Determinants of Innovation Capabilities at Firm Level: Auto Components Sector

*Ms. Swadha Agarwal
**R. K. Mittal
**Neena Sinha

ABSTRACT

Firm characteristics are defined by rapid changes, extensive impact of globalisation, hyper innovative competitors, etc and recent studies have stipulated that one of the most dynamic capabilities that leads to strongest level of competitiveness in any organisation is innovation capability. A firms' capabilities are important in providing and sustaining its competitive advantage, and in the implementation of the entire strategy. As innovation is becoming increasingly complex, therefore a wide variety of assets, resources, and capabilities are required to make such innovation capabilities successful. Therefore, innovation capability should be defined in a wide disperse scopes and levels in order to accord with the requirements of firm strategy and accommodate to the special conditions and competition environment. The need of the hour is, that many organisations have now begin to focus on the need to identify innovation capabilities, resources and strengths through an inside-out view. Innovation capabilities are not necessarily defined by a new product or service, but also through new administrative practice or process, new strategies in place to improve process performance, etc. The objective of this research paper is to identify key determinants of innovation capabilities present in an auto components cluster firms.

Keywords: *Technological innovation capabilities, Auto component cluster, Firm level innovation capabilities*

*Research Scholar, USMS, GGSIPU, Delhi, India
**Professor, USMS, GGSIPU, Delhi, India
***Professor, USMS, GGSIPU, Delhi, India

INTRODUCTION

Owing to the rapid changes in the international trade and the recent developments of the World Trade Organisation, industries worldwide are forced to face a new era of intense global competition. With the increase in level of competition, there arises a need to continuously adapt, develop and innovate to attain organisational excellence. Without the capability to adapt and innovate with change in a dynamic environment, businesses tend to stagnate and go out of business. Multiple studies have shown that a positive impact can be measured due to the presence of technological innovation which thereby enhances the competitiveness of firms [Dierickx and Cool, 1989; Guan, 2002]. So far we have seen a growing amount of interest from industry, academics and governments on how innovations could be better managed. For example, the UK Department of Trade and Industry (DTI) finds technical innovation as one of the drivers of national competitiveness and explore means to encourage companies to develop and improve their innovation management processes and performance.

With the changing technology scenario, global competition, with increasing customer needs and expectations, the product life cycles have gone shorter. Firms are now needed to adapt to dynamic market structure and have the capability to effectively respond with the innovative outputs in order to stay in the market, provide a sustainable competitive advantage, and to be able to maintain and increase their market share. To accomplish all these tasks, innovativeness is imperative. Innovation is defined from a broad viewpoint that consists of both new business conduction methods and new technologies. Innovation does not describe quantifying and commercializing a technologically significant improvement (radical innovation) alone, but also aims to focus on small scale improvements in technological knowledge (incremental innovation). While technology can be defined through the means of information, organisation and techniques needed for the manufacturing of a product/ service, it can also be viewed as the ending source of the knowledge, capabilities and tools required for monitoring the production factors in order to produce, maintain and distribute to the users, the economic and/or socially demanded products and services [Robock, 1980]. Therefore, innovation and technology, are critical for developing basic capabilities and putting in place a mechanism that effectively transforms input to output in the industry. [Tirupati, 2008].

A firm's competitive advantage stems from the capability and efficiency of new product developments [Lawless &Fisher 1990 ; Guan,2002]. The improvement in product innovation is accounted for due to the accumulation of capabilities and contributed to innovation outputs. In majority of the cases, high performance firms would prove to have stronger capabilities in comparison to the low performance firms. Innovation capability is the skills and knowledge needed to effectively absorb, master and improve existing technologies, and to create new ones [Lall, 1992]. Technological innovation capability (TIC) is a comprehensive set of characteristics of an organization that facilities and supports its technological innovation strategies [Burgelman, & Wheelwright, 2004]. They are a kind of special assets or resources that include technology, product, process, knowledge, experience and organization [Guan & Ma, 2003].

There have been multiple approaches to audit a firm's Innovation capabilities. For instance, Christensen [1995] defined IC in terms of science research asset, process innovation asset, product innovation asset and esthetics design asset. Chiesa et. al. [1996] applied 2 methods to measure innovation capability of a firm- through a process audit and a performance audit. The process audit focused on the individual processes necessary for innovation which includes concept generation, process innovation, product development, technology acquisition, leadership, resourcing, system and tools. Drawing from various literature, Yam et al. [2004] designed an empirical survey on technological innovation for firms in manufacturing in the region of Beijing [Guan et al., 2005, 2006; Guan and Ma, 2003]. This survey incorporated the findings of innovation capability studies [OECD, 1992;1997] which has measured the technological innovation capabilities (TIC) that each technological capability represents a separate business function of an organization (i.e. R&D, manufacturing, and marketing capabilities) or a cross-functional business process (i.e. learning, organizing, strategic planning, and resource allocation capabilities).

The aim of the following paper is to identify the key determinants of Innovation Capabilities at firm level. We conducted a survey on 165 firms within the auto components cluster in Gurgoan-Manesar in Haryana. The respondents were asked to identify the key areas that would constitute the innovation capabilities of the firm.

REVIEW OF LITERATURE

Innovation Capabilities

In recent times, a competitive business environment push firms to enhance their capabilities for working on and commercializing newer technologies, while staying ahead of their competitors is also facilitating the process of innovation and diffusion of internal innovation for strengthening competitive advantage. In this working environment, if the firms lacks the ability to innovate it can cause business stagnation and eventually going out of business [Yam et al, 2004]. Scholl [2005] stipulates that without the presence of innovation, a firm cannot seek growth and competitiveness. The evolution of resource-based view (RBV) in management and economics resulted in the development of the concept of technological innovation capability (TIC). Based on RBV, output discrepancies between firms are resulted from discrepancies in valuable, rent-generating, and difficult to be substituted resources or so called capabilities [Hamel & Prahalad, 1994]. In order to stay consistent and compete for new products, firms should aim at developing their own TIC. By developing their own TIC, it proves to be helpful for firms to enhance their competitive performance [Romijn & Albaladejo, 2002]

TIC (Technological Innovation Capabilities) are defined by Burgelman et al. [2004] as a comprehensive set of characteristics of an organization that facilitates and supports its technological innovation strategies. They are a special kind of assets or resources that include product, technology, assets, or knowledge, experiences, and organisation [Guan and Ma, 2003]. Lall [1992] states TIC as the knowledge and skills required to effectively absorb, master, and improve already existing technologies, and to focus on creating new ones. Evangelista et al. [1997] states that R&D activities are a central component of the technological innovation activities within a firm and considers it as the most essential intangible innovation expenditure. It is also observed that successful technological innovation does not only depend on technological capability, but it also requires to focus on other innovation capabilities in terms of manufacturing, organisation, marketing, strategy planning, resource allocation and learning [Yam et al., 2004; Romijn and Albaladejo, 2002]. As stated by Adler and Shenbar [1990], four types of TICs are identified, including:

(1) The capacity of satisfying market requirement by developing new products.

(2) The capacity of manufacturing these products by using appropriate process technologies.

(3) The capacity of satisfying future needs by developing and introducing new products and new process technology.

(4) The capacity to respond to an unanticipated technology activity brought about by competitors and unforeseen circumstances.

The above-mentioned capabilities already exist within a firm.

In the words of Peteraf [1993] a firm's heterogeneous resource portfolios (including human, capital, and technology resources) are accountable for observed variability in its financial returns. These are defined as a firm's specific capabilities that contribute extensively to the sales growth and competitive advantage. There would have to be a causal connection between a firm's resources and performance. Dierickx and Cool [1989] state that a firm must either strive to imitate high performing resources or should develop alternative capabilities that could reap similar results. Therefore, the development and improvement of TIC as a key resource of a firm, can prove to be competitively advantageous to a firm [Guan and Ma, 2003]. For example, Lawless and Fisher [1990] found that successful technological innovation helps firms to gain market position and realize more long-term returns and, Yam et al. [2004] found that TIC is positively related to the introduction of new product and innovation in sales.

A Study Framework for Innovation Audit

Drawing on the existing literature on innovation management, there has been some research to audit technical innovation. Studies which identified characteristics of technically progressive firms and factors associated with success or failure in innovation contributed to the audit framework to be developed. Cooper [1980; 1996] identified 3 variables to define innovation, namely- the nature of the product, the market environment and the existence of potential product–technology synergy. A concise summary of key factors that are identified in many innovation management studies, was provided by Rothwell [1992], which are highlighted below-

- Good internal and external communication.
- Providing good technical service to customers.
- Treating innovation as a corporate wide task.
- Strong market orientation.
- Presence of certain key individuals as technological gatekeepers.
- Efficiency in development work and high quality production.
- Implementing careful planning and project control procedures.
- High quality management.

Cooper (1996) further established that there were three critical success factors for drivers of new product performance:

- A clear and well-communicated new product strategy.
- High quality new product process.
- Adequate resource commitment.

A vast variety of researchers adopted multiple perspectives and components to audit a firms's TIC. For example, Burgelman et al. [1988] stated five dimensions while defining the innovative capabilities audit framework:

- Resource availability and allocation.
- Capacity to understand competitor's innovative strategies and industry evolution.
- Capacity to understand technological developments.
- Structural and cultural context.
- Strategic management capacity.

Christensen [1995] segregated the TIC's into product innovation asset, process innovation asset, science research asset and aesthetics design asset. These assets correlate with internal accumulation, experimental acquirement, and disquisition. A firm's competitiveness roots in its possession of special assets and resources that are valuable, heterogeneous, and difficult to be imitated and substituted. These would safeguard the firms' position in the areas of strategy and technology management. Bobe and Bobe [1998] manifested a checklist method to benchmark innovation processes and practices in three European Union countries, namely, Germany, the UK and France. Similar to that advocated in the OSLO manual (OECD, 1997), the method addresses:

- The national innovation systems context.
- Management of human resources
- Innovation and firms' strategy.
- Global innovation trends.
- Organizational structures and the organizational moves linking production, marketing and design.
- Origin of technological resources.

A technical innovation audit framework encompassing several main parts, such as technology acquisition, product development, leadership, process innovation, product innovation, and resourcing, was given by Chiesa et al. [1996]. That framework focused on core processes and enabling processes to delineate technological innovation. However, as Chiesa et al.'s (1996) suggest, more evidences are needed to test the validity of the framework (e.g. overlapping between product innovation and development). Other areas such as learning, organizing, and strategic planning that were important for a firms' innovation capability should also be stressed.

Determinants of Innovation Capabilities

Multiple researchers have defined the determinants of innovation capabilities within a firm.

Learning capability is a firm's ability to identify, assimilate, and exploit knowledge from the environment. It is the firm's ability to internalize new knowledge essential to gain competitive advantage [Guan & Ma, 2003).]

R&D capability refers to a firm's ability to integrate R&D strategy, project implementation, project portfolio management, and R&D expenditure. The firm develops new products by using new approaches and technologies (Guan & Ma, 2003)

Resources allocation capability is a firm's ability to acquire and to allocate appropriately capital, expertise and technology in the innovation process. It is also the firm's ability to compile appropriate resources for innovation process (Yam et al., 2004)

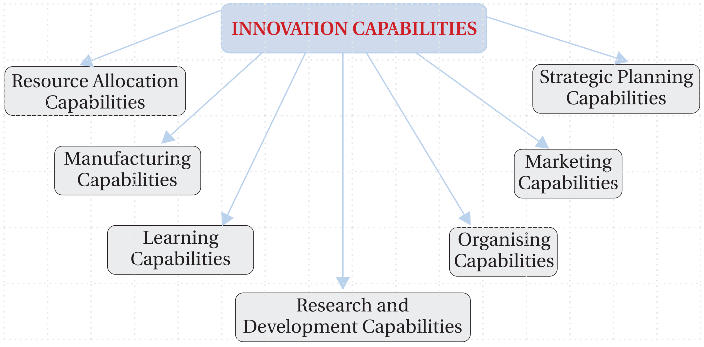
Manufacturing capability refers to a firm's ability to transform R&D results into products, which meet market needs, accord with design request and can be manufactured. It is also the firm's ability to produce products to adapt market conditions by using R&D outputs (Yam et al., 2004).

Marketing capability is a firm's ability to publicise and sell products on the basis of understanding consumer needs, the competitive environment, costs and benefits, and the acceptance of the innovation. It focuses on the firm's ability to make a difference in marketing activities in order to differentiate own's products (Cheng & Lin, 2012).

Organising capability refers to a firm's ability in securing organizational mechanism and harmony, cultivating organization culture, and adopting good management practices. The firm must organise all activities in order to speed up innovation processes (Guan & Ma, 2003)

Strategic planning capability is a firm's ability to identify internal strengths and weaknesses and external opportunities and threats, formulate plans in accordance with corporate vision and missions, and adjusts the plans for implementation. It is also the ability of the firm to make strategic plans which is compatible with firm's vision and mission by taking into consideration firm's specifications objectively (Yam et al., 2004).

Figure 1. Proposed Research Model



Source: Yam et al., 2004

OBJECTIVE OF THE STUDY

To explore and confirm the determinants of innovation capabilities of companies in auto component cluster sector.

RESEARCH DESIGN

The auto component cluster was identified through the cluster observatory as the Gurgoan- Manesar cluster. The sampling frame was developed by enlisting firms registered in the database of various directories such as the Gurgaon Udyog Association, Industrial Development Association, Gurgaon Industrial Association, Manesar Industries Welfare Association, Gurgaon Chamber of Commerce and Industry.

In order to ensure a high level of content validity, three academic staff in the field of technological innovation were consulted in advance in order to improve the survey instrument. A pre-test was then carried out with a convenience sample of 10 managers working in auto component industries in the Gurgaon cluster region. They were requested to complete the questionnaire and give their comments on the clarity and the appropriateness of the items in the formulated questionnaire. Simple statistical analysis were used to test the reliability of the scales. The readability of items measurements was confirmed. The results of the pilot test kept the questionnaire concise (Dillman, 1978). The revised questionnaire was sent to the targeted companies by post.

SAMPLING TECHNIQUE

Since the nature of study was purely exploratory in nature, a structured questionnaire was served to middle level and senior level employees. A web-enabled version of the questionnaire was developed and sent through mails, by tracking the LinkedIn profiles of the Director of engineering, the R&D manager, Engineering managers, HR managers and Communication Managers, the websites of the companies and few of them were contacted telephonically. We used convenience sampling technique for this study. A total of 344 firms were identified, that worked exclusively and extensively in the auto component sector, and then they were contacted. Out of these 165 firms responded back and contributed in the study. The targeted respondents included the owner(s), the general manager, the director of engineering, the R&D manager or the engineering manager. In the sampling frame there were:

90 small sized firms, 71 medium sized firms and 4 large sized firms. We received a total of 307 responses from these firms, in which 145 responses were from small sized firms, 142 responses were from medium sized firms and 20 responses from large sized firms. Out of the 307 responses collected, a total of 300 responses were valid and could be used for analytical purposes. In the identified clusters, majority of the small sized firms did not have a clear distinction between the top and middle level managers. In such scenarios, the firm owner was contacted as the decision-making power in terms of technology and research, resided with him.

DATA ANALYSIS

A total of 26 dimensions were selected based on literature. The information was collected through a sample of 300 middle and high level managers of the sample auto component cluster companies on a 5-point Likert Scale (1: Strongly disagree; 2: disagree; 3: neutral; 4: strongly agree; 5: strongly agree). Likert scales were used for all applicable items. Higher scores denote a higher ability in the IC. The scales of measuring innovation capabilities were adopted from Yam et al. (2004). The seven Innovation Capabilities (IC)'s including strategic planning , learning, research and development, resource allocation, organising, manufacturing and marketing capability were revised and then enlisted into the questionnaire.

The items for designed to measure the determinants of innovation capabilities are enlisted in Table 1. There are 26 items in the questionnaire.

Table 1. Dimensions For Measuring Innovation Capabilty

Your company encourage work teams to identify opportunities for improvement	IC1
Your company systematically monitors technology development trends	IC2
Your company has the capacity to assess technologies relevant to firm's business strategies	IC3
Your company has high-level integration and control of the major functions with the company	IC4
Your company has good coordination and cooperation of amongst all the department such R&D, marketing and manufacturing	IC5
Your company can handle multiple innovation projects in parallel	IC6
Your company trains for human resources in programmed phases	IC7
Your company selects key personnel in each functional department into the innovation process	IC8
Your company provides steady capital supplement fo innovation activity	IC9
Your company has flexibility and diversity of capital origins	IC10
Your company adjusts the production process according to the requirement of R&D process designing	IC11
Your company has capable equipment operating skilled manufacturing personal	IC12
Your company has system in place for continuous improvement of existing manufacturing system	IC13
Your company selects and tests innovation ideas, product concepts, product prototypes and customer preferences according to customer requirements competitive goals	IC14
Your company has an effective marketing intelligence system	IC15
Your company tracks customer satisfaction levels	IC16
Your company links the R&D plans to the corporate plan and technoloy competence	IC17
Your company has cross sectional screening of R&D project plans	IC18
Your company establishes project targets, phase standards and project managing regulations	IC19
Your company is highly adapted and responsive to changes in external environment	IC20
Your company has accurate connection between technological strategy and business strategy	IC21
Your company has high capability in identifying external opportunities and threats	IC22
Your company has high capability in identifying internal strengths and weaknesses	IC23
Your company has a clear road map	IC24
Your company adopts accessed knowledge into your daily activities	IC25
Your company provides after sales service and technological assistance	IC26

Source: Yam et al, 2004.

SCALE VALIDITY AND RELIABILITY

Following the data collection, the measures were subjected to a purification process to assess their reliability, content validity, convergent validity, discriminant validity and scale dimensionality (Gerbing and Anderson 1988; Akgün et al., 2007; Alegre and Cheeva, 2008). The ratio of the true score's variance to the observed variable's variance indicates reliability. The studies in the literature does not recommend the use of the Cronbach's alpha coefficient in isolation to evaluate the reliability of a measurement scale, our study following Alegre and Cheeva (2008), evaluate reliability through three indicators including; the Cronbach's alpha coefficient, Composite Reliability (CR), and Average Variance Extracted(AVE).

CONTENT VALIDITY

When the phenomenon to be observed is communication, then content analysis is an appropriate method (Malhotra and Birks, 2006). As per Malhotra and Birks (2006), content analysis includes observation as well as analysis where the unit of analysis may be words, characters or themes; they also stated that it is one of the classical procedures for analysing textual material in qualitative research. Content analysis involve the following steps, firstly, giving words, sentences and paragraphs meaning then secondly, the researcher codes the text into various themes and finally those themes can be quantified as to how frequently specific themes appear and in what context in the text (Kvale, 2007). Researcher can decide the themes before analysing the text or new emerging themes can also be added to it.. Content validity is not evaluated numerically rather it is subjectively judged by the researchers. In this study, the developed instrument have content validity since selection of measurement items were based on detailed evaluation by academicians, firm owners and managers.

The 26 dimensions were reduced to 23 after content analysis and successful pilot testing. Maximum likelihood method was used with promax rotation and generated four components

Table 3. IC Dimensions with Factor Loadings and Cronbach Alpha Values

IC Dimensions	Variables	Factor Loadings	Cronbach Alpha Values
IC-LC	IC3	0.811	
	IC1	0.697	0.758
	IC2	0.668	
IC-OC	IC6	0.835	
	IC5	0.82	0.774
	IC4	0.753	
IC-RAC	IC9	0.859	0.871
	IC8	0.802	
	IC7	0.787	
	IC10	0.78	
IC-MFC	IC13	0.852	0.8
	IC12	0.843	
	IC11	0.64	
IC-MKC	IC15	0.885	0.88
	IC16	0.88	
	IC14	0.815	
IC-RDC	IC18	0.908	0.889
	IC17	0.831	
	IC19	0.824	
IC-SPC	IC21	0.83	0.814
	IC20	0.719	
	IC22	0.707	
	IC23	0.646	

Source: Ownresearch

with eigen values above 1. The clubbed items in Seven components along with their factor loadings and the Cronbach alpha values are shown in the table 3 below:

It can be observed that Cronbach's alpha coefficients of all constructs are more than 0.7, which is a very acceptable amount for reliability of construct (Kline, 1998) .After the internal reliability of the construst, a diagram depicting the preliminary measurement model was designed. The model displayed 23 measured indicator variables and 7 latent variables which were subject to CFA with AMOS22, a computer program through which all interactions between variables represented in the conceptual model are captured and examined as a single statistical test.

The latent variables were identified and defined as follows:

1. The dimensions IC3, IC2, IC1 were combined together under the factor titled **"IC_LC"** which comprised of the **Learning Capabilities** under the innovation capabilities of the firm.
2. The dimensions IC6, IC5, IC4 were clubbed together under the factor titled **"IC_OC"** which comprised of the **Organising Capabilities** under the innovation capabilities of the firm.
3. The dimensions IC9, IC8, IC7 and IC10 were bundled together under the factor titled **"IC_RAC"** which comprised of the **Resource Allocation Capabilities** under the innovation capabilities of the firm.
4. The dimensions IC13, IC12, IC11 were combined together under the factor titled **"IC_MFC"** which comprised of the **Manufacturing Capabilities** under the innovation capabilities of the firm.
5. The dimensions IC15, IC16, IC14 were clubbed together under the factor titled **"IC_MKC"** which comprised of the **Marketing Capabilities** under the innovation capabilities of the firm.
6. The dimensions IC18, IC17, IC19 were combined together under the factor titled **"IC_RDC"** which comprised of the **Research and Development Capabilities** under the innovation capabilities of the firm.
7. The dimensions IC21, IC20, IC22 and IC23 were combined together under the factor titled **"IC_SPC"** which comprised of the **Strategic Planning Capabilities** under the innovation capabilities of the firm.

CONFIRMATORY FACTOR ANALYSIS

Confirmatory factor analysis (CFA) is a multivariate statistical procedure that is used to test how well the measured variables represent the number of constructs. In CFA, convergent and discriminant validity examine the extent to which measures of a latent variable shared their variance and how they are different from others. It is a process that decreases a large number of variables into a smaller set of variables. It ascertains underlying dimensions between measured variables and latent constructs, thus allowing the construction and refinement of theory [Kline, 1998].

CONVERGENT VALIDITY OF CONSTRUCT

The average variance extracted (AVE) and composite reliability (CR) were measured to assess convergent validity of the measurement. AVE measures the level of variance captured by a construct versus the level due to measurement error, values above 0.7 are considered very good, whereas, the level of 0.5 is acceptable. For Composite reliability values above 0.7 are considered good and acceptable. Based on table 5, the AVE of all constructs exceed exceeded the acceptance threshold value of 0.5 and the CR of all constructs exceeded the threshold value of 0.70 (Hair et al., 2010). Therefore, as the average variance values are well defined, we can state that the current data has acceptable convergent validity.

DISCRIMINANT VALIDITY OF THE CONSTRUCT

Discriminant validity refers to the extent to which factors are distinct and uncorrelated. It determines whether the constructs in the model are highly correlated among them or not. The rule is that variables should relate more strongly to their own factor than to another factor. It explains the extent to which the items/indicators of one factor are more related to each other, than the items/indicators of other factors in the model. The discriminant validity is ascertained through AVE (Average Variance Explained), MSV (Maximum Shared Variance) and ASV (Average Shared Variance). For discriminant validity to hold true the following conditions must be met:

- AVE> MSV
- AVE> ASV

Table 4. Goodness of Fit Model for Determinants of IC

Metric	Value	Base Value	Acceptance
CFI (Comparative Fit Index	0.926	≥ 0.9	Acceptable
AGFI (Adjusted Goodness of Fit Index	0.84	≥ 0.9	Acceptable
RMSEA (Root Means Square of Approximation)	0.054	≥ 0.08	Acceptable
RMSR (Root Mean Squared Resideual)	0.089	≥ 0.08	Acceptable
NFI (Normal Fit Index)	0.875	0 to 1	Acceptable

Source: Kline, 2005; Hooper et al., 2008.

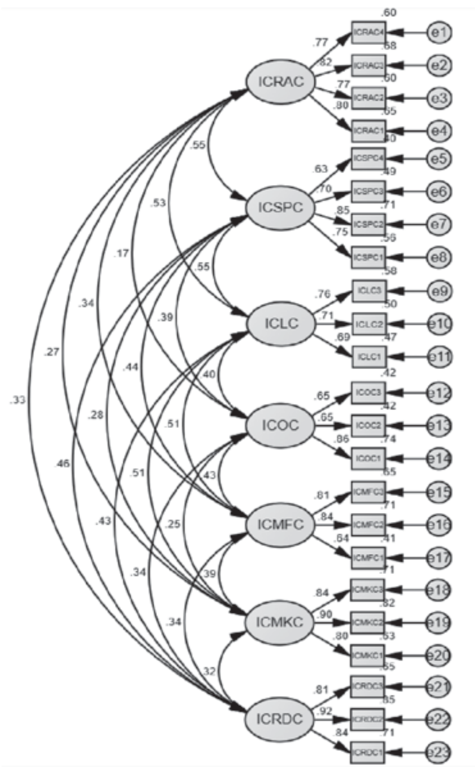


Figure 2. CFA Model for Determinants of IC

- Square root of AVE greater than inter-construct correlations: It compares the Square Root of AVE of a particular construct with the correlation between that construct and the remaining other constructs. The value of Square Root of AVE should be higher that the correlation.

As depicted in Table 5, for all the seven constructs, i.e. IC_MKC, IC_LC, IC_SPC, IC_RDC, IC_RAC and IC_MFC, the AVE values are greater than both their respective MSV and ASV values. Moreover, the square root of AVE which is depicted in bold in the diagonal matrix line for each construct, is higher than the inter-correlation values with other constructs (also depicted in the table below each construct). Therefore, it can be clearly stated that the items of one construct are not correlated with the items of remaining other constructs. Hence, discriminant validity holds to be true.

The principal task in CFA model was to determine the goodness of fit between the hypothesized model and model determined by the sample data. The adequacy of model fit was evaluated using the CFI (Comparative Fit Index), AGFI (Adjusted Goodness of Fit Index), RMSEA (Root Mean Square of Approximation), RMSR (Root Mean Squared Residual) and NFI (Normal Fit Index). The preliminary model was amended to improve the model fit. Modification indices and standardized residuals calculated throughAMOS22 were used to modify the model resulting in the final model.

The table with all the values is below:

Table 5. CFA Analysis for Determinants of IC

IC Determinants	CR	AVE	MSV	ASV	ICMKC	ICRAC	ICLC	ICSPC	ICOC	ICMFC	ICRDC
ICMKC	0.885	0.719	0.261	0.120	**0.848**						
ICRAC	0.872	0.630	0.301	0.153	0.269	**0.794**					
ICLC	0.762	0.517	0.308	0.243	0.511	0.535	**0.719**				
ICSPC	0.823	0.540	0.308	0.209	0.281	0.549	0.555	**0.735**			
ICOC	0.767	0.528	0.186	0.118	0.245	0.170	0.401	0.394	**0.727**		
ICMFC	0.811	0.591	0.258	0.170	0.387	0.342	0.508	0.444	0.431	**0.769**	
ICRDC	0.894	0.739	0.213	0.140	0.316	0.334	0.430	0.462	0.339	0.338	**0.860**

Source: own research

The model fit of the final model with all the indices' values beyond the threshold limits is indicative of the fact that the model is offering an adequate approximation of empirical data, hence it is acceptable. The standardized factor loadings of the dimensions of IC determinants (IC_LC, IC_OC, IC_RAC, IC_MFC, IC_MKC, IC_RDC, IC_SPC) ranged from 0.646 for IC_23 to 0.908 for IC_18.

Table 6 depicts the mean values and standard deviation values of the determinants of innovation capabilities.

Table 6. Descriptive Statistics

IC Determinants	N	Minimum	Maximum	Mean	Std. Deviation
ICOC	300	1.0000000000001000	5.0000000000001000	3.981111111111208	.898827980145209
ICMFC	300	1.0000000000001000	5.0000000000001000	3.827777777777877	.935869437535312
ICMKC	300	1.0000000000001000	5.0000000000001000	3.815555555555656	1.087093067107947
ICRDC	300	1.0000000000001000	5.0000000000001000	3.696666666666769	1.224755490959299
ICSPC	300	1.00	5.00	3.5650	1.09725
ICLC	300	1.0000000000001000	5.0000000000001000	3.395555555555653	.899553270083548
ICRAC	300	1.00	5.00	3.1583	1.01490
Valid N (list wise)	300				

Source: own research

As visible from the table the highest mean scores lie with Organising capabilities (IC_OC), Manufacturing capabilities (IC_MFC), Marketing capabilities (IC_MKC) and Research & Development capabilities (IC_RDC), wherein the mean scores are above the average value of 3.5 (on a 5 point likert scale). The medium mean scores value lie with Strategic Planning capabilities (IC_SPC) and Learning Capabilities (IC_LC). Lastly, the lowest mean scores value reside in Resource allocation capabilities (IC_RAC) , as depicted in the identified sample frame.

CONCLUSION

Technological innovation plays a critical role in predicting the long-term survival of organizations (Ancona and Caldwell, 1987). Many well-known leading authorities have discussed the importance of innovation in determining an organization's success and global competitiveness (Higgins, 1995; Porter, 1990). The objective of the current research study was to identify the key determinants of innovation capabilities within a firm. We proposed the seven innovation capability dimensions, which are thought to influence, export growth of firms, and then analyze the survey data from the 165 industrial firms. Traditionally, only R&D activities are considered by practitioners to be a major focus of innovation. Recently, other previous researchers have found that by emphasizing on R&D alone and by investing on R&D activities heavily cannot sustain innovation performance and firm's competitiveness (Yam et al., 2004; Guan and Ma, 2003).This study theoretically and empirically verifies that technological innovation capabilities cannot solely be sustained by research and development. The other dimensions of innovation capabilities need to be focused on for a holistic growth for the firm to attain a competitive advantage.

For managers in the region, this finding is important as it identifies that a more balanced development of multiple TIC is required. While R&D capability is essential to the success of innovation, our findings show that firms should also emphasize other innovation capabilities (i.e. learning, organising, and strategy planning) for better coordination of R&D activities. For instance, in order to enhance the percentage of sales due to technologically innovative products, manufacturers should aim to improve their strategic planning by identifying internal strengths and weaknesses as well as external opportunities and threats to formulate innovative and effective plans. For firms aiming to launch new goods in the markets, they must identify customer needs, expectations through their effective marketing capabilities, to innovate new additions to existing product line. Not only can the capability allow a firm to exploit their technology resources, including the acquisition of external technologies, technology information about competitors' core technology competence and the prediction of new technology trends, but it also enables the firm to attach and allocate sufficient human resources for innovation processes. Most essential for a long-term development of innovation capabilities within the firm, it is crucial that the management inculcates an organised learning culture towards innovation.

SUGGESTIONS

Firms need to i-) develop a strong ability to transform knowledge gained from internal and external resources, ii-)convert the innovative ideas into new products/processes by allowing the collective contribution of various functions, iii-) allocate the resources required to make it happen, iv-) manufacture the product, v-) develop strong relationships and good after-sales services, and ultimately complete the cycle by long-term planning regarding the external environment and SWOT analysis. There is an evidence in the literature that the competitiveness of an enterprise is based on a complex capability hierarchy. Successful new product introductions could provide the potential for firms to gain market position and realize more durable returns than otherwise possible. As a part of the study it was concluded that to attain innovative competitive advantage in the market, the firm must aim to focus on each of the seven dimensions identified and defined in the study. All the dimensions do not function in isolation, rather give better results, when they are complemented with each other.

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