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EFFECT OF SUPPLY CHAIN OPERATIONAL CAPABILITIES ON THE RELATIONSHIP BETWEEN ABSORPTIVE CAPACITIES AND PERFORMANCE OF MANUFACTURING FIRMS IN NAIROBI COUNTY

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Abstract

The aim of this study was to examine the direct and indirect effect of absorptive capacity and supply chain operational capability on performance of manufacturing firms in Nairobi Kenya. Explanatory research design and random sampling technique was used to collect data with the aid of a questionnaire from a sample of 200 firms. Reliability the research instrument was tested using Cronbach alpha. In order to test the hypotheses and the mediation effect, bootstrapping procedure was followed by testing the direct and indirect effect. The finding shows the significant direct effect of absorptive capacity on both performance and supply chain operational capability. Supply chain operational capability was also found to significantly, positively and directly affect performance. Lastly the result shows that Supply chain operational capability mediates the relationship between absorptive capacity and performance, hence providing new knowledge in research literature. Marketers have to recognize the central role of logistic capability, technological capability and structural capability together with acquiring, assimilating, transforming and exploiting the available business opportunities to enhance and sustain their performance in a competitive environment.

Keywords: Absorptive capacity, Supply chain operational capabilities, performance, logistic capability, technological capability

INTRODUCTION

Performance of firms is of vital importance for stakeholders and economy at large. For investors the return on their investments is highly valuable, and a well performing business can bring high and long-term returns for their investors (Mirza and Javed, 2013). Hausman*et al*. (2003) proposed several metrics to measure performance in the Supply Chain organized around three main pillars: services, activities and speed, other authors such as Lambert &Pohlen (2001) propose indicators that are established on the basis of financial performance indicators and economic in the entire SC. From another perspective, Kleij& Smits (2003), suggest that measuring the performance of a SC should consider the fact that each company is a particular economic system and a different legal entity.

Performance measurement is an important aspect of successful SCM. Gunasekaran *et al*. (2001) described effective performance measurement as necessary for SCM. Lai *et al*. (2002) further asserted that the lack of adequate performance measurement is one of the major obstacles to efficient SCM. Since the beginning of the manufacturing era, performance measures have been important for organizations as a way of obtaining knowledge about what is happening around them. Lambert & Pohlen (2001) argue that a well-crafted system of supply chain metrics can lead to competitive advantage through differentiated services and lower costs. They also hold that implementing a supply chain strategy requires metrics that align performance with the objectives of the other supply chain members. The performance of a supply chain can be viewed as a system of measures such as quality, delivery, flexibility and cost/price. Traditional performance measure such as profitability are less relevant for measuring supply chain performance The measures and metrics (quality, delivery, cost and flexibility) considered in this proposal could also be expanded by the inclusion of more types of performance measures. The reasons for only choosing four metrics are that the measures chosen are the ones most frequently referred to by purchasing managers when selecting suppliers.

This implies that the actual contribution of SCM practices to performance may not be direct; it is probably mediated by a number of competencies and interrelated objectives (Tracey *et al.,* 2004). This study will attempt to explore whether the relationship between the supply chain operational capabilities and performance will be different when a third variable which is competitive advantage is added, which is also known as the intervention. Shrout & Bolger, 2002). The study will extend the link between absorptive capacities and performance using a mediator (supply chain operational capabilities), which might give rise to different effect beyond what might have been anticipated. This will also help decompose the effect of absorptive capacities on performance into its effects via a number of different pathways. For example, the

study intends to separate the effect of absorptive capacities and performance into different effects via supply chain operational capabilities. The manufacturing sector accounts for approximately 10 percent of Kenya's gross domestic product (GDP (Onuonga*et al.,* 2011). Kenya's manufacturing sector is among the key productive sectors identified for economic growth and development because of its immense potential for employment creation and poverty alleviation. In addition, the sector will continue to provide impetus towards achievement of Millennium Development Goals (MDGs) both in the medium and long term particularly goal one on Eradication of extreme Poverty and hunger and goal eight on Global Partnerships for Development.

The sector is expected to play a key role in the growth of the Kenyan economy. The overall goal of the sector is to increase its contribution to Gross Domestic Product (GDP) by at least 10 per cent per annum. In addition the sector is expected to register a growth of 10 per cent in the medium term period, (2008-2012) this is to be driven largely by local, regional and global markets. This study hypothesized that:

$H_{O1:}$ There is no significant effect of absorptive capacity on performance of manufacturing firms

$H_{O2:}$ There is no significant effect of absorptive capacity on supply chain operational capabilities in manufacturing firms

$H_{O3:}$ There is no significant effect of supply chain operational on performance of manufacturing firms

H_{O4} There is no significant mediation effect of supply chain operational capabilities on the relationship between absorptive capacity and performance of manufacturing firms.

LITERATURE REVIEW

Some businesses need a measurement system in order to keep abreast of customer requirements e.g. ISO 9001, ISO/TS 16949, ISO 14001. However, the establishment of measurement system requires knowledge about the processes within the organization and between customers and suppliers. To generate this knowledge the organization has to decide what performance metric to measure. As Robson (2004) stated "without the knowledge of the exact circumstances under which a measurement system either will or will not improve the performance, it is difficult to genuinely justify the additional cost of implementing a measurement system". Pagell & Krausse (2002) presented a table of performance items for assessing organizational strategy, the main idea being to describe "priority" e.g. quality (reliability, durability, conformance), delivery (speed, reliability), flexibility (volume, mix), cost (price, total cost) and innovation (process, product) as well as the focus of the manufacturing and

purchasing items. For example, quality (reliability) in manufacturing is defined as “the ability to maximize the time to product failure or malfunction” while in purchasing the “supplier selection and retention decisions are based on the ability of a supplier to provide reliable inputs”.

Lambert & Pohlen (2001) claim that most of the performance measures known as supply chain metrics are nothing more than logistic measures that have an internal focus and do not actually capture how the firm how the firm derives value and profitability from the supply chain. A supply chain performance metrics system consists of a set of parameters that can fully describe the logistics and manufacturing performance of the whole supply system, as perceived by end customers, as well as of each actor in the chain, as perceived by downstream players. However, there are several supply chain performance measures and metrics that can be assessed. Those most commonly used by practitioners as well as the most cited in research are: quality, delivery, cost/price and flexibility.

Concept Absorptive Capacities

Absorptive capability is defined as the ability to assimilate, use, adapt and change existing technologies, as well as the ability to create new technologies, and to develop new products and processes in response to a changing economic environment (Kim, 1995). It enables firms to gain and to sustain a competitive advantage, and has become one of the most significant constructs in the last twenty years. AC allows a firm to use knowledge from the external sources through four sequential elements: acquisition, assimilation, transformation, and application capabilities (Camisón and Forés, 2010). Acquisition capability is referred as the recognition and understanding of new potentially valuable external knowledge through exploratory learning (Zahra and George, 2002). Assimilation capability is defined as the processes and routines that assimilate new knowledge through transformative learning (Camisón and Forés, 2010). Transformation capability is a firm's capability to create new knowledge and commercial outputs through exploitative learning (Kogut and Zander, 1992). Application capability enables firms to incorporate transformative knowledge into their operations and routines and to create leverage for new operations, competences, routines, goods and organizational forms (Zahra and George, 2002; Camisón and Forés, 2010)

Supply Chain Operational Capabilities

Capabilities are generated by sets of skills and resources to contribute to value-added tasks (Hart, 1995). Fundamentally, capability and asset have a mutual connection with each other. However, capability is slightly different from asset, in terms of its inability to provide monetary value, tangible plants and equipment to a firm, and also it cannot be traded and imitated

(Dierickx, Cool and Barney, 1989; Day, 1994). Capability can also be referred as "the exploitation of specific practices to attain performance gains" (Narasimhan, Swink and Kim, 2005). It can be concluded that capability and practice are different in several aspects because various plants are feasible to invest equally in practice, but they do not have the same degree of capability to achieve a good manufacturing performance outcome (Narasimhan *et al.,* 2005).

Capability in general is a new concept, very applied in the literature but with little consensus about what it really means. It is generally accepted that every firm has a set of capabilities, those let the firm perform a unique entity. Operational capabilities are firm-specific sets of skills, processes, and routines, developed within the operations management system, that are regularly used in solving problem process (Flynn *et al*. 2010). The operations performance is normally associated with competitive criteria (quality, cost, flexibility and delivery). Last decades, authors as Wheelwright (1984), Miller and Roth (1994), Ward *et al*. (1998), McKone*et al*. (2001), Boyer and Lewis (2002) and Swink*et al*. (2007) have presented studies with little variation about this approach

Absorptive Capacity, Supply Chain Operational Capability and Firm Performance

Firms need capability from overall operations, including cooperation and reconfiguration (Flynn et al., 2010; Wuet al., 2010). The capabilities that enable firms to cope with uncertainty and gain a competitive advantage through supply chain responsiveness are imperative. In fact, the operation encompasses all facets of firm's activities directed toward producing a product or rendering a service. The operational capability allows the respective manufacturing systems to become highly responsive in terms of equipment, material and labour (Wu et al., 2010). Operational capabilities are "firm-specific sets of skills, processes, and routines, developed within the operations management system that are regularly used in solving its problems through configuring its operational resources" (Wu et al., 2010, p. 726).

The operational cooperation (OC) is the ability to coordinate all related parties to work together as a whole to exchange information and develop a shared definition of the solution needed (Flynn and Flynn, 1999). In addition, the operational reconfiguration (OR) is about reshaping (investing and divesting) operations resources in order to catch up with environmental changes (Wu et al., 2010). SCM and operational capability continue to play critical roles in influencing a firm's ability to compete in the market. Studies are increasingly looking across the supply chain, beyond their encompassing concept, to establish the link between operations and SCM (Robb et al., 2008; Chen and Kim, 2007; Zhang and Dhaliwal, 2009; Oliva and Watson, 2011), with the aim of creating a seamless flow of goods/services and information from suppliers and operations to the customers. However, to the best of the authors' knowledge, the

linkages between SCI and operational capability have not yet been addressed explicitly and modeled collectively.

Indeed, previous studies have found there is a link between absorptive capacities, supply chain operational capabilities and performance (Tan, 2002; Min and Mentzer, 2004; Li et al., 2005; Chow et al., 2008; Chong et al., 2011; Cook et al., 2011). For example, Li et al. (2005) suggested an overarching overarching framework to address downstream, internal and upstream sides of the supply chain.

METHODOLOGY

Research Design

Explanatory research design was used in this study as it was found ideal to describe the characteristics of the variables and at the same time investigate the cause effect relationship between variables.

Study area and Target Population

The target population of this study was 400 registered manufacturing firms in Nairobi County (KAM, 2016). The study targeted management's team in marketing department who included two senior managers because they are perceived to have more knowledge and information of any activities that involve supply chain in the firm.

Sample Size

From the target population of 400 manufacturing firms in Kenya, a random sample of 200 firms was selected. The study used Yamane (1967) simplified formula to calculate sample sizes as shown below;

$$n = {}^{N}/_{1 + N_{e^2}} = {}^{400}/_{1 + 400_{0.05^2}} = 200$$

Where n=sample size, N=population size, e=the error of sampling.Using the formulae the study obtained a sample size of 200 firms where two (2) senior managers in marketing/procurement department selected from each firm, thus providing a sample size of 400. The study then used random sampling technique to select the firms sampled.

Reliability of Research Instrument

The variables was tested for reliability by computing the Cronbach alpha statistical tests where reliability coefficients around 0.90 was considered excellent, values around 0.80 as very good and values of around 0.70 as adequate (Koul, 2005). The piloting of the questionnaire was done

to identify faults hence improve its reliability.. Cronbach Alpha was established for every objective which formed a scale. The table below shows that logistic capability had the highest reliability (α=0.837), followed by technology capability (α=0.774), assimilation capacity (α=0.762),transformation capacity(α=0.741), structure capability (α=0.71), firm performance (α=0.717) and acquiring capacity (α=0.655). Other than acquiring capacity, the other scales were reliable as their reliability values exceeded the prescribed threshold of 0.7.

Table 1. Reliability analysis

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
acquiring capacity	0.655	0.701	8
transformation capacity	0.741	0.73	9
assimilation capacity	0.762	0.756	10
exploitation capacity	0.772	0.774	7
Logistics capability	0.837	0.84	10
Technology capability	0.774	0.78	9
structure capability	0.71	0.678	10
firm performance	0.717	0.76	8

Measurement of Variables

Dependent variable

For this study, the measurement scales and the indicators was adopted from previous studies. Performance was measured using 7 items derived from **(**Delaney and Huselid 1996). They include market share, market growth, sale growth, customer retention, satisfaction, reputation and profitability.

Independent variables

Absorptive Capacity Constructs (Representative References: Zahra and George 2002; Cohen and Levinthal 1994; and Todorava and Durisin 2007), Creating new supply chain knowledge is highly valued by our organization, In general, we are able to see how new supply chain practices might transform the way we operate our own business, analyze the potential usefulness of new supply chain ideas from external resources, allocate a noteworthy amount of our revenues to the gathering of new supply chain information, extensive experience in gathering supply chain data from external resources, invested significantly in activities that will

speed up its ability to gather information about new supply chain practices.. Allocate a significant amount of revenues into R&D activities that are utilized in supply chain applications. Potential absorptive capacity refers to the first two dimensions of absorptive capacity: acquiring and assimilating external knowledge. While acquisition covers the capability of a firm to identify and acquire external knowledge in a continuous search process by which external environments are constantly monitored to recognise opportunities for the firm (Pedrosa, Välling& Boyd, 2013), Knowledge acquire and assimilate capacity, even defined potential absorptive capacity by Zhara and George (2002), refers to firm's ability to search, identify, evaluate alternative sources of knowledge and assimilate it. It is measured trough the organizational capacity to collect information from customers, suppliers and third parties such as R&D institutions, management or technical consultants. Knowledge transform and exploit capacity, even defined realized absorptive capacity by Zhara and George (2002), corresponds to firm's ability to transform assimilated knowledge into organization skills and routines, and secondly to transform and exploit this knowledge into new products and services. It is measured assessing the organizational capacity to store newly acquired knowledge, to internalize it into organizational strategies, operative activities and common language in order to better exploit external knowledge.

Mediator

Logistics capability was measured using 10 items derived from Shang and Marlow (2007) they include utilizing time-based logistics solutions, active programmes to capture the experience and expertise of individuals, integrates operations with customers and/or suppliers by developing interlocking programmes and activities, Logistics information systems, effectively shares operational information between departments, share both standardized and customized information externally with suppliers and /or customers, active programmes to enforce standardized logistical performance.

Technology capability was measured using 9 items adopted and modified from Agan (2011) and Nielsen and Momeni (2016) such as direct computer-to-computer links with our key supply chain partners**,** IT system is compatible with those of our supply chain partner**,** IT system can be seamlessly connected with those of supply chain partners transmit information to our major customers electronically and receive information from our customers electronically

Structural Capability (Nielsen and Momeni, 2016), Strategy And Goals, Managerial Capacity**,** Management Style, Stability of Management**,** Resource Availability**,** Flexibility Cultural Capacity Diversity ,Risk Acceptance , Communication Network, Communicative Capacity

Cooperation with others, Organizational Learning, Organizational Knowledge Capacity, Knowledge Storage , Knowledge Absorption

ANALYSIS AND FINDINGS

The study distributed 400 questionnaires to 200 manufacturing firms. Out of which 400 questionnaires from 382 were returned. However, of the 382 returned, a total of 376 were reasonably and adequately completed representing approximately 94% response rate.

Descriptive statistics

Table 2 highlights the results on data transformation and scoring. Basing on the results, firm performance had the highest numerical mean (mean = 3.6706) while exploitation capacity the lowest mean (mean = 3.3756). The results imply that the manufacturing firms have exhibited a degree of satisfaction concerning factors such as the sales margin and growth in profits. On the other hand, there is less demonstration of translation of external knowledge into the business applications. Further, Skewness and Kurtosis values were used to test for normality distribution. From the results, the values of Skewness and kurtosis revealed that the data was normally distributed where the values were well below the threshold of +/- 10.

Table 2. Data transformation and scoring

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness
Acquiring capacity	376	1.13	4.88	3.6286	0.73328	-1.027
Assimilation capacity	376	1.5	5	3.5661	0.81687	-0.606
Transformation capacity	376	1.44	5	3.573	0.78943	-0.745
Exploitation capacity	376	1.57	4.86	3.3756	0.76558	-0.455
Operational capabilities	376	1.23	4.8	3.5638	0.66658	-1.507
Firm performance	376	2	5	3.6706	0.59429	-0.548

Correlation analysis

Correlation coefficients are the statistical method utilized to explore the six variables: firm performance, acquiring capacity, assimilation capacity, transformation capacity, exploitation capacity and Supply Chain operational capabilities. The results of the correlation analysis are presented in table 3. The correlation between acquiring capacity and firm performance was

significant, r = 0.684, P < 0.01. The correlation between assimilation capacity and firm performance was also significant, r = 0.694, P < 0.01. Moreover, the correlation between transformation capacity and firm performance was significant, r = 0.674, P < 0.01. In addition, there was a significant correlation between exploitation capacity and firm performance, r = 0.537, P < 0.01. Also, the correlation between operational capabilities and firm performance was significant, r = 0.752, P < 0.01.

Table 3. Correlation analysis

	firm performance	acquiring capacity	assimilation capacity	transformation capacity	exploitation capacity	operational capabilities
firm performance	1					
acquiring capacity	.684**	1				
assimilation capacity	.694**	.851**	1			
transformation capacity	.674**	.800**	.841**	1		
exploitation capacity	.537**	.604**	.679**	.518**	1	
operational capabilities	.752**	.836**	.846**	.837**	.709**	1

** Correlation is significant at the 0.01 level (2-tailed).

Hypotheses Testing

Finally, the overall model was assessed by first assessing the indirect effects and the total effects while controlling for age and employees. This was meant to offer means of testing the hypothesis that absorptive capacities do not significantly affect supply chain operational capabilities, absorptive capacities do not have an indirect and significant effect on firm performance, supply chain operational capabilities do not have an indirect and significant effect on firm performance and absorptive capacities do not significantly affect firm performance. The findings were presented in Table 4 related figure. The findings show that the independent variable absorptive capacities versus the mediator supply chain operational capabilities shows that absorptive capacities have a positive and significant effect on supply chain operational capabilities, 0.8814, p-value = 0.000. The model accounts for 83.26% (R-squared = 0.8326) of the variation in supply chain operational capabilities and significant, F = 74.3788, CI [0.3130,

0.6342] with a standard error of 0.0205. This means that with each unit increase in absorptive capacities, operational capabilities increases by 0.8814 units. Age has a positive and significant effect on operational capabilities, 0.0192, p-value = 0.045 while employee has a negative effect on operational capabilities, -0.0525, p-value = 0.004.

With regard to the indirect effect on firm performance, supply chain operational capabilities have a positive and significant effect on firm performance, 0.4606, p-value = 0.000, CI [0.3167, 0.6045] with a standard error of 0.0732 and implies that each unit increase in supply chain operational capabilities indirectly increases firm performance by 0.4606 units. In addition, absorptive capacities have a positive effect on firm performance, 0.2258, p-value = 0.001, CI [0.0868, 0.3649] with a standard error of 0.0707 and indicates that each unit increase in absorptive capacities indirectly results in 0.2258 unit increase in firm performance. Age and employee do not have significant effects on firm performance. However, the model was not significant, R-squared = 0.5815, F = 128.888.

Finally, the total effects model showed that absorptive capacities have a positive and significant total effect on firm performance, 0.6318, p-value = 0.000, CI [0.351, 0.4845] with a standard error of 0.0305 and shows that a unit increase in absorptive capacities results in 0.6318 unit increase in firm performance. The normal tests for specific indirect effect showed that supply chain operational capabilities significantly and positively mediate the relationship between absorptive capacities and firm performance.

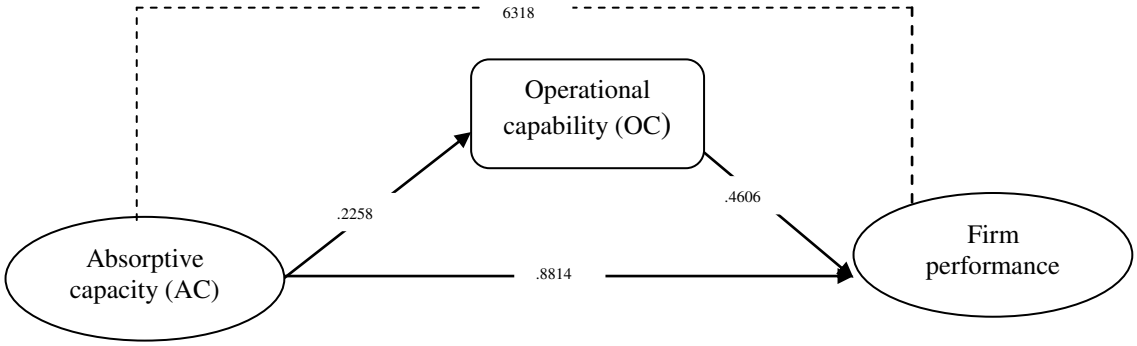
Table 4. Overall model

	Coeff	se	T	p	R-Sq	f	LLCI	ULCI
AC·····▶ OC	.8814	. 0205	42.914	.000	.8326	74.3788*	.3130	.6342
Age- - -▶OC	.0192	.0096	2.008	.045			.8410	.9217
Employee - · -▶ OC	-.0525	.0183	-2.872	.004			.0004	.0380
OC - · -▶ FP	. 4606	.0732	6.293	.000	.5815	128.888	.3167	.6045
AC - · -▶ FP	.2258	.0707	3.193	.001			.0868	.3649
Age- · -▶ FP	.0159	.0136	1.172	.242			-.0108	.0426
Employee - · -▶ FP	.0272	.0261	1.042	.298			-.0241	.0785
Total Effect								
AC- · -▶ FP	.6318	.0305	20.743	.000	.5369	50.759	.351	.4845
Age- · -▶FP	.0248	.0142	1.745	.081			-.015	.0535
Employee- · -▶FP	.0030	.0271	.112	.911			-.075	.0567

Normal theory tests for indirect effect

Effect	se	Z	p
.4060	.0652	6.2251	.0000

Figure 1. Model estimation



DISCUSSION OF THE FINDINGS

Acquiring capacity of manufacturing firms has been shown to have a positive and significant effect on firm performance. Transformation capacity exhibited a positive and significant effect on firm performance. The study has established that assimilation capacity has a positive and significant effect on firm performance. Exploitation capacity has exhibited a positive and significant effect on firm performance.

CONCLUSION

There is overwhelming evidence from the study indicating that the acquiring capacity of manufacturing firms results in improved firm performance. It is however important to establish the type of knowledge to be acquired by a firm.

Furthermore, transformation capacity enhances firm performance. Idea generation and identification of opportunities by firms in their sector lends credence on transformation capacity. As well, firms can examine themselves and the prospects of competitors thus facilitating innovation that drives firm performance.

The study has established that assimilation capacity has a positive and significant effect on firm performance. Assimilation capacity relates to innovations and development of new products that improve firm performance.

Regarding exploitation capacity, the firms emphasize on acquiring new knowledge and adapting it in accordance with new knowledge. Specifically, external information is directly translated into the business applications.

RECOMMENDATIONS

It is therefore crucial for firms to diverse into related technological and knowledge domains so that there is adequate level of knowledge relatedness between the extant knowledge and the acquired knowledge.

New knowledge needs to be linked with new insights and be made readily available in the firms. Also, it is important for the management to have monthly discussions with external advisors to have knowledge on the current trends in the market.

For firms to fully capitalize on their assimilation capacity and enhance their performance, the management needs to emphasize on cross-departmental support to solve problems and have a quick information flow.

There should therefore be a systematic and organized routine that allows firms to continuously exploit knowledge over long periods of time to create innovative goods and penetrate new markets.

FURTHER RESEARCH

First, this study has opened an insight into the factors influencing the performance of manufacturing firms in developing countries thus expanding on previous literature that has focused mainly on developed countries. It has opened up further research avenues to compare and contrast these results with firms in other sectors of other developing or developed countries.

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