ENHANCING CONSTRUCTION VALUE CHAIN EFFECTIVENESS IN HONG KONG

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Value Chain Management (VCM) is recognized as a contemporary concept that improves the organizational efficiency in construction by sustaining and enhancing the competitive advantages of all the participating firms in the production process. Nevertheless, competitive advantages were difficult to be enhanced or sustained unless effective strategies could be devised to save project cost and add project value. This paper reports a study that seeks to identify the value-creating activities in construction projects and to study their effectiveness to achieve cost-saving and value-adding. The results of a questionnaire survey conducted in Hong Kong suggested that all value-creating activities as identified in the previous literatures are effective to save cost and add value in the construction projects. In addition, 'Understanding clients' requirement' and 'Maintaining effective and sufficient communication route' were found as the most effective activity to achieve cost-saving and value-adding respectively.

Keywords: Value Chain Management, cost-saving, value-adding.

BACKGROUND

The first ever Hong Kong construction industry review conducted by the Construction Industry Review Committee pinpointed a number of problems concerning the inefficiency in terms of the collaboration among the local developers, consultants, contractors and the suppliers (CIRC 2001). These organizational inefficiencies were rooted from several problems, among others, including the lack of systematized information systems, poor communication routes and the lack of aligned project goals. (CIRC 2001). In fact, organizational inefficiencies in construction industries have no geographical boundaries (Egan 1998, Vrijhoef 1998, Lindfors 2002). In response to this, several management approaches, like the Total Quality Management, Benchmarking, Partnering and Supply Chain Management, were proposed (CII 1989, CIRC 2001, Al-Mudimigh *et al.* 2004). Among these concepts, Value Chain Management (VCM) has attracted great interest due to the multiplex of vendor-purchaser network in construction projects (Al-Mudimigh *et al.* 2004). Nevertheless, compared with the other management approaches, there exists little evidence to support the development of VCM by recognized theories or algorithms (Al-Mudimigh *et al.* 2004). This paper provides a boarder awareness of the application of VCM in construction context. In addition, it attempts to identify the value-creating activities and their respective effectiveness in view of the construction participants.

BENEFITS OFFERED BY THE VALUE CHAIN MANAGEMENT

VCM has been proved as a powerful strategic approach for companies to reconfigure their business (Normann and Ramirez 2000) through evaluating the end-users

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requirements, partners' core competences, as well as coordinating and integrating all value creating activities along the whole production process (Porter 1985, Lancaster and Walters 2000). As such, implementing VCM assists the companies to enhance their competitive advantage (Porter 1985, Kippenberger 1997), so as to minimize costs, maximize profits and market shares (Lancaster and Walters 1999).

Applying VCM concepts in construction has gained researchers' attention with the aim to enhance and sustain the competitive advantages for the entire industry. This is not only due to the encouragement from the government reports but also the anticipated benefits learnt from the other research fields. For example, in manufacturing industry, implementing VCM concepts assists the evaluation of project goals achievements as preset by the manufacturers (Cordova *et al.* 2002). It also helps to facilitate effective e-commerce systems in retailing (McGuffog and Wadsley 1999). Furthermore, successful cases like the resurrection of the business of Apple Computer by implementing the VCM concepts to reinvent traditional supply chain also enhanced the confidence of the construction practitioners on the application of VCM in construction (Bovet and Martha 2000).

The principles of VCM are suitable for different types of production processes to accrue benefits for the all organizations involved in their particular production lines (Al-Mudimigh *et al.* 2004). The benefits include assisting the organizations to:

- Identify their competences and their market place according to their strength and competitive abilities,
- Establish chains that save cost and create value and bring in end-user needs and wants,
- Create the customer focus by a continuous and uninterrupted relationships and information flow among the organizations and the end users,
- Develop the partnerships with suppliers and other stakeholders,
- Accrue cost advantage by focusing on value adding manner,
- Drive out cost through quality improvement and optimising activities,
- Be innovate, agile, responsive, flexible and cost effective to distinguish between various competitors, and
- Compete effectively through the management on the communication network and the information flows.

The success stories and the anticipated benefits prompted the construction researchers to investigate if benefits could be derived when VCM concepts are applied in construction projects. Nevertheless, there is a lack of evidences and theories developed to support that all these anticipated benefits of adopting VCM would be received if it was applied in construction projects (Al-Mudimigh *et al.* 2004). This makes the research study on VCM in construction difficult to be conducted since the research focus is hard to be clarified. Therefore, reviewing previous literatures of VCM is of great importance to identify the specific research focus on VCM in the construction context.

DEFINITIONS OF VCM

The notion of VCM was originated from Porter (1985). It was firstly defined as the strategies to enhance and / or sustain the competitive advantage of a company by

identifying and evaluating the functions and the inter-relationships among all activities involved in a production line (Porter 1985, Kippenberger 1997). Since then, VCM had become an explicit research area and was evolved to a broader view as shown in Figure 1.

Despite different interpretations were found from previous literatures, enhancing and sustaining competitive advantages was commonly regarded as key objectives of using VCM (IMA 1996). Thus, as summarized from the various definitions of VCM in Figure 1, VCM could generally be defined as a systematic approach to enhance and sustain the competitive advantages of all participating firms (from suppliers to the end-users) through four strategies; satisfying the needs of all participating firms and the end-users, evaluating the strengths and weaknesses of all firms within the production line, identifying all activities where they could generate value, and improving linkages and communication among all firms.

Furthermore, to evaluate the company's competitive advantages, the Institute of Management Accounts suggested all participating firms in the value chain to review their achievements on the low-cost strategies and differentiation strategies. If either type of the strategies were achieved, competitive advantages would be evaluated as enhanced and sustained (IMA 1996).

Indeed, Low-cost strategies refer to those measures applied to save the operational cost of the value chain. Differentiation strategies refer to those measures applied to evaluate the customers' perception in order to improve the existing or additional services to the customers. Thus, prices that the customers are willing to pay on the particular product or service would be increased (IMA 1996).

In sum, competitive advantages could be evaluated by the achievements of the strategies focusing on cost-saving and value-adding. In more tangible terms of Al-Mudimigh *et al.* (2004), value is created by reducing production cost and improving the product or services that increase the buyer's sense of its worth.

Figure 1: Evolution of the definitions of Value Chain Management

EVOLUTION OF VALUE CHAIN MANAGEMENT DEFINITIONS

	ENHANCING AND SUSTAINING COMEPETITIVE ADVANTAGES			
	Satisfying the needs of all participating firms and end-users	Evaluating the strengths and weaknesses of all firms within the production line	Identifying all activities where they could generate value	Improving linkages and communication among all firms
Porter (1985)	Basis for competitive advantage	Industry structure analysis, core competencies analysis, and segmentation analysis	Internal cost analysis, and internal differentiation analysis	Vertical linkage analysis
Govindarajan and Shank (1993)	Extended from immediate customer to the end-user		Value creating process include the whole industry, from raw material to operational product	
Geringer and O'Sullivan (1993)	To allow optimal use of resources	Identifying required and available resources & structure		Delivering the expected value to customer
Brown (1997)		Evaluating a firm's competitive scope as a source of competitive advantage		Performing strategically relevant activities more cheaply or better than competitors
Morrison and Slywotzky (1997)	Customer priorities are the first link to all that follow			

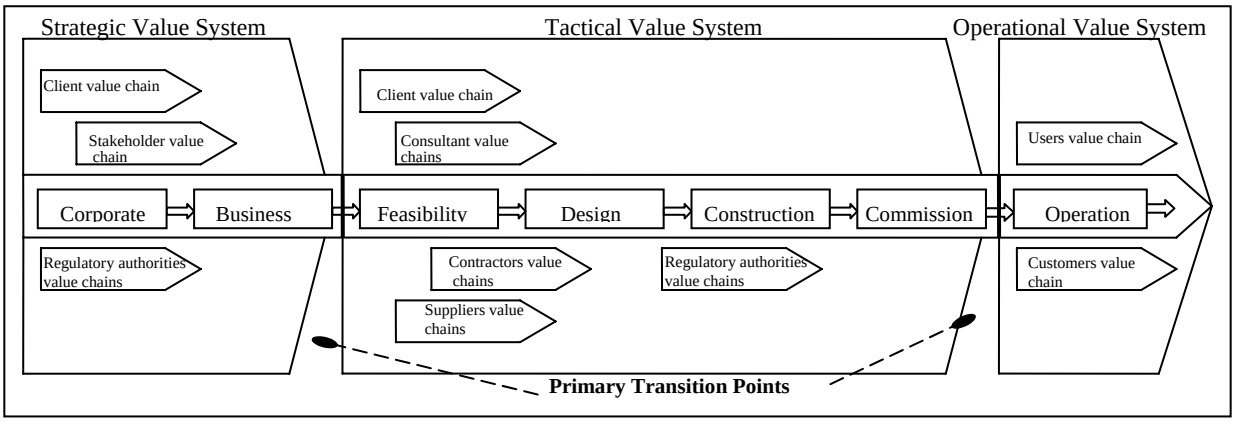
Lancaster and Walters (1999, 2000)	Both customer value and corporate value should be considered	The organization's relative position & distinctive competences determine the value proposition of the firm	Understanding customer benefits & cost together with organizational structure and knowledge help to produce and coordinate value	Necessary to create customer satisfaction & maintain long term relationship with customer. Emphasized on better communication and information management

VCM MODEL IN CONSTRUCTION

Kelly *et al.* (2002) and Smith (2002) adopted Porter's (1985) model and suggested VCM model in construction. This is as shown in Figure 2.

As illustrated in Figure 2, a construction project value chain could be divided into three distinct value systems namely the Strategic value system, Tactical value system and User value system. In each value system, there are different combinations of value chains of different organizations. The Strategic value system is concerned with a project to be constructed to meet a business or a social objective depending on the type of client. Usually a construction project is started from corporate level where the client would define the project missions and objectives. Then, several parties involved would strategically ally and work for the preset project missions and objectives (Kelly *et al.* 2002). The Tactical value system involves the processes at which the client effectively out-sources the project to the construction industry in the form of a technical project to meet that need. The problems then becomes one of ensuring the alliances of different organizational value chains involved in the project process to form a holistic value-driven project focused demand chain working for the benefits of the client (Kelly *et al.* 2002, Smith, 2002). The last phase is the Operational value system where the project hands over from the construction team to the client and ready for use. Operational value generated is depending on the satisfaction level of end user on taking over the end-product (Kelly *et al.* 2002).

Figure 2: VCM model in construction (modified from Smith, 2002)



VCM aims at optimizing project values by better management of the transition points along the project period. As such, Smith (2002) defined two types of transitions points namely Primary Transition Points and Secondary Transition Points in his conceptual VCM model in construction.

In a construction project value chain, there are two Primary Transition Points. The first one is between the Strategic and Tactical Value Systems. This describes the decision of the client to sanction the project to the construction industry (Dealing with Procurement system). The second one is between the Tactical and the Operational Value Systems. This describes the handover of the completed facility into the

operational domain (Dealing with the maintenance and marketing policies). Value could be optimized if the above mention transition points could be managed effectively.

The transition points describe how different value chains interact in the three value systems. Different organizations are involved in different stages along the construction project value chain. As such, value could be optimized if these organizations would work effectively sharing common project goals. On the other hand, discontinuity can occur as a result of the changes of values of the organizations involved (Smith 2002).

Hence to capitalize on the advantages offered by a value chain, it is necessary to identify value creation activities. In addition, the effectiveness of these activities to create value either through cost-saving and/ or value-adding should also be understood.

Pervious studies provide information on activities essential to achieve cost-saving and value-adding in different stages of the construction projects. These are summarized in Table 1.

The first research objective of this study is to investigate the effectiveness of the identified value-creating activities in construction in respect of achieving the cost-saving and value-adding purposes. This would assist the practitioners to decide a more effective strategy to facilitate VCM successfully. In addition, the effectiveness of the value-creating activities to achieve cost-saving and value-adding may post different levels for projects in different sizes and duration. Thus, the second research objective of this study is to investigate whether the above mentioned conditions would affect the effectiveness of the value-creating activities or not.

Table 1: Summary of the value-creating activities in construction

Value-creating activities	Citation
Understanding clients' requirement without confusion to reduce variations and abortive works ***(Understand clients' requirement)***	Porter (1985), Kelly *et al.* (2002)
Avoid using complicated or non-standardized designs and construction methods ***(Avoid using complicated designs and construction methods)***	Ditto
Considering the operation and maintenance cost before deciding the use of construction materials and its installation methods ***(Consider operation and maintenance cost before construction)***	Ditto
Applying tender pre-qualification to select capable contractors and/or suppliers ***(Apply tender pre-qualification)***	Kelly *et al.* (2002)
Selecting an appropriate procurement method to facilitate better contract and project management ***(Select appropriate procurement method)***	Wilkins (1999), Masterman (2002)
Facilitating better time management to meet the preset milestone date as stated in the programme ***(Facilitate better time management)***	Porter (1985), Kelly *et al.* (2002)
Making prompt decisions and giving prompt instructions ***(Make prompt decisions and give prompt instructions)***	Porter (1985), Kelly *et al.* (2002)
Maintaining effective and sufficient communication route among project team members to increase productivity and improve project performance ***(Maintain effective and sufficient communication route)***	Chen *et al.* (1999), Kelly *et al.* (2002)
Ensuring effective information flow to enhance mutual understanding on counter part's strengths and difficulties. ***(Ensure effective information flow)***	McGuffog & Wadsley (1999), Kelly *et al.* (2002)
Applying information technology for better communication among parties ***(Apply information technology)***	Ditto
Employing competent person to manage the project ***(Competent management)***	Ditto
Providing training and education to the project team members on modern management and construction techniques ***(Provide training and education)***	Ditto
Implementing incentive scheme to motivate project team members to improve productivity and quality ***(Implement incentive scheme)***	Porter (1985)
Implementing punishment scheme to ensure project team members to enhance productivity and quality ***(Implement punishment scheme)***	Ditto
Provide convenience product and offering better after-sale service like rapid response to defects. ***(Provide convenience product)***	Porter (1985),

DATA COLLECTION

Data for the study was collected through a postal questionnaire survey in Hong Kong. The questionnaire was designed after a review of the relevant published work concerning the value creating activities in construction. The framework of the questionnaire design consists of 2 parts; Part 1 - Personal information and Part 2 – The effectiveness of the value-creating activities to achieve cost-saving and value-adding purposes. Part 1 aims at soliciting information about the respondent including their working experiences, as well as particulars of the referenced project. Part 2 contains 15 questions, where each question was divided into two sub-questions. They are designed for revealing the effectiveness of the value-creating activities in respect to (i) save cost and (ii) add value. The 15 value creating activities enlisted in Table 1 became the questions asked in the questionnaires. Respondents were asked to provide their assessment of agreement on the seriousness of the obstacles on a 7 point Likert scale (totally disagree (1) to completely agree (7)).

As the successfulness of the VCM is highly dependent on the collaboration of all parties in a construction development, thus the target respondents of this survey included a mixed group of project team members. In this regard, questionnaires were sent to several developers', consultants' and contractors' firms. They were carefully selected from the web pages of the local professional institutes and the Hong Kong Builder Directory.

RESPONSE RATE

A total of 118 questionnaires were sent to private and public-sector developers, consultant firms and contractor firms. 54 replies were obtained representing a response rate of 45.8% (Table 2 refers).

Table 2: Questionnaire sent and received

	Sent (no.)	Received (no.)	% Received
Developers	6	3	50.0%
Consultants	62	28	45.2%
Contractors	50	23	46.0%
Total	118	54	45.8%

Both the return rate and sample size were considered reasonably good for this type of study. The return rate for similar studies in Supply Chain Management done by Lo and Yeung (2004) in Hong Kong was based on 30 responses.

FINDINGS

Relative importance ranking of the value-creating activities to achieve cost-saving and value-adding

Table 3 gives the mean scale ratings and rankings of the value-creating activities to achieve cost saving and value adding. It can be seen that the mean scale ratings for all 15 value-creating activities are higher than the mid-point score of 3.5 in a 7-point scale. This can be interpreted that, as a whole, the practitioners agreed that the above 15 activities are effective to achieve cost-saving and value-adding in their construction projects.

Table 3: Effectiveness of the value-creating activities to achieve cost-saving and value-adding

Value creating activities to achieve	Cost saving			Value adding		
	Mean	Std. Dev.	Rank	Mean	Std. Dev.	Rank
Understand clients' requirement	5.40	1.229	1	5.06	1.205	2

Facilitate better time management	5.14	0.939	2	4.81	1.065	9
Make prompt decisions and give prompt instructions	5.10	1.253	3	4.73	1.180	10
Select appropriate procurement method	4.96	0.979	4	4.81	1.024	8
Maintain effective and sufficient communication route	4.92	1.017	5	5.27	1.132	1
Avoid using complicated designs and construction methods	4.90	1.249	6	4.63	1.236	14
Consider operation and maintenance cost before construction	4.82	1.240	7	4.88	1.033	6
Competent Management	4.76	1.258	8	4.94	1.192	5
Ensure effective information flow	4.76	.916	9	4.98	1.145	3
Apply tender pre-qualification	4.47	1.309	10	4.96	1.160	4
Apply information technology	4.40	1.212	11	4.86	1.099	7
Provide convenience product	4.16	1.330	12	4.63	1.167	13
Implement incentive scheme	4.10	1.477	13	4.66	1.451	12
Provide training and education	4.06	1.265	14	4.72	1.386	11
Implement punishment scheme	3.82	1.466	15	3.75	1.631	15

Comparing by the effectiveness to achieve cost-saving, '*Understand clients' requirements*' ranked first (mean scale rating 5.40). Thus, this activity is considered by the respondents as the most effective one to achieve cost-saving in their particular construction projects. The next two on the list are '*Facilitate better time management*' (mean scale rating 5.14) and '*Make prompt decisions and give prompt instructions*' (mean scale rating 5.10). The results above indicated that activities relating to make early and prompt decisions to response to the clients' requirements are particularly important to achieve cost-saving in the construction projects. The findings are understandable since the above activities reduce the potential risks and uncertainties of the projects. Effective response to minimize risk has long been identified as one of the most effective way to save construction cost (Kelly *et al.* 2002). On the other hand, '*Implementing punishment scheme*' has a low mean scale rating (3.82). The result illustrates that this activity is less important in facilitating cost-saving compare with the rest of the activities. This echoes the previous study commented that punishment and win-lose philosophy were overwhelmed by the construction practitioners that may led to a contentious environment and lower down the project efficiency (CIRC 2001). Even if the punishment scheme was implemented, the amount of cost-saving is not guaranteed. Nevertheless, this may scarifies the harmonious relationships among the collaborating parties.

Comparing by the effectiveness to achieve value-adding, '*Maintain effective and sufficient communication*' and '*Understand clients' requirement*' have the highest mean scale ratings (5.27 and 5.06 respectively). Thus, they are considered by the respondents as the most effective to achieve value-adding in their particular construction projects. The result is compatible with Porter (1985) claiming that understanding end users requirements is the basic step for achieving value-adding. In this connection, continuous evaluation is of great importance to ensure that all project team members are working for fulfilling the client's requirements. This explains why maintaining effective and sufficient communication route is essential to achieve value-adding in views of the respondents. Similar with the findings as in cost saving aspect, *'Implementing punishment scheme'* ranked the least (3.75). This may because implementing punishment scheme discourage faithful collaboration among project team members. Preventing from punishment, project team members may hesitate to share innovative ideas or alternative construction methods even these may generate better values of the project.

Impact of project scales and duration on value-creating activities

According to the above results as shown in Table 3, the mean scale ratings ranged from 3.82 to 5.40 and from 3.75 to 5.27 in achieving cost-saving and value-adding in construction projects respectively. The close ranges of the mean scale ratings represented that the effectiveness of these activities in achieving cost-saving and value-adding in construction projects are considered to be close as perceived by the respondents.

Nevertheless, the effectiveness of value-creating activities may vary for projects of different scales and duration. To examine whether there exists significant differences in terms of project scales and durations, analysis of variance (ANOVA) was applied. The returned responses are divided into three groups according to the project scales and project durations respectively. For grouping by project scales, the responses are divided into Group 1 (with contract sum lower than $HK250 millions), Group 2 (with contract sum ranged from $HK250 millions to $HK500 millions) and Group 3 (with contract sum higher than $HK500 millions). For grouping by project duration, responses are divided into Group A (with project duration less than 18 months), Group B (with project duration ranged from 18 to 36 months) and Group C (with project duration longer than 36 months). The ANOVA results are shown in Tables 4 and 5 respectively.

In ANOVA, a high F value indicates that the sample means for the groups exhibit significant differences. In addition, the significance level (Sig.) also helps to determine whether the null hypothesis is to be rejected (Cheung *et al.* 2001). Usually, the group means are recognized as significantly different when the significant level is lower than 0.05 (Lai and Cheng 2003).

In this connection, '*Maintain effective and sufficient communication route'* (with F value of 3.657 at sig. level 0.019) was found as significantly different in its effectiveness to achieve cost-savings according to different project scales (Table 4 refers). The group means of this value-creating activity tend to decrease while the project sum increases. The results suggest that '*Maintain effective and sufficient communication route'* is more important in projects with smaller contract sums. This may because construction projects with small contract sums usually have short construction periods and tight programme. Sufficient communication route would obviously save cost due to misunderstanding and abortive works. As for the ANOVA results according to different contract durations, no value-creating activity was found to have a significant difference (sig. level <0.05) on its effectiveness to achieve cost savings (Table 4 refers). This suggests that the effectiveness of the value-creating activities to achieve cost-saving would merely be affected even the project durations were different.

Table 4: ANOVA results for the effectiveness of the value-creating activities in cost savings in different project scales and durations

	Project Scales					Project Durations				
	Gp 1	Gp 2	Gp 3	F-val.	Sig.	Gp A	Gp B	Gp C	F-val.	Sig.
Understand clients' requirement	5.73	5.00	5.42	0.640	0.593	5.71	5.17	5.40	0.597	0.620
Facilitate better time management	5.45	4.83	5.42	1.476	0.233	5.36	5.08	4.70	1.958	0.133
Make prompt decisions and give prompt instructions	4.91	5.33	4.83	0.466	0.707	5.36	4.92	5.00	0.578	0.632
Select appropriate procurement method	5.18	5.00	4.75	0.367	0.777	4.93	4.79	5.20	0.960	0.419
Maintain effective and sufficient communication route	**5.45**	**5.36**	**4.45**	**3.657**	**0.019***	5.21	4.77	4.80	0.581	0.630
Avoid using complicated designs	4.91	5.00	4.73	0.095	0.962	5.14	4.62	5.00	0.957	0.421

and construction methods										
Consider operation and maintenance cost before construction	4.55	5.33	4.55	1.048	0.381	4.71	4.75	4.89	0.519	0.671
Competent management	5.36	4.42	4.92	1.471	0.234	5.43	4.67	4.20	2.303	0.089
Ensure effective information flow	5.27	4.83	4.27	2.444	0.076	5.14	4.46	4.89	1.912	0.141
Apply tender pre-qualification	4.27	4.82	4.45	0.357	0.785	4.64	4.13	4.67	1.553	0.214
Apply information technology	4.27	4.25	4.73	0.357	0.785	4.21	4.54	4.11	0.619	0.606
Provide convenience product	4.09	4.33	4.27	0.172	0.915	4.50	3.96	4.33	0.663	0.579
Implement incentive scheme	4.18	5.00	3.73	1.883	0.146	4.21	4.00	4.00	0.211	0.888
Provide training and education	4.18	4.55	4.00	1.048	0.381	4.29	3.96	4.11	0.288	0.834
Implement punishment scheme	4.64	4.17	3.20	2.513	0.070	4.36	3.83	4.00	1.592	0.204

Table 5: ANOVA results for the effectiveness of the value-creating activities in value adding in different project scales and durations

	Project Scales					Project Durations				
	Gp 1	Gp 2	Gp 3	F-val.	Sig.	Gp A	Gp B	Gp C	F-val.	Sig.
Maintain effective and sufficient communication route	5.64	5.55	4.82	1.295	0.288	5.64	5.00	5.33	0.951	0.424
Understand clients' requirement	5.55	5.00	4.91	0.774	0.515	5.50	4.81	4.89	1.039	0.385
Ensure effective information flow	5.18	5.30	4.58	0.853	0.472	5.14	4.95	4.70	0.377	0.770
Apply tender pre-qualification	4.73	5.55	5.75	1.261	0.299	5.29	4.61	4.10	1.540	0.217
Competent management	**5.64**	**5.30**	**4.45**	**3.05**	**0.038***	**5.64**	**4.77**	**4.67**	**3.566**	**0.021***
Consider operation and maintenance cost before construction	5.00	5.00	4.75	0.171	0.915	5.00	4.64	5.10	0.804	0.498
Apply information technology	4.45	5.20	5.00	0.886	0.456	4.71	4.91	4.90	0.111	0.953
Select appropriate procurement method	4.64	5.10	5.00	0.658	0.582	4.57	4.97	4.78	0.570	0.638
Facilitate better time management	5.18	5.30	4.45	2.162	0.106	5.29	4.64	4.33	2.107	0.113
Make prompt decisions and give prompt instructions	4.45	5.40	4.45	1.530	0.220	4.64	4.68	4.89	0.136	0.938
Provide training and education	5.00	5.36	4.42	1.658	0.189	5.14	4.43	4.80	0.761	0.522
Implement incentive scheme	4.64	5.09	4.58	0.445	0.722	4.79	4.65	4.30	0.440	0.726
Provide convenience product	4.64	5.30	4.50	1.601	0.202	4.50	4.73	5.00	1.757	0.169
Avoid using complicated designs and construction methods	4.45	4.70	5.00	0.556	0.647	4.64	4.68	4.30	0.558	0.645
Implement punishment scheme	4.36	3.30	3.73	0.794	0.504	4.43	3.18	3.67	2.515	0.071

Table 5 reports the effectiveness of the value-creating activities to achieve value-adding in terms of different project scales and durations. '*Competent Management'* (with F value of 3.05 at sig. level 0.038 in different project scales and F value of 3.56 at sig. level 0.021 in different project duration) was found as significantly different in its effectiveness to achieve value-adding according to different project scales and durations (Table 5 refers). In this connection, higher mean scale ratings were found in projects with smaller scales and shorter durations. This may be due to the project delay and over-budget may cause a substantial impact of the client's profits. Employing competent person to manage the project would help to achieve the client's requirements and the desired project values.

CONCLUDING REMARKS

VCM has been regarded as a strategy to enhance and sustain competitive advantage of all firms involved in a construction development project. As such, competitive advantage in construction projects can be interpreted as optimizing profits by saving production cost and providing value-adding services that increase the worth of the products in view of the clients (Al-Mudimigh et al. 2004).

15 value-creating activities as summarized from previous studies are identified. It was suggested that these activities are effective to save cost and add value in the construction projects. Nevertheless, 'Implement punishment scheme' is found as the

least effective activity to achieve cost-saving and value-adding among others. In fact, implementing punishment scheme requires additional costs like developing the monitoring systems. Furthermore, this may discourage the conscientious and effective communication and collaboration among firms involved in the construction development.

To achieve cost-saving, wastage on time and abortive work should be minimized. As such, making early and prompt decisions to response to the clients' requirements is of great importance. In addition, sustaining effective and sufficient communication among collaborating firms is also essential to achieve cost-saving in construction developments, particularly in projects with short duration.

Compared with the construction developments projects with larger scales and longer durations, Employing competent person is considered as a more effective measure to add project value than those with smaller scales and shorter durations. Notwithstanding maintaining effective and sufficient communication route is found to be the most effective activity, among others, to achieve value-adding in the construction development projects.

In addition, understanding the client's requirements is also effective to optimize the project value. Through visualizing the client's needs, non-value-adding activities could be reduced and value-adding activities could be maximized. Furthermore, an effective value chain mapping of the construction development process is possible to be developed (Lindfors, 2002).

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