Original Research Paper

Moderating Effects of IT Applications on IT Capability and Competitive Advantage

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Abstract: Generally, this study aims to assist domestic companies to determine appropriate Information Technology (IT) applications to attain Competitive Advantage (CA). Specifically, this study aims to assess enhancement causes by IT applications between IT capability and CA. A new CA model by incorporating IT applications in organizations is then proposed. Pilot study was used to test a set of newly developed questionnaire prior to 500 Malaysian companies and 295 set of questionnaire were collected. Multiple group analysis of Structural Equation Modelling (SEM) was conducted to analyze the data collected from survey. Ten most regular utilized IT applications: (1) content management systems, (2) decision support tools, (3) document management tools, (4) email systems, (5) Intranet, (6) Internet access (7) knowledge base/repository, (8) search engine, (9) website content management and (10) workflow systems are supported having enhancement effects on IT capability and CA. This study implies a novel framework important for reaping CA. In addition to the literature of strategic management, this study would be a benefactor for domestic companies in adopting IT applications. The findings of this study can be generalized by other multi-ethnic, multi-cultural and developing countries.

Keywords: IT Applications, IT Capability, Competitive Advantage (CA), Moderating Effects

Introduction

Recent studies explored IT research to delineate the relationships of IT resources and its capabilities to improve organizational performance from different attempts (Ashrafi and Mueller, 2015; Lew *et al*., 2013; 2014; 2015). These different approaches conceptualize interrelationships of IT resources, IT capability and Competitive Advantage (CA) as key constructs in different ways. They focused on how IT resources create IT capability to organizations when measured by CA.

A number of researchers (Chang and Seow, 2016; Lew *et al*., 2015; Steven and Wim, 2009; Zhang *et al*., 2016) indicated IT applications enhance IT capability to organizations. Focuses were on revealing several regular utilized IT applications for improving organizational CA (Sher and Lee, 2004; Leistner, 2010; Zehrer, 2011). None of the previous studies actually bridged the IT applications to CA. This leads to issues about understanding "how – relationship orientation (either positive or negative impacts of tested key constructs) but not "what – types of IT application". Overlooking on "what" types IT application being tested for enahncement

effects leads to a research scarcity delivering thorough tests of its enhancement effects of theoretical propositions.

The present study will bridge this research gaps by having a more comprehensive way by adding all IT applications from past research followed by testing the moderating effects of the entire set of IT applications on IT capability and CA. Specifically, the research question being addressed is, *by having an IT application, how do an IT capability create competitive advantage for the organization?*

There are multiple cultures and races of population in Malaysia (60.3%- Malays and Aboriginals, 24.6%-Chinese and 7.1%-Indians) (DSM, 2011). These multiple races and cultures affect business activities in individuals and organizations (Furner *et al*., 2009). One dominance about conducting research in a country of multiple races and cultures is this cultural intersection of KM can reveal unseen areas created by multiple cultures (Giudice *et al*., 2012). With this, Malaysia which holds key IT capability can deliver sustinable organizational CA likewise developing countries such as United States, European countries and Australia (Marchand *et al*., 2000).

This study intensifies to the field of research in three circumstances. First, it closes a previous research gap such as uncertainty of IT application that can generate value; uncertainty of IT application and its capabilities that bringing organizational CA; scarcity of available empirical research in this study context. The results propose that the value of IT capability, when measured by CA, is moderated by IT applications. This delineation between IT applications, IT capability and CA further prolong the motivations of recent studies (Ashrafi and Mueller, 2015; Lew *et al.*, 2013; 2014; 2015) for the relationships between IT capability and their impact on an organizational achievement. Secondly, this article attends the issues of focusing on "how" instead of "what" in previous research. Thirdly, smart adoption of IT application will be enabled and focused by practitioners or managers.

Literature Review

Measuring Competitive Advantage (CA) for an organization is a multifaceted and complicated challenge, as demonstrated by the variety of previous research and their research findings are summarized in Table 1.

From the examination of previous theoretical concepts, approaches and studies of Information Technology Capability (ITC) and organizational CA from years 2000 to 2015, uncertainty and scarcity of what types of IT application can generate value for CA are obvious. Basically, past researches only determined if ITC had positive impact on organizational CA without finding what IT application contributed to ITC and its moderating effects on organizational CA. Besides, no research specified how and which IT application was important. Thus, it is difficult for IT and knowledge practitioners to plan their IT applications effectively for organizational CA.

A complete measurement of organizational CA advantage from IT application perspective was also not demonstrated in any past researches. Hence, practitioners have difficulties to empirically bridge IT application to organizational CA. CA is *"The capability of creating, storing, sharing and utilizing knowledge using dynamic capability, integrating capability and utility capability"* (Kim, 2001; Lew *et al.*, 2014; Sher and Lee, 2004; Tallon, 2008).

Although currently there is no perfect framework, critical review of the literatures found significant evidences on the moderating effects of IT applications on the relationships between ITC and organizational CA. The reviewed frameworks also enable the identification of independent variables, dependent variable and moderating variables. Organizational Information Processing Theory (OIPT) has been identified as important upon which the present research is based on.

The conceptual framework used in this research is presented in Fig. 2 while the methodology of this research is presented in Section 3.

Theory Development

Information Technology (IT) Applications

Sher and Lee (2004) implied an important concept between usage of Information Technology (IT) application and organizational Competitive Advantage (CA). The IT application costs were trimmed down by the usage of Information Technology (IT) application.

In Austrian, a Knowledge Management (KM) model was proposed by Zehrer (2011) for tourism organizations. The findings revealed corporate portals, electronic newsletters, e-mail and discussion forums enhanced IT capability such as knowledge sharing. Transforming tacit knowledge (expert's experience) to explicit knowledge (readability form of information) is possible and the stored information is ever ready to be used by employees in future.

The most regular utilized types of IT applications are content management systems, Internet Access, Intranets, groupware, document management systems, workflow systems, object and relational databases, data warehousing systems, Web site content management and data mining systems (Alavi and Leidner, 2001; Debowski, 2006; Leistner, 2010; Meso and Smith, 2000; Ngai and Chan, 2005; Lew *et al.*, 2013). These advanced information technologies can be applied to organize, improve and accelerate huge organizational Knowledge Management (KM) internally and externally (Alavi and Leidner, 2001).

The technologies such as knowledge base, portals and search engine allow larger knowledge collection and speedy knowledge retrieval to the person who needs it. With these proper IT applications, KM activities are facilitated (Leistner, 2010; Lew *et al.*, 2013; 2014). For instance, having a knowledge base as a database facilitates knowledge creation. It can then serve as a repository to store the newly created knowledge/previous knowledge. Other KM activities such as knowledge sharing and utilization are possible when the stored knowledge is retrieved to be shared among employees and utilized when one needs it.

Several IT applications were regarded as moderators in KM's effect on IT capability (Sher and Lee, 2004). First, e-mail was the most frequently utilized tool; however, the findings indicated that e-mail was not really effective for KM implementation. Second, document management was found to be enhancing dynamic capability. Synchronisation with external entities and document sharing enhanced communication and coordination and induced responsiveness among organizational participants. Third, powerful search engine often encouraged knowledge availability for fast decision making. Finally, data warehousing was found to enhance dynamic capability. Implementation of powerful databases allowed speedy knowledge storage and retrieval. It was also highlighted that, security and accessibility of the entire KMS were critical in achieving organizational Competitive Advantage (CA).

Table 1. Summary of findings of previous research

Sources	Constructs/ Variables	Strengths	Weaknessess	Value-added into present researh
Bixler (2000)	Competitive advantage	A set of fifteen expected benefits of a KMS was determined	Three major perspectives of organizational competitive advantage were not explored 1. The reason of a type of KMS being selected was not highlighted. 2. The right ITC to enable the organizational competitive advantage was not investigated 3. KMS was not viewed in greater details in terms of their knowledge process which can lead to the appropriate selection of ITC.	Fourteen measurements of organizational competitive advantage are adopted
Kim (2001)	Integrating and utility capabilities	Four distinct Knowledge Management (KM) models-termed as types I, II, III and IV were developed from knowledge and service types as foundation.	The study did not explore the impact of ITC - organizational CA. The findings were non-supportive results of relationships between KM models and ITC while past research shows positive results. Therefore, the KM model developed was insufficient to link ITC to organizational competitive advantage.	ITC includes: 1. Integrating capability and 2. Utility capability
Sher and Lee (2004)	IT applications	IT applications were proven in enhancing dynamic capability towards organizational CA.	The findings were just based on 13% of the top 100 Taiwanese organizations, leading a doubtful generalization to represent the population.	IT applications enhance dynamic and integrating capabilities which will then contribute to competitive advantage.
	Dynamic and integrating capabilities	IT applications were seen as moderators in KM's impact on dynamic capability.	The research design was only focused on dynamic capability; a narrower scope without consideration of other ITC perspectives.	IT applications are moderators of the relationship of dynamic capability and competitive advantage.
Rajiv and Sanjiv (2005)	IT applications	The use of IT and the effectiveness of KM implementation were evaluated based on the public announcements and market perceptions of performance.	Relationships of organizational KM efforts, organizational prior KM practices and private information were not examined. The positive impacts were based on the published KM effort on any of the KM activities	When organizational competitive advantage is achieved from right information technology capability (ITC), appropriate IT applications should be identified but not the KM
Tanriverdi (2005)	IT applications	Better way of understanding knowledge strategy was investigated using IT applications from large multi-business organizations perspective.	The relevancy of the framework is doubtful as small and medium enterprises (SMEs) were excluded. When the framework is highly concerned with knowledge and IT applications, knowledge-and-technology intensive organizations will be more appropriate instead of multi-business organizations. Moreover, there is still elusive link between IT applications	Mediating roles of KM is observed between IT applications and organizational CA. The roles of IT applications will be investigated in the current research to confirm its contribution in this research stream.
Burca et al. (2006)	IT applications	This research extended the fundamental relationship of service practice to performance by integrating IT sophistication. This integration was supported by findings of positive relationship between IT sophistication and service performance.	However, this study did not consider the way of service provider and service type classification. The matching of the right service to the right type of organization may be miss-matched without the service type information.	For achieving the organizational CA, the suitable IT applications for the right organizations are required.
Wang et al. (2007)	Dynamic capability	IT support of KM indirectly benefits manufacturing organizations.	This study was focused on dynamic capability only based on manufacturing organizations	Knowledge-based dynamic capability has direct effect for IT support for KM and organizational CA.
Qi et al. (2008)	Information technology capability	The empirical results of 241 IT executives in the USA showed ITC provided competitive advantage by developing effective ITC.	The identification of the right IT applications for ITC was not carried out.	An empirical link drawn from this empirical finding: Better organizational ITC leads to better organizational competitive advantage. Suitable IT applications for ITC will be carried out in this research.
Tallon (2008)	Dynamic capability IT applications	Relationship of ITC on business process agility was investigated. Managerial and technical capabilities were found to be essential for organizational dynamic capabilities.	The types of ITC were based on managerial and technical IT perspectives; not derived from KM perspectives	ITC from management and technical perspectives were proven to have direct effect on organizational CA.
Bhatt et al. (2010)	Information technology capabiliies	Dynamic capability creates information building effects which help facilitate market responses on business prospects, therefore enhancing CA. The IT applications were classified as infrastructure resources, human resources and IT-enabled intangibles.	The underlying IT applications were not identified based on KM perspective.	The right ITC based on KM perspectives and relationship of the right IT applications to ITC are required to achieve the organizational competitive advantage.
Lew et al. (2013)	Information technology capability Competitive advantage	The empirical results of 275 IT executives in Malaysia showed ITC provided competitive advantage by developing effective ITC.	The research design was only focused on collaborating capability; a narrower scope without consideration of other ITC perspectives	An empirical link drawn from this empirical finding: ITC leads to better organizational competitive advantage.
Lew et al. (2014)	Integrating dynamic and utility capabilities	IT capability is a group of three exogenous constructs: dynamic, integrating and utility capabilities.	The identification of the right IT applications for ITC was not carried out.	ITC includes: 1. Dynamic 2. Integrating capability and 3. Utility capability
	Competitive advantage	They are used to predict endogenous construct, organizational competitive advantage		
Ashrafi and Mueller (2015)	Information technology capability	IT resources contributes IT capability, IT CA and financial performance.	The identification of the right IT applications for ITC was not carried out.	An empirical link drawn from this empirical finding: ITC leads to better IT competitive advantage and improved
	Competitive advantage	Although physical IT resources generate small CA, direct impacts are demonstrated from insubstantial IT resources to IT CA and financial performance.		

Despite the research contributions described above, Sher and Lee (2004)'s findings were doubtful as it was just based on 13% of the top 100 Taiwanese organizations, leading to generalisation issues to

represent population. The present study will bridge this research gap by having a more comprehensive way by increasing sample size to 500 (Lew *et al*., 2015).

Systematic Literature Review (SLR) was used to explore and analyze previous notorious studies prior to developing research questions and theoretical model (Kitchenham *et al*., 2007). Based on SLR, IT applications enhance KM activities and the enhancement effect is controlled by various IT applications (Lew *et al*, 2013; 2014; Sher and Lee, 2004). With this, an organization will prioritize IT applications effectively and efficiently. Based on this notation, Research Question (RQ) and Hypothesis *(H1)* are then identified as:

RQ1 : *What are the IT applications having enhancement effects for achieving organizational CA?*
H1 : *Types of IT applications moderate the level of enhancement on organizational competitive advantage with Information Technology (IT) capability*

The theory is expressed visually and presented in Fig. 1. The measured indicators and their corresponding paths and errors have been left out from the figure for the sake of simplicity.

Information Technology (IT) Capability

The IT capability is a group of three exogenous constructs: Dynamic, integrating and utility capabilities (Kim, 2001; Lew *et al*., 2014; Sher and Lee, 2004; Tallon, 2008). They are used to predict endogenous construct, organizational CA and adopted in this study. The three IT capabilities are operationally adopted as follows.

Dynamic Capability

The capability to confront external challenges through organizational flexibility and the ability to integrate, build and reconfigure internal and external competencies" (Lew *et al*., 2014; Sher and Lee, 2004; Tallon, 2008; Wang *et al*., 2007).

Integrating Capability

The capability to link individual components and services for the purpose of sharing software, communication and data resources" (Kim, 2001; Lew *et al*., 2014; Sher and Lee, 2004).

Utility Capability

The capability to include IT planning, training, education, customer service and support" (Kim, 2001; Lew *et al*., 2014).

Competitive Advantage

Organizational (CA) is the endogenous construct in this model (Fig. 1). It is determined by exogenous constructs included in the model and so it is also seen as an outcome. This is perfectly acceptable in Structural Equation Modelling (SEM) and test for all hypotheses can be provided with one structural model test (Hair *et al*., 2010). CA is operationalized as "the capability of creating, storing, sharing and utilizing knowledge using dynamic capability, integrating capability and utility capability" (Ashrafi and Mueller, 2015; Bixler, 2000; Bhatt *et al*., 2010; Burca *et al*., 2006; Lew *et al*., 2013; 2014; Qi *et al*., 2008; Sher and Lee, 2004; Tallon, 2008; Tanriverdi, 2005).

H1 hypothesizes types of IT applications moderate the level of enhancement on organizational CA with IT capability.
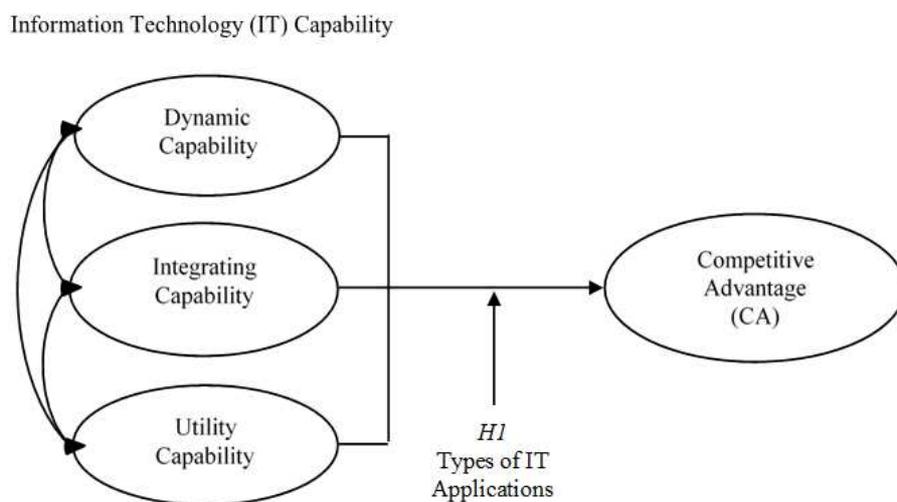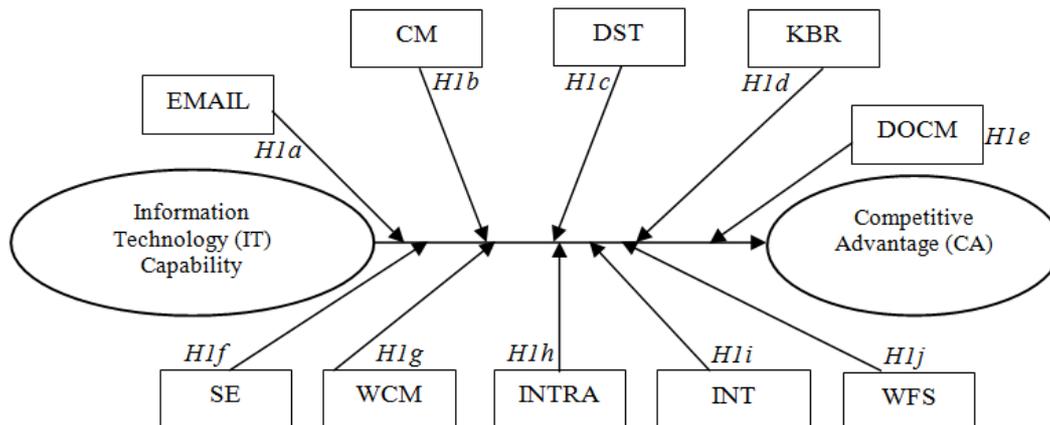

Fig. 1. The theoretical model

Fig. 2. The parsimonious model with IT applications

Methodology

This study randomly chose 500 middle managers from MSC Malaysia status companies as the target population. MSC Malaysia companies was selected for its business nature of IT and knowledge which is believed more relevant to the current scope of study (Lew *et al*., 2013; 2014; 2015) MSC is defined as:

"MSC status is recognition by the Government of Malaysia through the Malaysia Digital Economy Corporation (MDEC), for ICT and ICT-facilitated businesses that develop or use multimedia technologies to produce and enhance their products and services.
It is also a mark of world-class service and achievement and your passport and gateway to a host of privileges granted by the Government of Malaysia to the business entities" (MDEC, 2016).

The survey questionnaire designed was pre-tested by 50 middle managers and evaluated by 3 experts. The results of pilot study, suggestions and comments of experts were assessed and appropriate amendments were made.

In this study, missing data was treated by list wise deletion. Cronbach's coefficient alpha was used to confirm internal consistency reliability.

Descriptive Statistical Analysis and Structural Equation Modelling (SEM) were utilized to analyze the collected data. The indices such as "CFI (> 0.90), GFI (> 0.90), AGFI ($\geq$ 0.80), RMSEA ($\leq$ 0.08 with 95% confidence interval), X^2 (<0.05), X^2/DF (Ratio) ($\leq$ 3.0)" were used as guides to model goodness-of-fit acceptance (Hair *et al*., 2010; Kline, 2005).

Multiple group analysis was carried out to examine the moderating effects of types of IT applications towards the exogenous and endogenous constructs. The moderating effects are tested with the final structural model for two separate two-group analyzes (Garson,

1998). This study also used the parameter estimates to confirm moderation effect. Table 2 lists the hypotheses of moderating constructs.

Results

The Cronbach's Alpha measures with all above 0.70, indicating internal consistency reliabilities (Sekaran, 2003; Bowling, 2009).

500 respondents were contacted electronically for answering the questionnaire. Completed surveys were received from 302 individuals (50.3%). After treating the missing data using list wise deletion; leaving 295 questionnaires (49.2%) for analysis. Table 3 presents the gender, age, ethnicity breakdowns, position and department, number of year in the position and qualification of the respondents in this study.

A total of 295 respondents answered in this study. They were classified and analyzed by different groups such as gender, age, position, education qualification; detailed results are displayed in Table 3.

Ten IT applications were incorporated into hypothesis. The hypotheses were numbered from *H1a* to *H1j* (Table 2) as follows:

H1x: *IT Application moderates the level of enhancement on organizational competitive advantage with Information Technology (IT) capability*
H1x₀: *There is no difference on organizational competitive advantage of IT capability with IT Application*

The moderating effects of an IT application were tested by "Combined Group", "With IT Application Group" and "Without IT Application Group" for all the IT applications. For instance, testing of *H1b* "Content Management Systems" was carried out by the "Combined Group", "With Content Management Systems Group" and "Without Content Management Systems Group".

Table 2. List of hypotheses

H1:	Types of IT applications moderate the level of enhancement on organizational competitive advantage with Information Technology (IT) capability.
H1a:	Electronic mail system moderates the level of enhancement on organizational competitive advantage with IT capability.
H1b:	Content management systems moderate the level of enhancement on organizational competitive advantage with information IT capability.
H1c:	Decision support tools moderate the level of enhancement on organizational competitive advantage with information IT capability.
H1d:	Knowledge base/repository moderates the level of enhancement on organizational competitive advantage with IT capability.
H1e:	Document management tools moderate the level of enhancement on organizational competitive advantage with IT capability.
H1f:	Search engine moderates the level of enhancement on organizational competitive advantage with IT capability.
H1g:	Website content management moderates the level of enhancement on organizational competitive advantage with IT capability.
H1h:	Intranet moderates the level of enhancement on organizational competitive advantage with IT capability.
H1i:	Internet access moderates the level of enhancement on organizational competitive advantage with IT capability.
H1j:	Workflow systems moderate the level of enhancement on organizational competitive advantage with IT capability.

Table 3. Demographic profile

Demographic profile	Number	Percentage
Gender		
(Mean = 0.74; SD = 0.442)		
Male	217	26.4
Female	78	73.6
	N = 295	100%
Age		
(Mean = 3.83; SD = 1.16)		
21-25	18	6.1
26-30	123	41.7
31-35	83	28.1
36-40	45	15.3
41-45	14	4.7
46-50	12	4.1
	N = 295	100%
Ethnicity		
(Mean = 1.98; SD = 0.328)		
Chinese	138	22.5
Malays and bumiputras	62	50.2
Indians	52	18.9
Others	23	8.4
	N = 295	100%
Position		
(Mean = 1.87; SD = 0.355)		
Department head	253	13.6
Section head	40	85.8
Others	2	0.7
	N = 295	100%
Department		
(Mean = 5.92; SD = 4.311)		
IT/EDP	101	34.2
Others	65	4.1
R&D	54	2
Product development	16	5.4
Quality control/assurance	12	4.1
Finance	12	2
Engineering	11	2
Customer service	6	2
Human resource	6	3.7
Marketing and sales	6	18.3
Production	6	22
	N = 295	100%
Number of Year (s) in the position		
(Mean = 2.31; SD = 0.478)		
1-5	205	69.5
6-10	88	29.8
11-15	2	0.7
	N = 295	100%
Qualification		
(Mean = 5; SD = 0.202)		
College/diploma	6	2
University (Bachelor degree)	283	95.9
Postgraduate	6	2
	N = 295	100%

Table 4. Testing for IT application as a moderator

Path estimate	Types of IT application	Combined group	With IT application group	Without IT application group
U → CA (p value)	Email system	0.520*** (0.000)	0.275* (0.012)	0.992***(0.000)
	Content management	0.520*** (0.000)	1.116** (0.003)	0.072 (0.317)
	Decision support tools	0.520*** (0.000)	0.758* (0.037)	-0.042 (0.582)
	Knowledge base/repository	0.520*** (0.000)	0.445*** (0.000)	0.808 (0.076)
	Document management	0.520*** (0.000)	0.495** (0.003)	0.734* (0.010)
	Search engine	0.520*** (0.000)	0.245* (0.009)	0.753*** (0.000)
	Website content management	0.520*** (0.000)	0.448*** (0.000)	0.893 (0.075)
	Intranet	0.520*** (0.000)	0.984* (0.045)	0.322*** (0.000)
	Internet access	0.520*** (0.000)	0.032 (0.741)	0.797* (0.010)
	Workflow systems	0.520*** (0.000)	0.139 (0.064)	0.860** (0.001)
D → CA (p value)	Email system	0.475*** (0.000)	0.287* (0.029)	0.228*** (0.000)
	Content management	0.475*** (0.000)	0.042 (0.228)	0.457*** (0.000)
	Decision support tools	0.475*** (0.000)	0.248** (0.001)	0.112 (0.164)
	Knowledge base/repository	0.475*** (0.000)	0.581*** (0.000)	0.118* (0.027)
	Document management	0.475*** (0.000)	0.625*** (0.000)	0.263*** (0.000)
	Search engine	0.475*** (0.000)	0.486* (0.000)	0.477*** (0.000)
	Website content management	0.475*** (0.000)	0.615*** (0.000)	0.436*** (0.000)
	Intranet	0.475*** (0.000)	0.261* (0.029)	0.536*** (0.000)
	Internet access	0.475*** (0.000)	0.227 (0.075)	0.293*** (0.000)
	Workflow systems	0.475*** (0.000)	0.257* (0.047)	0.341*** (0.000)
I → CA (p value)	Email system	0.055 (0.447)	0.333 (0.117)	0.237*** (0.000)
	Content management	0.055 (0.447)	0.003 (0.131)	0.342** (0.001)
	Decision support tools	0.055 (0.447)	0.029*** (0.000)	1.035*** (0.000)
	Knowledge base/repository	0.055 (0.447)	-0.046865	0.300** (0.002)
	Document management	0.055 (0.447)	0.109 (0.279)	0.299*** (0.000)
	Search engine	0.055 (0.447)	-0.018 (0.343)	0.284** (0.003)
	Website content management	0.055 (0.447)	0.331*** (0.000)	-0.055 (0.430)
	Intranet	0.055 (0.447)	-0.004972	-0.000918
	Internet Access	0.055 (0.447)	0.558*** (0.000)	0.164* (0.013)
	Workflow Systems	0.055 (0.447)	0.246 (0.095)	0.177** (0.004)
$^1R^2$	Email System	0.528	0.396	0.915
	Content management	0.528	0.428	0.436
	Decision support tools	0.528	0.635	0.465
	Knowledge base/repository	0.528	0.396	0.915
	Document management	0.528	0.697	0.830
	Search engine	0.528	0.305	0.306
	Website content management	0.528	0.587	0.946
	Intranet	0.528	0.995	0.385
	Internet access	0.528	0.509	0.847
	Workflow systems	0.528	0.049	0.973

Table 4 lists the path estimates in of "IT Application" moderates the relationships of Utility capability (U) → Competitive Advantage (CA), Dynamic capability (D) → Competitive Advantage (CA) and Integrating capability (I) → Competitive Advantage (CA) relationships. Bolded path estimates show significant relationships and un-bolded path estimates show non-significant relationship of U → CA, D → CA and I → CA respectively.

There is one squared multiple correlation, R-squared (R^2) for endogenous construct. It is the "percent variance explained in that variable". R^2 is an indicator of the fit of distinctive equations in the structural model (Garson, 1998). For instance, looking at the R^2 values of "Email System", the "Combined Group" reported for 52.8% of the variance in CA; "With Email System" reported for 39.6% of the variance in CA and "Without Email System" accounted 91.5% of the variance in CA.

Discussion

Direct moderating effects are found from the ten IT applications on the main constructs as presented in Fig. 2.

Table 5 lists hypotheses and statistical results.

Results of *H1a* were in line with past research (Coussement and Poel, 2009; Hwang, 2012). Email exchanges are essential tools for IT capability. Client and organizational emails were proven to improve predictive performance of customer attrition (Coussement and Poel, 2009). From the Coussement and Poel (2009)'s study, by integrating emotions and information available from emails, new opportunities are generated and the purpose of retaining customers is achieved.

Table 5. List of hypotheses

	Hypothesis	Supported
H1:	Types of IT applications moderate the level of enhancement on organizational competitive advantage with Information Technology (IT) capability.	Yes
H1a:	Electronic mail system moderates the level of enhancement on organizational competitive advantage with IT capability.	Yes
H1b:	Content management systems moderate the level of enhancement on org organizational competitive advantage with IT capability.	Yes
H1c:	Decision support tools moderate the level of enhancement on organizational competitive advantage with IT capability.	Yes
H1d:	Knowledge base/repository moderates the level of enhancement on organizational competitive advantage with IT capability.	Yes
H1e:	Document management tools moderate the level of enhancement on organizational competitive advantage with IT capability.	Yes
H1f:	Search engine moderates the level of enhancement on organizational competitive advantage with IT capability.	Yes
H1g:	Website content management moderates the level of enhancement on organizational competitive advantage with IT capability.	Yes
H1h:	Intranet moderates the level of enhancement on organizational competitive advantage with IT capability.	Yes
H1i:	Internet access moderates the level of enhancement on organizational competitive advantage with IT capability.	Yes
H1j:	Workflow systems moderate the level of enhancement on organizational competitive advantage with IT capability.	

Sharing knowledge by emails was tested by Hwang (2012). Collectivist cultural orientation has moderating effects towards social norms on attitude and knowledge sharing by emails (Hwang, 2012).

One possible interpretation for this outcome obtained is that content management systems are "the tools that offer abilities to integrate, classify and codify knowledge from various sources" (Benbya *et al*., 2004). With this, integrating capability was tested "With Content Management" which subsequently improved competitive advantage.

Another interpretation for this outcome obtained is that authorized users can create knowledge anytime and anywhere from Knowledge Management System (KMS). Hence, contents of KMS must be monitor cautiously to ensure its integrity and readiness (Debowski, 2006).

Results of *H1c* supported past research (Meso and Smith, 2000; Sher and Lee, 2004). Decision support tools enhance communication between working teams especially for professionals situated far apart from each other (Meso and Smith, 2000). Furthermore, decision support tools are specifically crucial when organizations need flexibility and creativity for making speedy and unknown market structures and business rivals (Sher and Lee, 2004).

Results of *H1d* supported the findings of several past studies (Davenport and Prusak, 2000; Debowski, 2006), which stated business warehouse stored new knowledge. The stored knowledge was extensible to intellectual assets which are required to achieve sustainable CA.

One interpretation for this outcome obtained is that document management tools are among the most frequently utilized types of IT applications (Alavi and Leidner, 2001; Ngai and Chan, 2005). Furthermore, positive aspects of the document management tools were also highlighted by Jones (2012) in line with the future deployment of electronic document management systems. Although some users might see some shortcomings in the document management systems implementation, generally, the implementation was delivering benefits to organizations.

One interpretation for this outcome obtained is that "Search Engines" is not only for information searching. For instance, the search engines such as Yahoo! Search and Google are not only for information searching engines but users of such engines can utilize search engines as portals to make their business more visible online and enhance their business competitiveness (Rangaswamy *et al*., 2008).

Ford Motor Company utilized Website to redefine the auto manufacturing industry so as to gain a competitive stronghold in emergent electronic markets and get closer to its customers. The organization has established the auto-exchange mart to enable consumers get highly customized products while the organization saves substantial amount of capital in engaging auto designers, financiers, marketers and production engineers. They would also save in paying for insightful knowledge about the customers, customer needs, trends in consumer tastes and the evolution in consumer behavior. With the Website, Ford is actually creating a sustainable competitive advantage in the auto industry (Kerwin, 2000).

Results of *H1h* were in line with the findings of a study testing real time Intranet for production management (Ionesco, 1998). By using Intranet, the teamwork between geographical separated departments are enhanced. Employees' awareness has also increased on the production process.

Results of *H1i* supported Debowski (2006) and Shegda (2003)'s findings. Internet resulted in enhancement of integrating capability. Debowski (2006) discovered that Internet access is required for exchanging emails.

Results of *H1j* were in line with the findings of a previous study carried out by Reijers and Aalst (2005) which showed that workflow management systems are extensively utilized for increasing organizational performance. Substantial increase was accomplished for the sixteen researched business processes from the six Dutch organizations (Reijers and Aalst, 2005).

These results also supported the findings of Fakas and Karakostas (2004)'s study that presented the architecture of a novel workflow management system. Active directory system was proposed to obtain a list of all users participating in Web workflow processes. With the architecture, distributed workflow administration and management were facilitated. In addition, the available users would be discovered dynamically from the workflow management system (Fakas and Karakostas, 2004).

Research Implications

These findings of study would offer as guidelines to organizations on incorporating significant IT applications for organizational competitive advantage. IT applications are utilized to make information technology capability available. This study identified the ten most useful IT applications from a pool of twenty-one applications. As predicted, the results of this study implied that all the ten IT applications are essential for organizations to enhance the level of competitive advantage. In this regards, it was also found that the usage of IT applications such as content management systems, decision support tools, document management tools, email systems, Intranet, Internet access knowledge base/repository, search engine, website content management and workflow systems tend to moderate the level of competitive advantage.

Limitations and Recommendations

This is a cross-sectional design. A single-time description survey was conducted due to budget and time constraint. The survey results may reveal only a snapshot analysis of a specific point of time. Longitudinal study is recommended in future when budget and time allowed. Respondents were limited to middle managers. It could be extended to other level of positions.

Conclusion

A research model of IT applications on IT Capability (ITC) and competitive advantage was first established, measured and statistically validated. Dynamic capability, integrity capability and utility capability were validated as independent constructs. This study concludes that ten IT applications: (1) content management systems, (2) decision support tools, (3) document management tools, (4) email systems, (5) Intranet, (6) Internet access (7) knowledge base/repository, (8) search engine, (9) website content management and (10) workflow systems have moderating effects within the research model. The findings of this study provide implications of active IT applications for competitive advantage in Malaysia, as well as other multi-ethnic, multi-cultural and developing countries that wish to be IT-oriented organizations and centres.

Acknowledgement

Ethics

The author has obtained consent from respondents prior to the conduct of the survey. A detailed description of data collection was provided to the respondents to ensure respondents understand the objectives of this study. Information collected was analyzed in general and results summarized to ensure privacy of respondents and avoiding revealing information from a singular organization.

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