention has also been given to examining the critical issues in the use of recent technologies like the virtual concept, where actors in projects rely on information and communication technology(ICT) tools to operate independent of time and location to deliver value[5,10]. This latter gap in the literature is however not surprising, since the virtual model is a relatively, new phenomenon.

This study fills part of the identified gaps in the literature. The study achieves this by examining the critical issues (at the tactical level) in the use of the virtual model for value delivery in construction projects. The research adds to the literature by highlighting from an empirical, triangulated perspective the issues which require attention in value delivery in virtual projects. In practical terms, the revelations of this research can guide project and construction managers in the tactical design and deployment of virtual projects. Also the study shows the use of triangulated research methods and data analysis to examine the critical variables concept. The research also gives fresh empirical evidence to the literature in this research domain.

Before a map of the paper is presented, it will be appropriate to define certain key terms in the paper. In this study the virtual concept entails the use of modern ICT tools by construction actors (who maintain less physical presence) to operate independent of time and space to provide common goals [5]. Also value which can be a potentially complex construct is defined as the project end delivery attributes often attained via efficient processes and effective results delivery. Crucial tactical variables also refer to certain few, key items which can enhance the delivery of value in virtual projects at the tactical level.

The layout of the paper is as follows. First, existing literature on the topic is examined. Then the research methodology used in the study is given. This is followed by the presentation of the study's results and analysis. The paper concludes with a synthesis of the key, examined issues and the implications of this research.

2. Literature review

2.1. Virtual model in construction projects

The impact of modern ICT tools (e.g. internet) on business in recent times requires no further elaboration. Key ICT tools such as the internet, intranet, and extranets have provided businesses (including those in the construction industry) with the opportunity to overcome time and space constraints in value delivery [5,10]. For example, dispersed parties in construction projects can now collaborate

E-mail address: obarima7@gmail.com.
[1] Address: Box 23024, A.N.T, Kumasi, Ghana.

0926-5805/$ – see front matter © 2009 Elsevier B.V. All rights reserved.
doi:10.1016/j.autcon.2009.03.014

irrespective of location or time constraints to attain common goals, via the use of the virtual concept [5].

There can be several benefits through the use of the virtual model in construction projects. These include the opportunity to leverage time zone differences across continents to provide a seamless, 24 hour value delivery cycle, for potential savings in time and travel costs [5,6]. Modern ICT tools relied on by virtual actors (e.g. internet) can also give ready access to massive information at relatively cheaper cost, than the traditional methods of communication [6]. Thus, the virtual model provides a strong case for efficient value delivery in construction projects.

However, despite the potential benefits actors who use the virtual model in construction project delivery can also face potential challenges. For example, most construction project products and deliverables do require rich physical presence (e.g. tactical supervision) for value delivery. Also the construction industry is characterized by adversarial tendencies in most local, physical, geographic places [e.g., 7]. Needless to say, how can geographically, dispersed, adversarial parties be expected to effectively create and deliver value? Hence, it is important to examine and enhance understanding on the issues which can be critical in the use of the virtual concept for value delivery in construction projects. This need becomes imperative given the potential of the virtual model to become a base technology in construction project delivery in the near future.

However, extant studies on the virtual concept in relevant literature have mainly focused on software design, and the perfection of tactical tools [e.g., 8,9]. For example, Waly and Thabet [8] examined the use of virtual planning tools (in virtual construction environment) to support tests of varied execution strategies prior to the actual commencement of construction works. Alves and Bártolo [9] also recently proposed a system to support the prompt and precise generation of 3D computer models from existing big objects to enhance task delivery in virtual and physical construction. Thus, with a few exceptions [e.g. 10], studies on the use of the virtual concept in construction project value delivery has not been accorded much deserved attention. This study examines (at the tactical level) what issues are critical in the use of the virtual concept for value delivery in construction projects.

2.2. Critical variables research

Research focused on the examination of critical variables in projects has attained a lot of attention in extant literature over the years [e.g., 2,3,11,12]. However the focus of most studies has been on the crucial issues which can give success in projects [1].

A number of propositions have been given on how to achieve success in projects in the literature [2,3]. However, these propositions have also attracted criticisms. Scholars have over the past two decades criticized the lack of adequate, empirical evidence to support extant claims and prescriptions for project success [13–15].

Another main criticism against research in the CSF domain is the lack of structured guidance on what can be considered as critical in project delivery. For example, the structured classification of variables into strategic and tactical issues [16], macro and micro issues [13,16], are some of the ways which can give beneficial guidance to enhance dissemination of results. This contrast the scenario where critical variables are given as an unstructured list of issues [e.g.13,16], where say, strategic and tactical issues are bundled together.

Other research gaps (on critical variables) in the literature include the following. The lack of attention to the use of triangulated methods and data analysis. The use of such triangulated lenses can plausibly, enhance claims on issues proposed to be critical in project delivery. Most studies have also focused on traditional physical projects [e.g. 2,3]. More studies are required to enhance comprehension in less understood research domains, like the use of novel technologies (e.g. virtual model) in construction project delivery.

This research differs from most extant studies in the following ways. First, the study examines the critical, tactical issues which can enhance value delivery via the use of the novel virtual model in construction project delivery. This research therefore shifts the emphasis from the dependent construct of 'success' to that of 'value in projects.' The research adds further value (by doing this) through the lens of virtual projects instead of traditional projects. Second, this study emphasizes triangulation (in data collection and analysis) to give an enhanced perspective on the subject. Thus, apart from providing empirical evidence to support the findings in this study, the research also enhances this contribution by giving triangulated, robust perspective.

3. Research methodology

3.1. Data collection and sampling

A triangulated method was used to examine the constructs in the study. Thorough literature review and initial semi-structured interviews with 29 professionals in Hong Kong were used to collect data, and also sharpen the constructs of the study for further examination. Following Patton [22], purposive/theoretical sampling was used to select the respondents for the semi-structured interviews. This approach was adopted to ensure that respondents with adequate knowledge and experience of the phenomenon were selected for the study. Theoretical saturation guided the further choice of respondents, and this was attained after 29 one-on-one interviews were done.

To guard against bias, upfront theories, preconceptions, and values were as far as possible not allowed to influence the qualitative inquiry. Empathic neutrality was also maintained throughout the study. Also the use of triangulated questions, and respondents with varied backgrounds from middle to senior management level enriched the data. Feedback from the respondents on the initial findings of the qualitative studies provided another means to strengthen accuracy and validity. Thus, the qualitative studies provided a good alternative source of data to extant literature in capturing information on the subject.

The thorough literature review and initial interviews yielded 398 tactical items. A series of pilot studies which combined both interviews and a questionnaire survey ($n=49$) were then used to refine the resulting constructs and their corresponding scales. The set of interviews (in this phase) comprised a review of the items by knowledgeable independent experts (8no) in one-on-one interviews; quasi-focus group interview ($n=5$). A set of statistical tools which included factor analysis, correlation and reliability tests were used in the pilot quantitative survey to refine the tactical items under their macro variables. These latter processes provided 116 tactical items grouped under 16 manifest, macro variables for further survey-based quantitative investigation. This study, however, focuses on the tactical issues examined in the main quantitative study.

Stratified random sampling was used to select the respondents for the main quantitative study. This approach was adopted to reduce errors. Respondents were chosen from the professional registers of the major construction oriented bodies in Hong Kong (available in the public domain). The questionnaire was administered via emails, faxes and postal mails. To ensure quality of the study, only respondents with thorough knowledge of the subject were solicited.

The questionnaire comprised 5 sections. The first section provided information on the objectives of the study, definition of key terms and instructions for answering the questions. The second section concerned the main questions of the survey. The third section focused on collecting demographic data of the respondents. The fourth section gave the opportunity to respondents to give comments and opinions on the study. The last section stated all the addresses for correspondence as well as an offer of a copy of the study.