Information and Knowledge Management
ISSN 2224-5758 (Paper) ISSN 2224-896X (Online)
Vol.7, No.4, 2017
www.iiste.org

The Impact of Mental Models as a Construct of Organizational Learning on Competitive Advantage in Kenya's Oil Marketing Sector

Daniel Jonathan Mturi[1], Dr Joseph N. Kamau[2], Dr. Damary Sikalieh[3]

[1] Doctor of Business Administration candidate, United States International University-Africa, Nairobi, Kenya

[2]Assistant Professor of Marketing, United States International University-Africa, Nairobi, Kenya

[3]Associate Professor of Management, Business Research Methods and Entrepreneurship, United States International University-Africa, Nairobi, Kenya

Abstract

Introduction: Despite the growing popularity of organizational learning (OL) and its constructs, the concept remains complex and vague for researchers as well as managers. Mental models are inherently difficult to study and several methods have been developed that essentially document a mental model in the form of a mind map or concept diagram. **Objective:** This study aimed to determine the impact of mental models as a construct of organizational learning on competitive advantage in Kenya's Oil Marketing Sector. The latent aspects of competitive advantage; organization agility, innovation, barriers to entry, mass customization and inimitability (difficulty to duplicate) were investigated against the independent variable. **Methodology:** The research design was explanatory, non-contrived and cross-sectional study on Kenya's oil marketing sector. A sample size of 425 was drawn from oil marketing companies that had a market share above 1% according to the Petroleum Institute of East Africa. Structured questionnaires were used as the data collection tool. Correlation, regression and SEM model were used to analyze the study findings. **Findings:** The study found that mental models significantly predicted competitive advantage which indicated rejection of the null hypothesis.

Keywords: *Organizational Learning, Mental Models, Competitive Advantage, Oil Marketing Sector.*

1.0 INTRODUCTION

1.1 Background of the Study

Organizational learning is a concept with many definitions. There has been some disagreement in the literature over whether learning is a process or an outcome although much of the empirical quantitative research tends to conceptualize learning as a behaviour or process that leads to improved performance outcomes (Kayes & Burnett, 2006). One way of getting into the minds of individuals in organizations and enhancing the link between individual and organizational learning is through understanding the concept of a mental model (Rook, 2013). Mental models aid managers in the strategic planning process and solving the complex problems that corporate decision makers face (Creative Advantage Inc, 2016). In mental models, the assumptions held by individuals and, by proxy the organization; need to be challenged so as to facilitate the process of organizational learning. Individuals tend to espouse theories that they intend to follow, and theories-in-use that they actually do (Cuccureddu, 2013). In the absence of an alternative to mental models, our cognitive systems would be too overloaded with data to function successfully. The great benefit of mental models is their ability to simplify complex situations and distribute (devolve) decision making so that a large number of people in a company can make decisions day in and day out without having to coordinate each of them with everyone else in the organization (Creative Advantage Inc., 2016). Mental models help focus the business on the top-line product value and they help deliver greater value to an organization's customers (Young, 2008).

Senge (1990) stated that mental models are hypotheses and generalizations that influence both the individual's comprehension of and interaction with the world and that often, individuals are not aware of their mental models and the influence they have on their behaviour. For example, mental models of a firm's strategies are a critical element of specific management knowledge (Xu, 2011). Advancing our understanding about mental model accuracy and how an organization performs is important (Gary & Wood, 2011). Gary and Wood further state that there has been very little empirical research on whether managers' accurate mental models actually support superior organizational performance. Mental models that are supportive to business environment shorten the decision making cycle and may be a source of competitive advantage through organizational agility. At the root of mass customization benefits is giving end-users virtually limitless choices, and mental models need to be in tune with understanding choice offering for employees to offer would-be customers the same in product design stage (Pine, 2016). With regard to sustaining innovation in the organization and progressing from a chance occurrence to routine capability, it has to be accepted as a repeatable and embedded process in the mindsets of employees within the organization. This touches on their mental models (Kelley, 2016).

Senge (1990) opined that mental models must be managed because they can affect manifestation of competitive advantage by preventing novel powerful insights and organizational practices from becoming implemented. The entire process of managing mental models begins with self-reflection; unearthing deeply held belief structures and generalizations, and understanding how they dramatically influence the way we operate in our own lives. Unless there is comprehension and an emphasis on frankness, tangible beneficial change is not possible (Mason, 2016).

1.2 Problem Statement

There is growing evidence that the existence of shared mental models among the members of a work team has a positive effect on organizational processes and effectiveness (Druskat & Pescosolido, 2002). Theory and research on shared mental models have focused on establishing that the higher the convergence in member mental models (i.e. the more 'shared' the model), the better the organization will perform (Rouse et al., 1992). Rouse et al. (1992) further stated that since mental models represent the assumptions held by individuals in an organization, collectively, these collective mental models ultimately determine how an organization 'thinks' and 'acts', they can be a barrier to organizational learning. A contrary view is that while affecting both decision making and implementing strategic orientation, mental models can damage overall organizational development and be a barrier to establishing competitive advantage aspects of organizational agility, innovativeness, barrier entries, mass customization and inimitability (Magzan, 2012).

Although mental model accuracy of the business environment is positively correlated with performance (Gary & Wood, 2011), it still remains to be directly associated with competitive advantage. Frequently, organizational changes fail to be implemented as a consequence of conflicts they generate with powerful pre-existent mental models (Mason, 2016) therefore if counter-productive mental models are held they may adversely affect the organization and its competitive advantage. The study of mental models is essential to understanding why some organizations and not others adopt certain strategies that ultimately give them competitive advantage (Gary & Wood, 2011). This study sought to establish the relationship that mental models have with competitive advantage in Kenya's Oil Marketing sector and to dispel with the ambiguity and diverse view-points carried in literature as to the hypothesized relationship.

1.3 Purpose

The general objective of this study was to determine the impact of mental models as a construct of organizational learning on competitive advantage in Kenya's Oil Marketing Sector.

1.4 Hypothesis

$H_{0:}$ Mental models have no significant relationship with competitive advantage

H_1: Mental models have a significant relationship with competitive advantage

2.0 LITERATURE REVIEW

Introduction

This study operationalized mental models according to studies by Oudejans et al. (2013) and Song, Baek-Kyoo and Chermack (2009) whereby mental models were seen to be measureable by manifestation of behaviour such as people within the organization openly being able to discuss mistakes in order to learn from them; employees helping each other learn; individual (personal) stand points about specific jobs having a strong effect on how the job is done; employees being able to frequently adjust standpoints and ideas about their jobs via consultations with experts; employees being able to discuss standpoints with their colleagues; the organisation facilitating an environment for building trust; employees being encouraged to ask each other what their thoughts are; employees being rewarded for learning; openly providing feedback; employees holding strong mental images on how the organization operates and; whether the images individual employees hold limit them to familiar ways of thinking.

Mental models are depictions of reality that people use to comprehend specific occurrences. They denote deeply embedded moulds or generalizations that influence how people understand the world and how action is taken. These deeply held internal images of how the world works evolve over time through the process of socialization, including education, experience and interaction with others (Magzan, 2012). Mental models are very often hidden and individuals may not consciously be aware of their own mental models or the effects they have on their behaviour. Once created, they become static and reinforced in the mind, becoming difficult to change (Senge 2004). The function of mental models is to 'mediate reality for our minds and help us categorize and organize an endless stream of information we take every day' (Magzan, 2012).

Building a learning organization requires that employees are encouraged to be open and personally assess and scrutinize deeply held opinions and views. Open debate that allows real dialogue between individuals is the method advocated to test personal assumptions and beliefs (Caldwell & Fried, 2011). When individual mental models change, they change through drift, disruption, or design. Drift occurs naturally over time as a person adds to experience. Disruption happens when a significant event not accounted for within the existing model occurs, forcing a change. Drift and disruption are implicit, as the individual remains unaware of a change to the model.

Design occurs when a person applies conscious thought to modifying the existing mental model, and is therefore explicit (Vivian, 2007). Vivian further posited that shared mental models end up producing a common understanding by individuals within an organization. This however, is not the sum total of the individual mental models, but rather the agreed upon framework of organizational culture that is incorporated into each individual model. Such shared understandings support learning and act as the canvas for new organizational knowledge development. With this shared mental model, the organization achieves alignment when it gains wide acceptance within the firm and the members of the organization strive with a common purpose toward the same goals.

For learning to occur, new information will only be addressed in any meaningful way if a difference between the currently held mental model and the newly perceived apparent reality occurs. This is prompted by an appropriate stimulus which causes the individual mental model to be adjusted, hence reflecting the new information and developing it into knowledge (Davison & Blackman, 2005). Although mental model accuracy of the business environment is positively correlated with performance (Gary & Wood, 2011), it still remains to be directly associated with competitive advantage. Frequently, organizational changes fail to be implemented as a consequence of conflicts they generate with powerful pre-existent mental models (Mason, 2016) therefore if counter-productive mental models are held they may adversely affect the organization and its competitive advantage.

Synergistic knowledge growth enables individual members of an organization to assimilate varied information obtained from their peers. Conversely, a large amount of diverse information and knowledge may create

information overload, so that the individual needs to distinguish core concepts from peripheral concepts through gradual learning to efficiently and effectively process this information and knowledge (Xu, 2011). Synergistic knowledge development is an active learning process whereby collective knowledge develops through the discussion and integration of the individual perspectives (mental models) of a specific information domain (Nonaka, 1994).

Shared mental models improve team effectiveness by accelerating team members to form resonance and right foresight of their job, leading to the coordination among members (Xiao & Jin, 2010). Shared mental model (SMM) theory posits that members of a team must have a shared understanding of their tasks and roles to maximize team effectiveness (Evans & Baker, 2012). Evans and Baker further opined that by enabling individuals to describe, explain, and predict events in their environment, mental models facilitate sense-making and reduce situational uncertainty since parameters of interpretation, regardless of situational occurrence in the environment have already been mentally set.

Though the concept of a mental model is somewhat ambiguous, through comparison and close attention to the definitional aspects of the concept, it can be argued that there is some consensus in the concept being internally held and as having the capacity to affect how a person acts. Therefore, these aspects are important for consideration when attempting to understand what a mental model is (Rook, 2013) and eventually measuring it. Rook further made the observation in the study that not only were management and staff mental models within the same organization different when compared, but individuals within the two researched participant groups were discovered to have different mental models. The study also observed that within management, individuals had different understandings of the prevailing work practices.

Mental models are a means by which organizations and individuals create and share meaning, thereby enabling a common understanding and the development of knowledge (Pruzan, 2001) and new mental models. If this new mental model supports innovative knowledge development then the organization can be creative, however, if, for any reason, the mental model does not support innovative knowledge development, it is likely that the team will not achieve innovation in its outputs (Davison & Blackman, 2005). Davison and Blackman further stated that organizations that seek to establish a competitive advantage employ people with high levels of knowledge and skills and use them as a foundation for the ongoing development of knowledge and skills relevant to the work.

3.0 METHODOLOGY

The study was based on positivism as it relied on experimental and non-manipulative methods. The study used the quantitative approach as the research was independent of what is observed, seeking to realize objectivity as far much possible. Both census approach and proportionate stratified probability sampling were used for appropriate presentation of the target population. The data was collected from employees of 19 petroleum companies that were listed by the Petroleum Institute of East Africa (PIEA) and that had a market share of 1% and above. The target population was 1,585 employees of whom 111 belonged to senior management and 1,474 belonged to various administrative non-senior positions. The study carried out a census on senior management and utilized Yamane (1967) random sampling on the remaining 1,474 employees. Information was collected by way of questionnaires.

The research targeted to collect data from a sample of 425 top management and employees of 19 Oil Marketing Companies (OMC) with a regional 1% market share and above as captured by the Petroleum Institute of East Africa (PIEA). However, the study did not achieve a response of 100% as there was some non-response incidences Therefore, out of the 425 targeted managers and employees, 368 gave adequate information through answering the questionnaires completely and returned the questionnaires accordingly. However, 57 respondents did not give response to the study making a non-response of 13%. Thus, the study realized a response rate of 87%.

4.0 FINDINGS

The study was guided by the hypothesis:

$H_{0:}$ Mental models have no significant relationship with competitive advantage

H_1: Mental models have a significant relationship with competitive advantage

The analysis was necessary to inform the researcher whether to accept or reject the null hypothesis.

4.1 Factor Analysis Results for Mental Models

Factor analysis was used to reduce the items of mental models. Factor analysis results for mental models showed that KMO had a value of 0.865 and Bartlett's test, $x^2(11, N = 368) = 180.553$, $p = .000$. The results are presented in Table 1.

Table 1: KMO and Bartlett's Sphericity test for Mental Models

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.865
Bartlett's Test of Sphericity	Approx. Chi-Square	180.553
	df	11
	Sig.	.000

The study findings presented in Table 2 give the Eigen values for the factors under mental models. According to the findings, the first factor accounts for 55.735% of the variance, second factor accounts for 17.913% while the third factor accounts for 13.143%. All the remaining factors were found to be not significant hence were dropped.

Table 2: Total Variance Explained for Mental Models Construct

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.131	55.735	55.735	6.131	55.735	55.735
2	1.970	17.913	73.648	1.970	17.913	73.648
3	1.446	13.143	86.791	1.446	13.143	86.791
4	.706	6.417	93.209			
5	.270	2.455	95.664			
6	.258	2.350	98.013			
7	.166	1.513	99.526			
8	.046	.422	99.948			
9	.006	.051	99.999			
10	.000	.001	100.000			
11	017	016	100.000			

Extraction Method: Principal Component Analysis.

The study, further, showed that among the eleven items used to measure mental models, the item, “In my organization, people openly discuss mistakes in order to learn from them” had the highest factor loading of 0.956 in the first component. I discuss standpoints with my colleagues had the highest factor loading of 0.755 in the second component while The images I hold limit me to familiar ways of thinking had the highest factor loading of 0.554 in the third component. The results are presented in Table 3.

Table 3: Component Matrix for Mental Models

	Component		
	1	2	3
MM1	.956	.045	.023
MM2	.842	.443	.122
MM3	.706	-.569	.377
MM4	.768	-.356	.508
MM5	.504	-.755	-.260
MM6	.955	.021	.017
MM7	.527	.310	-.732
MM8	.776	-.002	-.397
MM9	.877	.343	.129
MM10	.705	.481	.110
MM11	-.331	.554	.491

Extraction Method: Principal Component Analysis.
a. 3 components extracted.

4.2 Descriptive Statistics for Mental Models

The study also sought to analyze the views of the respondents on mental models using a table of means and standard deviations. Using a Likert scale, data was collected rating the views on a scale of 1 to 5 where 1 represented strongly disagree whereas 5 represented strongly agree. The results from the collected responses were analyze based on means and their standard deviations to show the variability of the individual responses from the overall mean of the responses for each aspect of mental models. The mean results were therefore given on a scale interval where a mean value of up to 1 was an indication of strongly disagree; 1.1 – 2.0 was disagree; 2.1 – 3.0 was neutral, 3.1 – 4.0 was agree and a mean value of 4.1 and above was an indication of strongly agree.

The findings of the study indicated that the respondents strongly agreed with the following statements; I often adjust my standpoints and ideas about my job via consultations with experts, my stand points about my job have a strong effect on how I do my job, feedback is provided openly, in my organization, people help each other learn, in my organization, people openly discuss mistakes in order to learn from them, my organization facilitates an environment for building trust and I hold strong mental images on how my organization operates. The respondents agreed with the following statements; I discuss standpoints with my colleagues, we are encouraged to ask each other what we think, we are rewarded for learning and the images I hold limit me to familiar ways of thinking. The findings are as shown in Table 4.

Table 4: Mean and Standard Deviation for Mental Models

Mental Models	N	Mean	Std. Deviation
MM1	368	4.35	.861
MM2	368	4.26	.946
MM3	368	4.18	.715
MM4	368	4.17	.702
MM5	368	4.12	.692
MM6	368	4.08	.663
MM7	368	4.07	.718
MM8	368	3.99	.611
MM9	368	3.91	.753
MM10	368	3.34	.648
MM11	368	3.05	.990

4.3 Correlation between Mental Models and Competitive Advantage

Correlation was used to test the strength of the relationship between mental models and competitive advantage. The results for correlation analysis between mental models and competitive advantage indicated that the two variables were strongly correlated r (368) = .947, p < .000. The results are presented in Table 5.

Table 5: Correlation between Mental Models Index and Competitive Advantage

		Mental Models
Competitive Advantage	Pearson Correlation	.947**
	Sig. (2-tailed)	.000
	N	368

4.4 Regression Testing for Mental Models and Competitive Advantage

The study sought to establish the relationship between mental models and competitive advantage. The following hypothesis was therefore tested:

$H_{o:}$ Mental Models have no significant relationship with competitive advantage

H_1: Mental Models have a significant relationship with competitive advantage

The regression results show that mental models explained 89.6% significant proportion of variance in competitive advantage, R^2= .896, F (1, 368) = 31.433, p<0.01. The results are presented in Table 6.

Table 6: Model Summary for Mental Models

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.947[a]	.896	.896	.12055

a. Predictors: (Constant), Mental Models

The study found that mental models significantly predicted competitive advantage, β = .947, t (368) = 56.200, p< .000. These results indicated rejection of the null hypothesis. Thus, mental models have a significant relationship with competitive advantage. The results are presented in Table 7.

Table 7: Coefficients for Mental Models

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.255	.052		24.279	.000
	Mental Models	.729	.013	.947	56.200	.000

a. Dependent Variable: Competitive Advantage

The findings imply that for every unit change on mental models, competitive advantage increases by 0.729 hence depicting a positive and significant relationship between mental models and competitive advantage. Time was also used as a moderating variable to determine whether it had an influence on the significant relationship between mental models and competitive advantage. The findings obtained showed that β = .980, t (368)= 67.210, p< .000. This implied that time was an important factor in influencing mental models effect on competitive advantage.

4.5 SEM Model Results

The study sought to determine the relationship between mental models and competitive advantage. The following hypothesis was tested.

$H_{4:}$ Mental Models contribute to an organization's competitive advantage

Figure 1 shows the path coefficients for the relationship between mental models and competitive advantage. The path coefficients were positive and significant at 0.05 level of significance. Path coefficient beta values were (β = 0.942, β = 0.347, β = -0.190, β = 0.903 and β = 0.965) for agility, barriers to entry, inimitability, innovation and mass customization respectively. The overall β coefficient was 0.806 implying that for every 1 unit increase in mental models, competitive advantage is predicted to increase by 0.806.

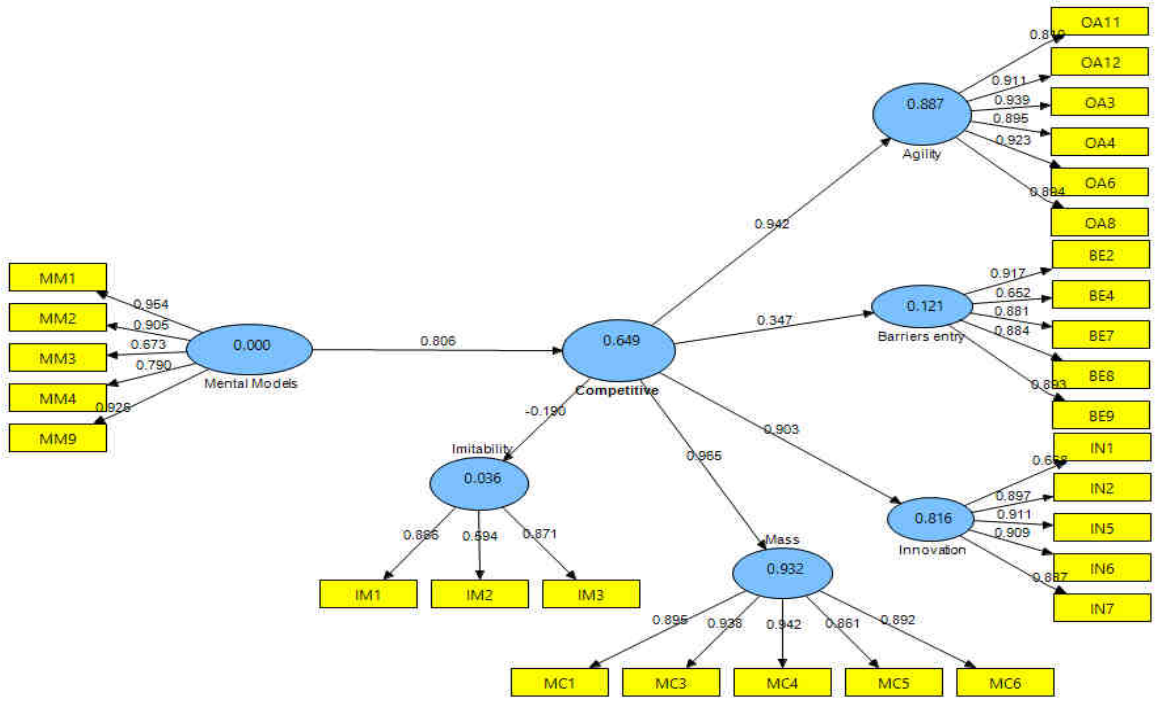

Figure 1: Path coefficients for the relationship between MM and CA

T values for mental models were obtained and the values obtained indicate that all the values were significant except for inimitability. Agility (t-value = 46.827, *p*-value = 0.000), barriers to entry (t-value = 4.465, *p*-value = 0.000), inimitability (t-value = 1.646, *p*-value = 0.079), innovation (t-value = 19.432, *p*-value = 0.000) and mass customization (t-value = 52.074, *p*-value = 0.000) showing that all values were significant at 0.05 level of significance except for inimitability. The overall T value was obtained as 20.252 with a p value of 0.000 showing a significant relationship. Figure 2 shows the T values for the relationship between mental models and competitive advantage.

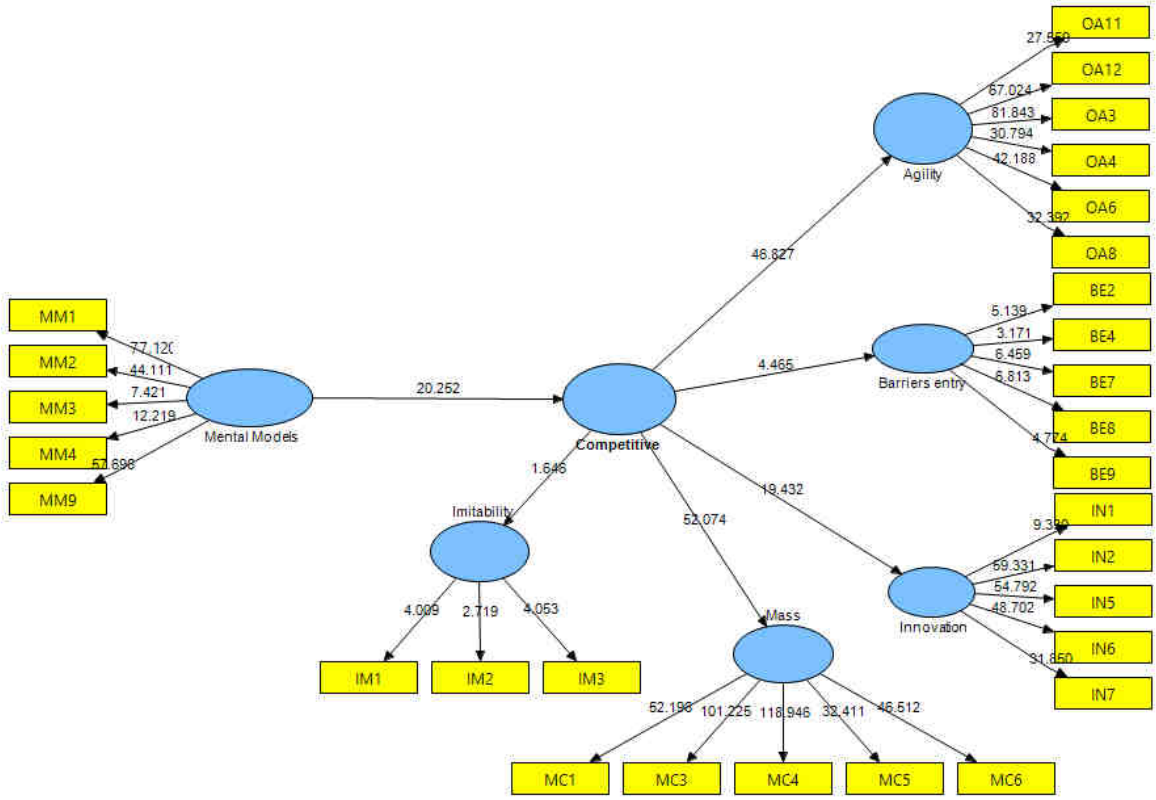

Figure 2: T values for the relationship between MM and CA

The overall path coefficients, standard errors, T statistics and p values for the relationship between mental models and competitive advantage was summarized in Table 8.

Table 8: Path coefficients for the relationship between MM and CA

Path	Path coefficients	Standard Error	T Statistics	P values
Competitive -> Agility	0.942	0.020	46.827	0.000
Competitive -> Barrier Entry	0.347	0.078	4.465	0.000
Competitive -> Inimitability	-0.190	0.116	1.646	0.100
Competitive -> Innovation	0.903	0.046	19.432	0.000
Competitive -> Mass Customization	0.965	0.019	52.074	0.000
Mental Models -> Competitive	**0.806**	**0.040**	**20.252**	**0.000**

The study also sought to determine the moderating effect of time on the relationship between mental models and competitive advantage. The path coefficients for the moderated model were positive and significant at 0.05 level of significance except for inimitability and time. Path coefficient beta values were ($\beta = 0.936$, $\beta = 0.346$, $\beta = -0.216$, $\beta = 0.911$, $\beta = 0.972$ and $\beta = 0.225$) for agility, barriers to entry, inimitability, innovation, mass customization and time respectively. The overall β coefficient was 1.195 implying that for every 1 unit increase in mental models, competitive advantage is predicted to increase by 1.195 when acting under the moderating effect of time. Figure 3 shows the path coefficients for the moderating effect of time on the relationship between mental models and competitive advantage.

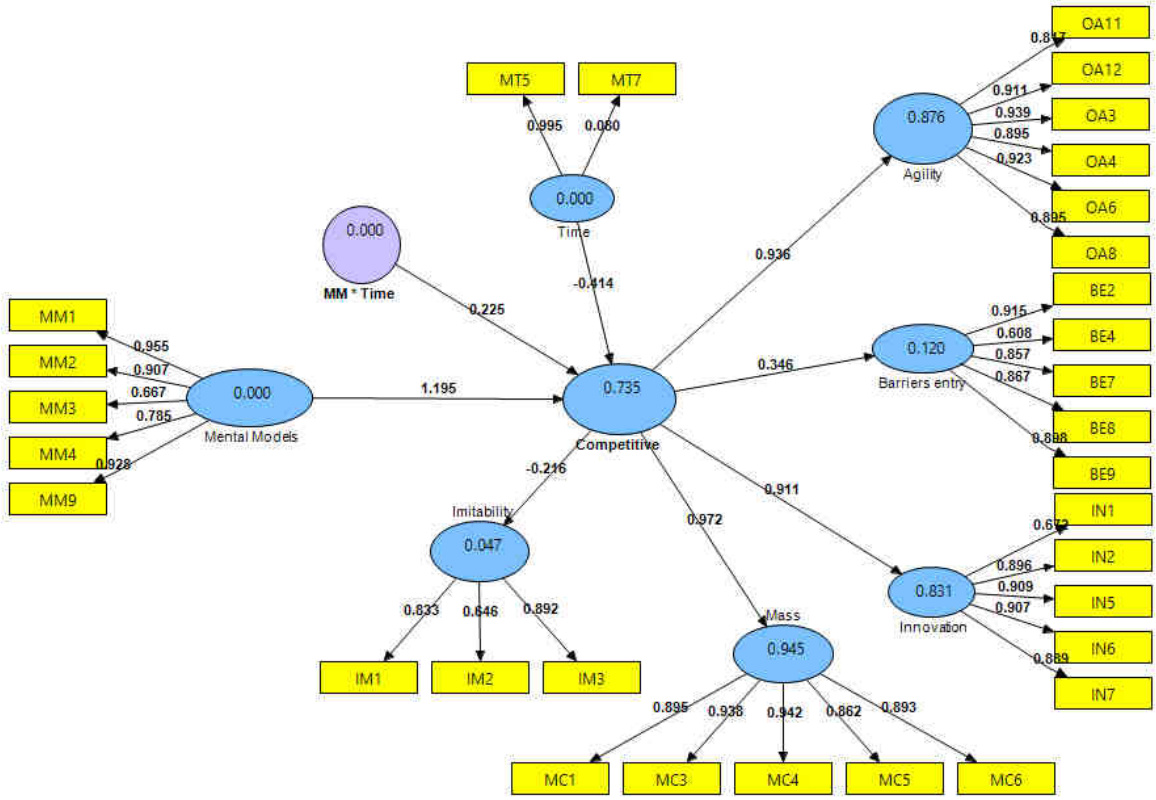

Figure 3: Path coefficients for the moderated model for MM and CA

T values for the moderated effect of time on the relationship between mental models and competitive advantage were obtained and the values obtained indicate that all the values were significant except for inimitability and time. Agility (t-value = 35.039, *p*-value = 0.000), barriers to entry (t-value = 4.180, *p*-value = 0.000), inimitability (t-value = 1.656, *p*-value = 0.098), innovation (t-value = 18.790, *p*-value = 0.000), mass customization (t-value = 47.573, *p*-value = 0.000) and time (t-value = 1.414, *p*-value = 0.158) were all significant at 0.05 level of significance except for inimitability and time. The overall T value was obtained as 4.136 with a p value of 0.000 showing a significant relationship. Figure 4 shows the T values for the relationship between mental models and competitive advantage under the moderating effect of time.

The overall path coefficients, T statistics and p values for the moderated relationship between mental models and competitive advantage was summarized in Table 9.

Table 9: Path coefficients for the moderated path between MM and CA

Path	Path coefficients	Standard Error	T Statistics	P values
Competitive -> Agility	0.936	0.027	35.039	0.000
Competitive -> Barriers entry	0.346	0.083	4.180	0.000
Competitive -> Inimitability	-0.216	0.130	1.656	0.098
Competitive -> Innovation	0.911	0.049	18.790	0.000
Competitive -> Mass	0.972	0.020	47.573	0.000
MM * Time -> Competitive	**0.225**	**0.159**	**1.414**	**0.158**
Mental Models -> Competitive	**1.195**	**0.289**	**4.136**	**0.000**
Time -> Competitive	-0.414	0.163	2.544	0.011

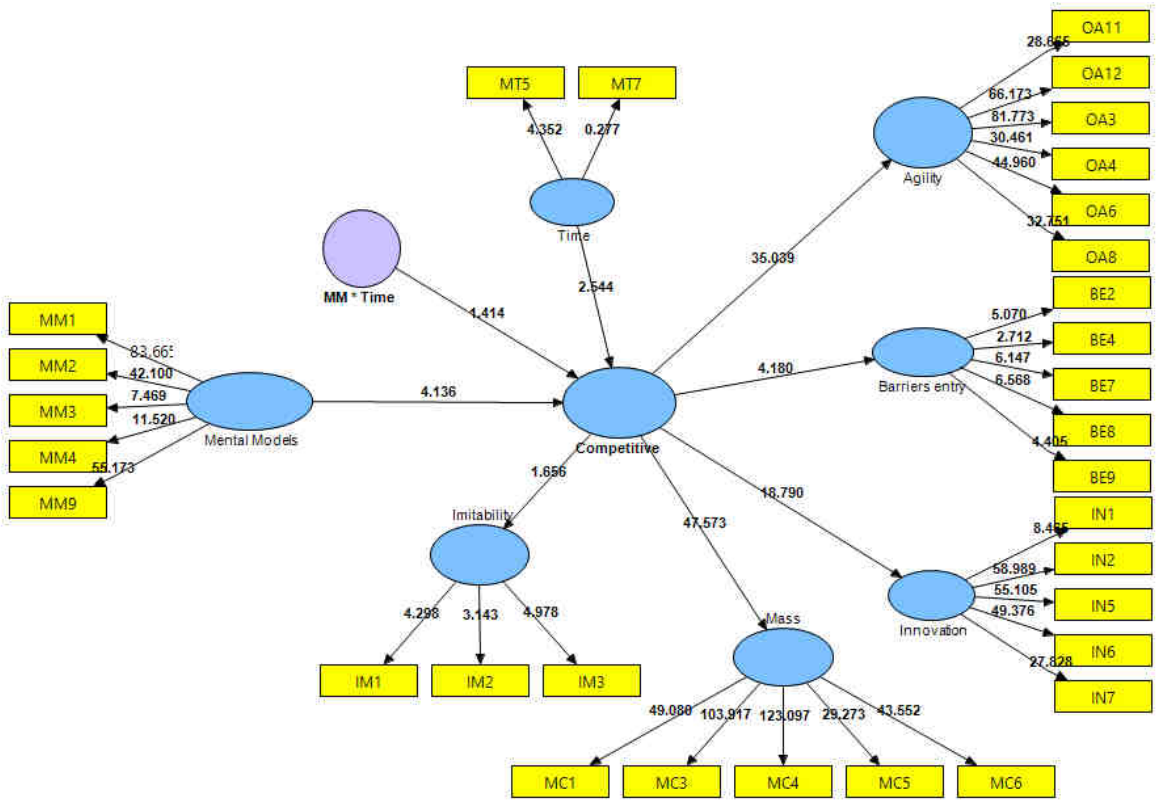

Figure 4: T values for the moderated path between MM and CA

5.0 DISCUSSION

The study sought to determine the relationship between mental models and competitive advantage in Oil Marketing Companies in Kenya. The findings of the study revealed that mental models and competitive advantage were strongly correlated. These findings indicate that mental models play a significant role in helping managers in problem solving, particularly the complex problems that corporate decision makers face. In line with upper echelons theory, the study determined that oil marketing companies in Kenya behaved according to the mental models of its senior management. The findings obtained are similar to the findings of Hambrick (2007) who determined that organizational outcomes are directly impacted by the knowledge, experiences and expertise of those individuals occupying prominent managerial roles in the organization. This implies that an organization that has the general collective mental models that are properly in tune with the dynamic environment and organizational goals will have employees that spend very little time analyzing complex issues before making decisions or taking action but more often than note end up making the right decision.

In line with the findings of Gary and Wood (2011), the study determined that mental models help managers identify promising regions of the competitive landscape and drastically reduce the feasible strategy choices, thus affording a significant competitive advantage over managers with less accurate mental models. This is especially useful in a hyper-dynamic environment where quick understanding of the causal relationships can contribute to the quality of choices during strategy formulation, implementation and evaluation. This observation implies that this dimension of organizational learning can yield competitive advantages over both tangible and intangible organizational resources.

The findings of the study agree with the findings of Xiao and Jin (2010) who found out that shared mental models improve team effectiveness by accelerating team members to form resonance and right foresight of their job, leading to the coordination among members. In line with the shared mental model (SMM) theory, the findings of the study reveal that members of a team must have a shared understanding of their tasks and roles to maximize team effectiveness. Evans and Baker (2012) also agree with the findings of the study when they found out that enabling individuals to describe, explain, and predict events in their environment, mental models facilitate sense-making and reduce situational uncertainty since parameters of interpretation, regardless of situational occurrence in the environment have already been mentally set.

6.0 CONCLUSIONS

The study established that mental models contributed significantly to an organization's competitive advantage. The path coefficients for the relationship between mental models and competitive advantage were positive and significant at 0.05 level of significance. Path coefficient beta values were also significant for agility, barriers to entry, inimitability, innovation and mass customization. The study further concluded that for every 1 unit increase in mental models, competitive advantage is predicted to increase by 0.806 in the oil marketing companies.

Implications for practice and policy makers

The study recommends that OMCs registered in Kenya establish ways of evaluating staff members frequently to assess their aptitudes against desired corporate goals. Wrong mental models may inhibit individual positive development and growth. Self-appraisal and triangulation of the same can be a starting point that may give the organization a snapshot of what training efforts to recommend for their staff.

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