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The moderating role of the interactive use of Management Control Systems (MCS) on the relation between knowledge management types and marketing project performance

Cheng-Tsung Lu[1]*, Dauw-Song Zhu[2] and Yeun-Wen Chang[3]

[1]Department of Accounting, Feng Chia University, Taiwan, R. O. C.
[2]Department of Business Administration, National Dong Hwa University, Taiwan, R. O. C.
[3]Department of Public Finance and Taxation, National Taichung Institute of Technology, Taiwan, R. O. C.

This study integrates the contingency concept to inspect the moderate effects of the interactive use of management control system (MCS) on the relation between knowledge management (KM) types and marketing project performance. One hundred and eighty five companies in Taiwan were surveyed for the analysis data with the respondent of marketing project managers. The empirical results showed that: (1) Based on the internal and external knowledge, this study derived four types of KM (knowledge creator, knowledge introducer, knowledge integrator, and non-KM); (2) When the marketing project department dedicated more on the interactive use of financial MCS or multiple dimensions MCS, the three types of KM mechanism (knowledge creator, knowledge introducer, and knowledge integrator) would have a positive effect on marketing project performance; (3) When the marketing project department emphasized on the interactive use of interpersonal MCS, the KM application of knowledge integrator would have a positive effect on marketing project performance.

Key words: Management control system (MCS), the interactive use of MCS, Knowledge management (KM), marketing project performance.

INTRODUCTION

Enterprises are expressing more emphasis on using management control system (MCS) for solving management and decision issues such as cost variance analysis (Bruining et al., 2004; Nasir and Yatim, 2009), budget execution (Gómez et al., 2007; Lin and Yahalom, 2009) and performance measurement (Clark et al., 2006;

Karakaya, 2009). In other word, MCS means the systematic policy and control process that is used to influence the behavior and activities of management for the purpose of achieving the organization goal (Marginson, 2002). MCS includes formal MCS like budget system or incentive compensation system based on financial perspective (Cravens et al., 2004; Román et al., 2005; Lin and Yahalom, 2009). Furthermore, MCS also involves multiple dimensions MCS, such as internal control system (Simon, 1995), multiple dimensions performance measurement system (Chen and Huang, 2006), and balanced scorecard (BSC) (Kaplan and Norton, 1992, 1996; Lee and Lai, 2007; Lages et al., 2008; Lin and Yahalom, 2009). Informal MCS includes behavioral control mechanism from the supervisors' monitoring or

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*Corresponding author. E-mail: z3127330@ms31.hinet.net. Tel: 0926502057, 886-4-23165431.

monitoring or stress, and team workers' binding effect (Snell, 1992; Challagalla and Shervani, 1996). According to Marginson (2002), different MCS designs would have different impacts on the organization innovation and performance owing to specific concern of strategic uncertainty. Therefore, the design and planning of MCS has been an important research issue valued by industrial and academic circles.

Davila (2000) proposes the contingency theory of MCS that different product development strategy must go with different MCS interactive usages in order to maximize the project performance. Therefore, the contingency concept of the interactive use of MCS becomes the basis of planning and designing MCS for subsequent studies. Bisbe and Otley (2004) respond to this by investigating the interactive use of MCS as moderate variable and classify MCS into three categories which are budget system, BSC and project management system. The empirical results show that the relationship between product innovation and performance would be moderated by the extent to which MCS are used interactively. From the perspective of contingent theory, Mallin and Pullins (2008) suggest that compensation represents a performance contingent reward for a salesperson and that sales control systems may focus perceptions of these rewards as controlling or informative, thus impacting salesperson intrinsic motivation. However, prior researches just focus on formal MCS and do not discuss the importance of informal MCS. Therefore, this study suggests that ideal MCS design needs to involve formal and informal MCS and coordinate with a company's management attributes like innovation or strategy. In other words, the interactive use of MCS would moderate a company's management attribute and performance.

Most of the literatures regarding the MCS focus on the effect of MCS on strategic change and performance (Bruining et al., 2004), or the relation between MCS design and performance in new product development (Davila, 2000; Bisbe and Otley, 2004). Few studies have investigated how the knowledge management (KM) types match with the interactive use of MCS to improve marketing project performance. Lee and Lai (2007) indicate that MCS is an effective management mechanism in implementing KM. In addition, Kotler (2003) also states that marketing is a social and managerial process that meets customers' desires or needs and further customizes for customers by applying innovation, supply, and exchange valuable products/service. Current marketing projects would emphasize more on customer-oriented rather than traditional product-oriented (Mallin and Pullins, 2008). Hence, companies establish specialized marketing project department to be responsible for selecting target market, maintaining good communication with customers and retailers, dealing with post-purchasing service, and developing new marketing project (Cano et al., 2004).

Marketing project department has to capture, assimilate, create, integrate and transform information and knowledge for the purpose mentioned (Rangarajan et al., 2004). As the result, marketing project department applies the KM mechanism to acquire the novel information or knowledge which is not only related to their market but also their innovation and customer attributions (Calantone et al., 2002; Lin et al., 2006; Wang, 2009). In other words, it means that KM is a necessary management process for marketing team to achieve organizational goal. In conclusion, this study would explore how the KM mechanism of marketing project department works on their MCS design to achieve their expected project performance. There have thus far been relatively little researches in previous literatures. The research findings of this study contribute not only in the academic fields but also in the practice fields.

This study classifies knowledge management (KM) into four types: knowledge creator, knowledge introducer, knowledge integrator, and non-KM. Among them, non-KM represents the type that marketing project depart-ment does not emphasis KM. This classification is first applied in the typology of KM, and it is also one of the main innovative contributions in this study. Further, this study integrates the contingency concept to inspect the moderate effects of the interactive use of MCS on the relation between KM types and marketing project performance. The research questions are as follows: (1) How to make a complete classification on MCS and propose contingent factors for the interactive use of MCS; (2) What are the typologies of KM in marketing project department by using the main source of internal and external knowledge; (3) How to design and match with MCS based on different KM types to maximize the marketing project performance. The rest of this study is organized as follows. The literature review and research hypotheses are discussed in the next section. The research methodology and empirical results are explained after that. Finally, the conclusion and suggestions for future research are discussed.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

The concept of knowledge management and application types

Knowledge management is a management philosophy of creating, capturing, transferring, and accessing the right knowledge and information in order to make better decisions and deliver the results to support the business strategy (Söderquist, 2006). In other words, KM can be defined as the formalized approach of managing the creation, transfer, retention, and utilization of an enterprise's knowledge assets (Möller and Svahn, 2004; Lin et al., 2006). Lin et al., 2006). A considerable number of recent studies have been suggested that the resources of knowledge are usually classified under internal and external knowledge (Leonard-Barton, 1995; Jordan and Jones,
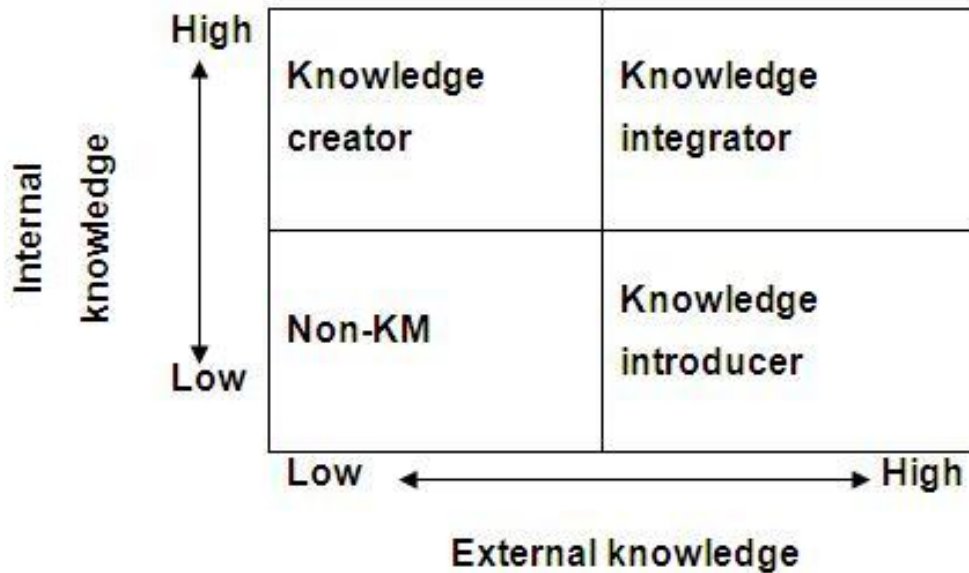
Figure 1. Application types of KM.

1997; Zack, 1999). Internal knowledge can be defined as the knowledge created or developed by the organization members themselves, such as the individual's mental model of experience, professional judgment, thinking and creative ability. The organization would apply this knowledge to generate more innovation in products or service (Leonard-Barton, 1995; Jordan and Jones, 1997; Zack, 1999). In addition, external knowledge can be defined as the knowledge that acquired or absorbed outside the organization members, like inter-organizational alliances, publications, professional associations, consultant vendors, universities, government agencies, knowledge brokers, and personal relation. The organization would apply this knowledge to achieve the purpose of strategy (Zack, 1999). Based on the degree of application from internal and external knowledge, this study categorizes KM into four types: knowledge creator, knowledge introducer, knowledge integrator, and non-KM (Figure 1).

1) Non-KM: This type belongs to KM with low application on internal and external knowledge. It means that the organizational culture, structure and information technology (IT) do not emphasize KM mechanism.

2) Knowledge introducer: This type places emphasis on knowledge's codifying and reusing, belonging to the high application on external knowledge and low application on internal knowledge. Knowledge introducer uses advanced information system and novel industrial information to increase the analysis and innovation ability for building brand image. The characteristics of this type are fast customer response, excellent learning capabilities and relationship maintenance with their

stakeholders. Good performance of standard operation processes (SOP) and management regulations can be well exemplified in cases of Japan's Mitsukoshi department store and Federal Express. Moreover, their marketing project department continuously analyses customers' preference patterns, plans sales promotion schedules, and measures the break-even sales by Data Warehouse or Data Mining. These activities rely largely on external knowledge to systemize, analyze, and store it for future decision making.

3) Knowledge creator: This type puts more emphasis on the acquisition, adoption and sharing of organization members' knowledge and experience. Knowledge creator is classified by high appliance on internal knowledge and low on external knowledge. The main knowledge source comes from informal social networks to provide clients customized products or service. Therefore, this type is characterized by team work, cooperation, communication, and trust. Companies such as financial advisors, management consultants or B and Q companies need a variety of organization members' experience, professional judgment and innovative ability for customized products or service. An example of knowledge creator is KPMG management consulting firm; they always need to customize their service (the introduction of BSC or activity-based costing for different enterprises). Therefore, knowledge sharing, spreading, and learning would be the critical factor in maintaining the competitive advantage.

4) Knowledge integrator: This type emphasizes on sharing, integration, and innovation from external and internal knowledge. KM is a dynamic process where individuals transfer their internal knowledge into

documents, numbers, and symbols by IT technology and management mechanisms like e-conference, e-learning, departmental website or expert system in the organization. It can be illustrated in the example of Nokia, which applies IT to analyze past operating information and integrates the whole marketing team's creativity and innovative know-how to set up sales promotion schedules. This type of KM not only absorbs external knowledge but also integrates internal knowledge for continuously exploring the demands of different customers.

Based on the above literature review and discussion, this study proposes that KM can be classified into different types according to the application degree of internal and external knowledge. Therefore, this study formulates the hypotheses as follow:

H_1: Different KM types will be formulated based on different application degrees of internal and external knowledge.

The relationship of the application of KM and marketing project performance

Traditionally, marketing project performance is often assessed with regard to managerial outcome performance (that is, making dollar sales or providing successful sale promotion schedule) (Fang et al., 2005). However, in a multi-functional organization, the project department will need to cooperate with other departments to implement market or benefit segment strategy, promotion project and marketing plan by sharing not only cross department's expertise but also information outside the organization (Cano et al., 2004). The application of KM offers the opportunity for project department members to learn from different sources and this stimulus effectively improves innovative knowledge and creativity (Rangarajan et al., 2004).

Moller and Svahn (2004) indicate that knowledge transferring between business units will help multi-functional companies reduce the operation cost of individual departments and strengthen the leader position of product. Therefore, the difference of knowledge that a company can acquire and use will influence its recognition and response ability to new markets (Lin et al., 2006). In other words, competitive competence of marketing project department is from different internal and external knowledge that would further advance their brand's products to create new market share. Consequently, department emphasizes on the application of KM mechanism may improve marketing project performance. The following hypotheses are proposed:

H_2: Emphasis on the application of KM mechanism will have a positive effect on marketing project performance.

A detailed H_2 is described below:

H_{2a}: The KM application of knowledge creator would have a positive effect on marketing project performance.
H_{2b}: The KM application of knowledge introducer would have a positive effect on marketing project performance.
H_{2c}: The KM application of knowledge integrator would have a positive effect on marketing project performance.

Management control system

Management control system (MCS) means the systematic policy and control process that is used to influence the behaviour and activities of management for the purpose of achieving the organization goal (Marginson, 2002), which includes formal and informal control mechanism (Maciarello and Kirby, 1994; Cravens et al., 2004). Formal MCS includes clear regulation and procedure based on specific designs which match organizational structure, routine task and operating activities (Maciarello and Kirby, 1994). These implicit MCS would assist organization in implementing its strategy and performance measurement, such as budget system or incentive compensation system based on financial perspective (Cravens et al., 2004; Román, et al., 2005). With more emphasize on current control mechanism, companies build multiple dimensions MCS to inspect the executive ability of financial and non-financial field (for example, internal control system or BSC, etc) (Kaplan and Norton, 1992, 1996; Lages et al., 2008; Lin and Yahalom, 2009). In addition, Snell (1992) suggests that MCS needs to be based on interpersonal behavior control.

Cravens et al. (2004) also find that behavioural control regulates the antecedent conditions of performance that behavioral control includes supervision on staff's skills, abilities, value, and motives. In other words, companies also apply informal MCS besides formal control processes. This study integrates the concept of Simon (1995) and Cravens et al. (2004) and classifies MCS into interpersonal MCS, financial MCS, and multiple dimensions MCS as showed in Table 1.

The moderate effect of the interactive use of MCS on the relation between KM types and marketing project performance

Managers usually evaluate various operational activities of strategic business unit (SBU) in order to collect the information regarding the efficiency of resources allocation (Robinson and McDougall, 1998). The results of measurement would be the references for future decision-making. Therefore, designing a well fit MCS is the best mechanism to understand the executive ability of a company (Marginson, 2002; Mallin and Pullins, 2008).

Table 1. Extent of MCS.

MCS categories	MCS factors	Reference
Interpersonal MCS	(1) Supervisor's monitor (2) Team workers' binding effect	Snell (1992); Challagalla and Shervani (1996); Cravens et al. (2004).
Financial MCS	(1) Budget system (2) Incentive system	Bruining et al. (2004); Roman et al. (2005).
Multiple dimensions MCS	(1) Internal control system (2) BSC or multi dimensions performance measurement system	Simon (1995). Kaplan and Norton (1992; 1996; 2004); Lee and Lai (2007); Lages et al. (2008).

Simon (1995) indicates that different MCS designs would have different impacts on the organization innovation and performance because of specific concern of strategic uncertainty. Bruining et al. (2004) examine the design of the interactive MCS under different strategic change. The empirical result shows that the interactive use of MCS can alleviate disruptive performance when a company is changing its strategy. Moreover, Davila (2000) focuses on the project performance of product development team from twelve companies. He finds that different product development strategy needs to be concerned with the interactive use of MCS to maximize the project performance. Therefore, the contingency concept of the interactive use of MCS is the foundation for later studies on MCS planning and design. For instances, Bisbe and Otley (2004) propose a contingency model in which the effect of innovation on performance are moderated by the interactive use of MCS. However, these studies neglect the importance of the interpersonal MCS. Therefore, this study suggests that ideal MCS design needs to involve formal and informal MCS and coordinate with a company's management mechanism. How, only few studies have inspected how KM types match with the interactive use of MCS to improve marketing project performance.

This study intends to investigate the relationship between KM application, the interactive use of MCS and marketing project performance. We propose that companies should use MCS to understand the executive ability of marketing project based on the application of either internal or external knowledge, such as budget achievement ratio, sale growth rate, customer satisfaction, and customer response time. Budget system offered managers aggregated information and broad-scope information for advanced performance evaluation and reward policy (Choe, 1998). The financial and non-financial information from BSC can assist managers to understand the executive ability and departmental performance (Kaplan and Norton, 2004; Lin and Yahalom, 2009). On the other hand, Simon (1995) proposes the concept of strategic uncertainty, and he suggests that different MCS designs will affect the organization performance based on a specific strategy. Therefore, different strategic selection will have different KM types and different interactive uses of MCS application to promote the entire performance. This study takes the interactive use of MCS as a moderator variable and adds the interpersonal MCS to combine with contingency effect in order to test the relationship between KM application and marketing project performance. Therefore, the following hypotheses are proposed:

H_3: When the marketing project department stresses more on the interactive use of MCS, the application of KM mechanism will have a positive effect on marketing project performance. A detailed H_3 is described below:

H_{3a-1}: When the marketing project department stresses more on the interactive use of interpersonal MCS, the application of knowledge creator mechanism will have a positive effect on project performance.

H_{3a-2}: When the marketing project department stresses more on the interactive use of interpersonal MCS, the application of knowledge introducer mechanism will have a positive effect on project performance.
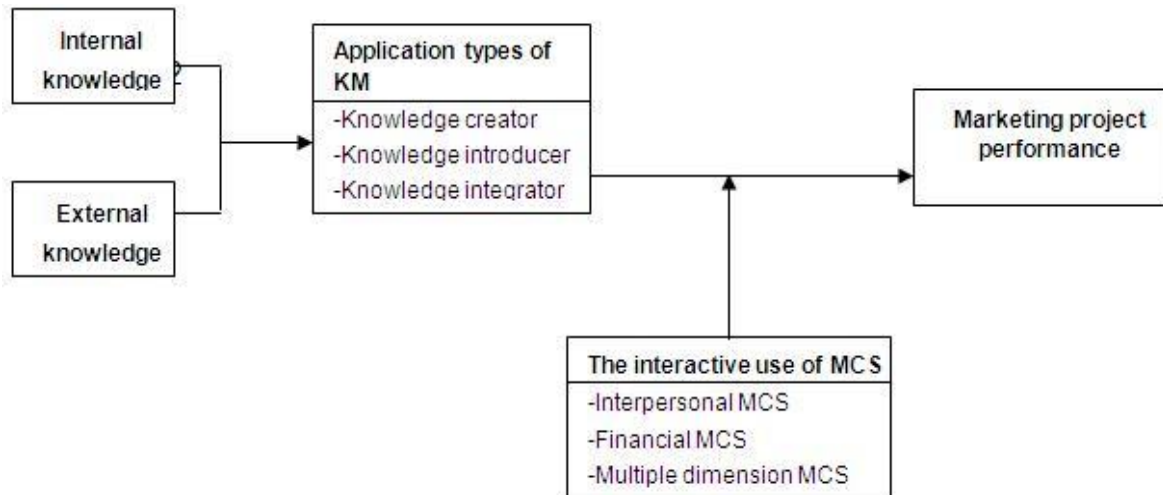
H_{3a-3}: When the marketing project department stresses more on the interactive use of interpersonal MCS, the application of knowledge integrator mechanism will have a positive effect on project performance.

H_{3b-1}: When the marketing project department stresses more on the interactive use of financial MCS, the application of knowledge creator mechanism will have a positive effect on project performance.

H_{3b-2}: When the marketing project department stresses more on the interactive use of financial MCS, the application of knowledge introducer mechanism will have a positive effect on project performance.

H_{3b-3}: When the marketing project department stresses more on the interactive use of financial MCS, the application of knowledge integrator mechanism will have a positive effect on project performance.

H_{3c-1}: When the marketing project department stresses more on the interactive use of multiple dimensions MCS, the application of knowledge creator mechanism will have

Figure 2. Conceptual research model.

a positive effect on project performance.

H_{3c-2}: When the marketing project department stresses more on the interactive use of multiple dimensions MCS, the application of knowledge introducer mechanism will have a positive effect on project performance.

H_{3c-3}: When the marketing project department stresses more on the interactive use of multiple dimensions MCS, the application of knowledge integrator mechanism will have a positive effect on project performance.

RESEARCH METHDOLOGY

Conceptual research model

Based on the internal and external source of knowledge, this study categorizes KM into four types: knowledge creator, knowledge introducer, knowledge integrator, and non-KM. Non-KM shows little interest or effort in KM, and this study does not explore the relation between this KM type and MCS. In addition, the contingency concept of the interactive use of MCS is the basis of understanding the executive ability (Davila, 2000; Bisbe and Otley, 2004). This study deduces that the effects of KM application on marketing project performance are moderated by different interactive use of MCS (interpersonal, financial, and multiple dimensions MSC). The conceptual research model is showed in Figure 2.

Data collection and sampling procedure

The sample is originated from the top 1,000 listed and OTC (over-the-counter) companies found in Taiwan Economic Journal Data Bank and their detailed information are gathered from the industry databank of ITRI (Industrial Technology Research Institute). The subjects of this study are mainly the marketing project managers, and this conforms to the claim of Choe (1998) who believes that the analytical unit of contextual variables must be consistent. A pre-test was conducted to survey 15 marketing project managers with at least 5 years working experiences in Taiwan listed companies. Surveys were followed by interviews to obtain suggestions on how questionnaires should be modified to improve understanding by participants. 1000 questionnaires were distributed to the marketing

project managers. To increase the return rate, follow-up calls were made via phone and email 2 weeks after distribution. As a result, 193 surveys were returned with 185 valid surveys, achieving a return rate of 18.5%. This study also use T test to inspect the response bias. As a result, the t-value of all variables is not significant and the response of questionnaires does not exist obviously response bias.

Application types of KM

This study adopts the K-means cluster analysis to derive the application types of KM and then applies multiple regressions to analysis the relationship between KM applications, the interactive use of MCS, and marketing project performance. Table 2 shows the result of cluster analysis. Because the F-value is significantly (P-value < 0.01), it is reasonable to categorize the application types of KM into four types. As a result, 12 companies are categorized into non-KM with low degree in both two sources of knowledge (cluster 1), 48 companies are knowledge integrator with high degree in two sources of knowledge (cluster 2), 80 companies are knowledge introducer with low degree of internal knowledge and high degree of external knowledge (cluster 3), and 45 companies are knowledge creator with high degree of internal knowledge and low degree of external knowledge (cluster 4). Hence, Hypothesis H_1 is supported. However, only 173 companies emphasize on the application of KM (knowledge integrator, knowledge introducer, knowledge creator). Table 3 also only shows the demographic profile of the 173 companies.

Reliability and validity of measurement scales

The constructs in this study were measured and revised by existing scales. For each questionnaire item, subjects were asked to express the degree to which they agreed with the statements on seven-point Likert rating scale with strongly disagree (1) to strongly agree (7). External knowledge was measured using a revised 5-item scale developed by Zack (1999): the sources of the operational and managerial knowledge in my department mainly come from: (1) management regulations, SOP documents of company; (2) professional journals or books; (3) information system (includes internet); (4) academic or research units; and (5) public medias. Internal knowledge was also measured using a revised

Table 2. Cluster analysis results.

Knowledge source	Clusters				F-test	P-value
	1. Non-KM (n = 12)	2. Knowledge integrator (n = 48)	3. Knowledge introducer (n = 80)	4. Knowledge creator (n = 45)		
Internal knowledge	2.87 Low	6.50 High	4.25 Low	5.00 High	93.07	0.000
External knowledge	2.60 Low	6.80 High	6.00 High	3.40 Low	209.85	0.000

Table 3. Demographic profile (N = 173).

Attributes	Items	Number	Percentage (%)
Industry	Semi-conductor	22	12.71
	Opto-electronic	11	6.36
	Communication	7	4.05
	Industrial machinery	9	5.20
	Electronic devices	27	15.61
	Oil , petrochemical	6	3.47
	Computer peripherals and accessories	23	13.29
	Automotive	9	5.20
	Food	9	5.20
	Textile	3	1.73
	Mechanic manufacturing	3	1.73
	Plastic , Rubber Materials	12	6.94
	Others	32	18.51
Employee	Under 200 people	19	10.98
	Between 201~500 people	40	23.12
	Between 501~1000 people	47	27.17
	Between 1001~5000 people	60	34.68
	Above 5001 people	7	4.05
Working seniority	Under 1 year	5	41.62
	Between 1 year 1day ~ 5 years	69	39.88
	Between 5 years 1day ~ 10 years	54	31.21
	Between 10 years 1day ~ 15 years	20	11.56
	Between 15 years 1day ~ 20 years	12	6.94
	Between 20 years 1day ~ 25 years	5	2.89
	Above 25 years	8	4.93

4-item scale developed by Zack (1999): the sources of the operational and managerial knowledge in my department mainly come from: (1) the professional judgment from inner staffs; (2) the experience from inner staffs; (3) the internal communication or cooperation between staffs from different departments; (4) the innovative knowledge transfer from R and D department.

The interactive use of interpersonal MCS was measured using a revised 3-item scale from Challagalla and Shervani (1996). It included asking supervisors to express the degree to which they agreed with the following statements: (1) Company has more emphasis on supervisors' direct monitoring and review; (2) The binding effect between colleagues in the department is existed; (3) The stress is often from the supervisors' requirement to perform well. The interactive use of financial MCS was measured using a revised 5-item scale developed by Davila (2000): (1) Financial accounting information is usually use (for example, budget, sale and cost, etc) as a means of questioning and debating the ongoing decisions and actions of department managers; (2) There is a lot of interaction between top management and department managers in the budget process (planning, execution, evaluation); (3) The

Table 4. Reliability and validity analysis.

Construct	The item- to-total correlation	Factor loading	Eigenvalue	Variance explained by factor (%)	Cronbach's α	Means	SD
External knowledge	0.43-0.66	0.59-0.80	2.70	53.96%	0.79	5.2	0.84
Internal knowledge	0.47-0.68	0.71-0.99	1.22	80.54%	0.75	5.7	0.66
Interpersonal MCS	0.56-0.76	0.72-0.91	2.16	72.04%	0.81	5.5	0.88
Financial MCS	0.60-0.75	0.77-0.91	2.19	73.13%	0.82	5.8	0.88
Multiple dimensions MCS	0.64-0.87	0.82-0.95	2.46	81.98%	0.89	5.0	1.12
Marketing project performance	0.65-0.91	0.69-0.92	8.23	68.57%	0.95	5.5	0.85

financial accounting information was use to discuss with my peers and subordinates changes occurring in the organization. The interactive use of multiple dimensions MCS was measured using a revised 5-item scale developed by Bisbe and Otley (2004): (1) Multiple dimensions management control mechanism is usually use (for example, internal control or BSC, etc) as a means of questioning and debating the ongoing decisions and actions of department managers; (2) The multiple dimensions management control mechanism is continuous- it demands regular and frequent attention from managers at all levels; (3) The multiple dimensions management control mechanism was use to discuss with my peers and subordinates changes occurring in the organization.

Marketing project performance was measured using a revised 12-item scale from Gupta and Govindarajan (1984) and Fang et al. (2005). Subjects were asked to evaluate their marketing project performance with regard to twelve performance dimensions, such as sale promotion schedule development, market share, profit margins, newly introduced product/service, the achievement of sales objectives, cost reduction, maintaining good customer relations, providing accurate and complete paperwork, acquiring the necessary knowledge about my product/ service, competitors' product/service, and my customer's needs, the customer's satisfaction, the job satisfaction of department member and the coordination and cooperation with other department. Also, this study evaluated marketing project performance as a weighted average of the twelve performance dimensions. The weight assigned to each performance dimension depended upon the relative importance attached to the dimension by the superior. The response scale was a seven-point Likert-type scale ranging from 1 (little importance) to 7 (extremely important) (Gupta and Govindarajan, 1984). In recent years, balanced scorecard (BSC) provides valuable feedback on a performance measurement framework that also weights the relative importance of performance dimensions (Kaplan and Norton, 1992, 1996, 2004). Next, subjects were asked to evaluate marketing project performance in accordance with eight performance dimensions on a seven-point Likert rating scale from well below average (1) to well above average (7). The formula of marketing project performance shows as follows:

$$MPP = \Sigma\ (MPP i \times W i) / \Sigma\ W i$$

Where MPP is marketing project performance; MPPi is marketing project performance for dimension i; Wi is the weight value of importance for dimension i.

The Cronbach's α reliability coefficients (Table 4) for the seven multiple-item scales are above the commonly applied standard of 0.7, and it shows the reasonable item convergence in this study (Nunnally, 1978). This study also tests the construct validity. The item-to-total correlation, between each item and the sum of the remaining items, is used for convergent validity and the item-to-total cor-relation score that is lower than 0.4 should be eliminated (Kerlinger, 1986). We also use factor analysis to check discriminate validity. The factor analysis with varimax is employed to check uni-dimensionality among the items, and those with factor loading values lower than 0.5 should be eliminated (Kerlinger, 1986). The results are presented in Table 4 and the convergent validity and discriminate validity of this study should be reasonable. Descriptive statistics are also demonstrated in Table 4.

RESULTS

The direct effect of KM application on marketing project performance

This study uses multiple regressions to test the hypotheses. Before the analysis of multiple regressions, the variables were centralized. That is, the study subtract the mean of each variable from the value of the variable ($X_i - X_u$ or $Y_i - Y_u$, X_u and Y_u represent the mean of the variables) in order to make the variable a positive or negative data. This centralization process is instrumental to the analysis of interaction term in the contingency model (Jaccard et al., 1990; Aiken and West, 1991).

Table 5 shows the results of regression analysis analysis. The F–value of regression model is significant (P-value $<$ 0.01). For testing the rationality of multicollinearity among the independent variables, we calculate variance inflation factors (VIF) in each of the regression equations. Since all of the VIF within the linear model are below 10, we conclude that multicollinearity is not a significant problem in the analyses (Neter et al., 1990). Table 5 shows that only the KM application of knowledge integrator are positively related to marketing project

Table 5. Regression results on H_2.

Regression		Knowledge integrator		Knowledge introducer		Knowledge creator	
Variables	Coefficient	Standard coefficients value	t-value	Standard coefficients value	t-value	Standard coefficients value	t-value
X_i	β_1	0.335	2.062**	0.108	1.035	0.060	0.377
F-value		17.642***		17.642***		3.895**	
Adj.R^2		0.296		0.296		0.116	
Max VIF		1.227		1.227		1.265	

Xi = KM application type (i = 1 represented knowledge integrator, i = 2 represented knowledge introducer. i = 3 represented knowledge creator). *P < 0.1, **P < 0.05, ***P < 0.01.

performance ($\beta_1 = 0.335$**), therefore, hypothesis H_{2c} is supported. In addition, knowledge creator and knowledge introducer do not have significantly effect on marketing project performance; H_{2a} and H_{2b} are not supported. This might be due to different KM applications should match with the interactive use of MCS to improve marketing project performance, and there is need to consider the interaction effect. Contingency effect on MCS interaction usage will be discussed in the next section.

The effect of KM application on marketing project performance- the moderate effect of the interactive use of MCS

This study uses multiple regression to test the hypothesis H_3, including H_{3a-1} to H_{3c-3}, which examines the interaction effect of KM types application and the interactive use of MCS on marketing project performance. The multiple regression equation can be written as:

$$MPP = \beta_0 + \beta_1 X_i + \beta_2 Y_j + \beta_3 X_i Y_j + \varepsilon$$

MPP = Marketing project performance; X_i = KM

application type (i = 1: knowledge integrator; i=2: knowledge introducer; i = 3: knowledge creator); Y_j = The interactive use of MSC (j = 1: The interactive use of interpersonal MCS; j = 2: The interactive use of financial MCS; j = 3: The interactive use of multiple dimensions MCS); β: coefficient; ε: error term.

The results from Table 6 reveal that the coefficients of interaction items ($X_i Y_j$) are required to be positive ($\beta_3 > 0$) and significant for confirming the significant correlations between KM application application and marketing project performance under different interactive use of MCS (Schoonhoven, 1981). According to Table 6, hypotheses H_{3a-1}, H_{3b-1}, H_{3b-2}, H_{3b-3}, H_{3c-1}, H_{3c-2}, and H_{3c-3} meet the requirement, in which hypothesis H_{3a-1} ($\beta_3 = 0.353$**) confirms the effects of the KM application of knowledge integrator on marketing project performance is moderated by the interactive use of interpersonal MCS; Hypothesis H_{3b-1} ($\beta_3 = 0.348$**) confirms the effects of the KM application of knowledge integrator on marketing project performance is moderated by the interactive use of financial MCS; Hypothesis H_{3b-2} ($\beta_3 = 0.269$**) confirms the effects of the KM application of knowledge introducer on marketing project performance is moderated by the

interactive use of financial MCS; Hypothesis H_{3b-3} ($\beta_3 = 0.238$*) confirms the effects of the KM application of knowledge creator on marketing project performance is moderated by the interactive use of financial MCS; Hypothesis H_{3c-1} ($\beta_3 = 0.398$**) confirms the effects of the KM application of knowledge integrator on marketing project performance is moderated by the interactive use of multiple dimensions MCS; Hypothesis H_{3c-2} ($\beta_3 = 0.248$**) confirms the effects of the KM application of knowledge introducer on marketing project performance is moderated by the interactive use of multiple dimensions MCS; Hypothesis H_{3c-3} ($\beta_3 = 0.326$**) confirms the effects of the KM application of knowledge creator on marketing project performance is moderated by the interactive use of multiple dimensions MCS.

In detail, the study explain the moderate effect of multiple regression equation from H_{3a-1}, which can be written as:

$$MPP = 0.267 X_1 + 0.005 Y_1 + 0.353 X_1 Y_1$$

Take partial derivative out of X_1 and it leads to:

$$\delta MPP / \delta X_1 = 0.267 + 0.353 Y_1 \quad (1)$$
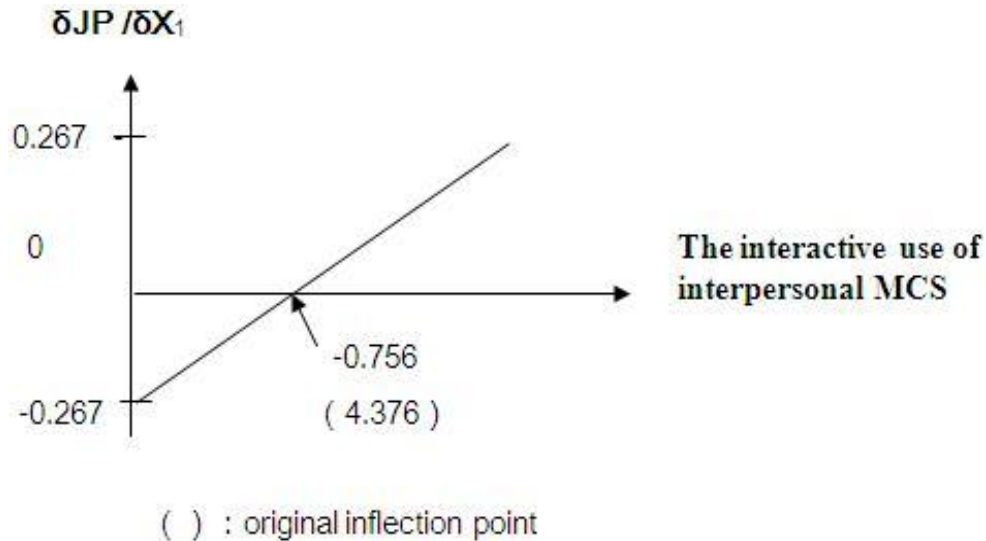
Figure 3. The moderate effect of the interactive use of interpersonal MCS on the relation between knowledge integrator KM type and marketing project performance.

Let (1) = 0, then Y_1 (the interactive use of interpersonal MCS) = -0. 756. From this, the study derive that Y_1 = -0.756 as the inflection point (Figure 3). To get the original inflection point, the mean value of Y_1 (5.501) adds back to -0.075 and examines whether the original inflection point (5.501-0.756 = 4.736) sits within the actual range of Y_1, which is 3.33~7.00. Hypothesis $H_{3a\text{-}1}$ meets the requirement and confirms the interactive use of interpersonal MCS has moderating effect of non-monotonic (Schoonhoven, 1981).

CONCLUSION AND MANAGEMENT IMPLICATIONS

Previous studies on MCS tend to focus on the relationship between management attributes, formal MCS and performance. As organization structure becomes more flexible and organic, the informal MCS is likely to become an increasingly important managerial mechanism (Daft, 2001). With the importance of the interactive use of MCS, this study explores how the KM mechanism of marketing project department works on their MCS design to achieve their expected performance. The primary contribution of this study is that we apply the contingency concept depicting the interactive use of MCS (interpersonal MCS, financial MCS, and multiple dimensions MCS) as moderating variables between KM application and marketing project performance. Few studies were examined about how the KM types match with the interactive use of MCS to improve marketing project performance. In addition, this study also categorizes KM into four types: knowledge creator, knowledge introducer, knowledge integrator, and non-KM. The classification on the study is first shown in the

related literature, and it is also one of the main innovative contributions in this study. Specifically, the following discussion provides the results of this study.

From the perspective of direct effect of KM application type on marketing project performance, the more emphasis placed on the KM application of knowledge integrator in marketing department will have significantly direct relationship on marketing project performance, compared to another two application types of KM. However, knowledge creator and knowledge introducer do not have direct effect on marketing project performance. This might be due to different KM applications should match with the interactive use of MCS to improve marketing project performance. Therefore, on the perspective of the moderate effect of the interactive use of MCS on the relation between KM types and marketing project performance, the study find that the marketing department applying different KM types (knowledge creator, knowledge introducer, knowledge integrator) with the interactive use of formal MCS (financial and multiple dimensions MCS) would raise marketing project performance. In addition, when the marketing project department emphasizes more on the interactive use of interpersonal MCS, this will assist the knowledge integrator KM type to achieve and improve marketing project performance. Theses findings are the main contribution of this study because past researches seldom discussed the influence between KM mechanism, MCS design and marketing project performance. Especially, project departments increasingly acquire industry information or customer attributes by KM mechanism recently (Calantone et al., 2002; Lin et al., 2006). It becomes an important research issue how project department applies the interactive of MCS with KM to form the executive

ability.

Excellent marketing project management has been the main source of competitive advantage. In addition, enterprises stress more emphasis on executive ability (Bossidy and Charan, 2002). Therefore, when the marketing project department captures, creates, transfers, and integrates internal or external knowledge for decision making, KM mechanism should still match with the interactive use of MCS. For instances, finance MCS can assist project department understand the budget achievement ratio, income growth rate and cost control; multiple dimensions MCS will provide non-financial information of employee and customer satisfaction, research and development (R and D) performance, customer response time, new customer acquisition, etc (Kaplan and Norton, 1996, 2004; Lee and Lai, 2007). In addition, MCS also acts as a precautionary mechanism once the organizations encounter financial crisis to provide necessary actions in time (Bruining et al., 2004). In conclusion, the study suggests that marketing project department using KM mechanism with the interactive use of MCS perform better and display higher executive ability.

Finally, this study uses the revised scales of marketing project performance developed by Gupta and Govindarajan (1984) and Fang et al. (2005). Due to marketing project manager's subjective recognition on marketing project performance rather than using actual financial or non-financial data, the answers collected may be somehow central-oriented, strict or lenient according to the entire performance. The paper suggests future research apply case study to achieve more objective results. In addition, this study may exist several research limitations like the halo effect, and social desirability bias when applied questionnaires for data collection. It also advises later studies can be applied by experimental design or focus group interviews in order to test the causal relationship between variables. In addition, the subjects of this study are marketing project managers. Therefore, the questionnaire return rate is less than 20%. The suggestion to enlarge sample size is to target the marketing project staff for future studies.

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