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ASSESSMENT FRAMEWORK FOR INNOVATION CAPACITY

Hari AP Nair, Dileep Kumar & Subramaniam Sri Ramalu

Innovation is no more an option for companies, as the competitive spirit in the market place is increasing with the global consumer pressure. With the fast and furious change which technology is bringing in to all walks of life, innovation becomes the critical success factor for technology companies. Firms which desire to sustain organizational health, should ensure continuous improvement in collective innovation capacity. Through this paper, we put an effort to crystalize the term Innovation Capacity (IC) and further to create an assessment model with dimensions culled out from the available literature. Measurement of collective Innovation Capacity will be a guidance for practitioners to fathom the organizational readiness for rapid product changes, from a resource based view. Data is consolidated using the Delphi technique with the opinions of experts from diverse fields within Malaysia. The study identified an IC model of second order construct with seven dimensions. There are 21 factors, which collectively influence the aggregate IC in an Organization. These factors are itemized to convert the model into a survey-based instrument of measure. Further research is required to empirically test the model for its validity and reliability at different organizational and business contexts.

Keywords: Innovation capacity, Technology, Competency, Change, Customer, Improvisation, Disruptive innovation

Introduction

Innovation capacity (IC) is the collective ability of a firm to look into future through the eyes of customer and reengineer products and services accordingly. This involves an element of risk, which needs to be calibrated to take appropriate investment decisions. According Frohman (1985), technological innovation can make or break profitability, while Maidique& Patch (1982) stated that 'capacity to innovate' is a vital force in the competitive environment of the modern firm. The challenges of the new millennium tend to further reinforce the importance of technological aspect. Globalization, the reduction in life cycle of products and processes and technological convergence promote an ever-changing competition that companies are exposed to. The current competitive landscape makes companies coexist with increasingly complex organizational environments. This puts pressure on companies to develop a set of anticipatory skills to deal with the multiple variables that affect the strategic choices of firms (Ashington& Hardy, 2009). The ultimate answer lies in how much and how fast the organization can go to the market with innovative products and services. Further, Roberts (2003) explained the need of improving organization's Innovation capacity in order to adopt to the advanced

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technological systems so as to move faster than the competition. Such competitive pressure among the firms are increasing globally, resulting into reduced life cycle of technologies and products, and pushing companies into compelling proposition of innovation.

Looking at the recent downfall of Nokia, Motorola and Blackberry, the much accomplished ICT firms, it is evident that IC is a game-changing factor for technology companies, however small or big it is. It has been proved by Christensen (1997) that traditional customer inputs can sometimes misguide companies in their product development process. Christensen's theory of disruptive innovation proved right when Nokiaimprisoned by its own past success, was more than complacent to calibrate any risk to invest into the unknown territories of smartphone market, notwithstanding the fact that it had already pioneered the smartphone manufacturing. It was very quick for the world to jettison the phones with voice-based hardware to transition into an era of smart screens with enormous internet based applications. The upgrade of technology has not only resulted a sudden depletion of existing hardware engineering skills within Nokia but caused substantial deficiency in the much required software programming competence also. Nor did these newly released phones entice the customer with their futuristic features, but they grossly disappointed the customer with its heavy hardware and an inflexible operating system. While Apple and Samsung won over millions of customers through their touch screens and complimentary intuitive applications, Nokia stayed at the starting point, continually losing customers to the west and east bound competition. Internet on the tiny screens in the pocket has enabled customers to raise the bar of their expectations.

ICT companies have been the harbingers of technology innovation for the world. Table 1 gives a geographical overview of the number of remarkable innovations rolled out by the Telecommunication companies across the world in 2013.

TABLE 1: TELECOMMUNICATION TECHNOLOGY INNOVATIONS AROUND THE WORLD IN 2013

Region	*Number of Technology Innovations*
Africa	32
Asia Pac	85
Europe	219
Middle East	29
North America	54
South/Central America	19
Grand Total	438

Source: Telco Services Innovation Radar: Analysis and Case Studies, Sara Kaufman, Analyst, January 2014

The pivotal role of innovation is a topic much discussed and evaluated by the academicians and practitioners as well in the recent past. Studies centered on the disruptive innovation caught momentum in the second half of the last decade when companies recovered from a long standing recession coincided with the global competitive pressure in the market place. While academicians and practitioners started recognizing the relevance of IC in the firms, there remains a prevalent confusion on what constitutes the IC from the competence perspective.

In this study, we endeavor to highlight the relevance of IC in the context of Information Technology and Communication sector and attempt to develop an integrated framework for assessing innovation capacity of firms. It is based on the elaborate review of literature available on innovation and also recognizing the theories of innovation, especially the theory of disruptive innovation. With detailed data inputs, the assessment framework may be used to analyses the antecedents and consequences of IC on various organizational factors. The framework is intended to measure the collective capacity of innovation in an organization from the human competence perspective and hence is different from the assessment framework on innovation developed by Gatignon, et al. (2002) and the framework on disruptive innovation by Hang and Chen (2010).

The motivation behind this research is based on the customer and market driven innovation pressure which companies face today with the emergence of rapid technology options available in the world. The impact of such pressure is forcing companies to review the human resource strategies to maintain the equilibrium of competence required to stay ahead of competition in the market.

Literature Review

Innovation is traditionally defined as the adoption of a new idea, artifact or behavior which is unprecedented for the adopter (Rogers & Shoemaker 1971). Not necessarily all the ideas, artifacts and behaviors can turn into innovation as newness and novelty are the distinct features of innovation (Lyytinen & Rose 2003). Majority of the theories in innovation literature were derived out of the need for industrial innovation when time demanded quicker and diverse products to the market with same or reduced production cost. Industrial innovation predominantly examined how and why the ideas, artifacts and behaviors emerged and the business impact of such innovations created on the firms. The studies were mostly concentrated on products, customers and organizations (Abernathy *et al.*, 1985), leaving a gap on the human capital and their collective IC. The speed and efficiency with which organizations respond to change and the sincere efforts put towards encouraging innovation will determine the success rate of the organization in the market. Changes in technology influence organizational systems including products and process. For example, phenomenal changes in computer hardware design and chip manufacturing has resulted in significant innovation in information technology related products and

processes. The process of innovation can create, shape and re-shape markets and industrial sectors. What most firms fail to attempt is to translate the internal power of innovation into a core competency, which characterizes the innate ability of the firm to define product lines based on the potential requirement of current customers and thus redefine the markets.

The study conducted by Goddard and Eccles (2012) on organizational failures enumerates the causal effect of internal factors on failure are as high as 93%. The effects from external environment contribute only 17% to the failure. The lion share of these failure causes can be controlled internally by building IC, concentrating on the core business, careful diversification, developing compatible leadership, flat organizational designs and ensuring constant talent pipeline.

Most of the innovation literature highlights the dichotomy of technology changes with innovation (Teece&Pisano, 1994; Nelson, 1995). Innovation as a mantra has been part and parcel of the industrial sector post the industrial revolution. Ehrnberg (1995) notes that despite having enormous amount of research time spent on innovation, its analysis and interpretations remain quite ambiguous. There has been studies to distinguish competence enhancing innovations from incremental innovations (Anderson &Tushman, 1990; Green *et al.* 1995). Differences of architectural innovations and disruptive innovations were the favorite topic of study in the homology of innovation studies in the last decade (Henderson and Clark, 1990; Christensen, 1998). The correlation of radical innovation with core system changes in the organization was elaborated in the innovation studies (Tushman and Murmann, 2002; Baldwin and Clark, 2000). Considering the apparent confusion prevalent in the research, it is imperative that a measurement model be developed to empirically assess the IC of firms from the human capital perspective. Empirical evidences of the correlation between innovation and organizational performance in terms of market share and profitability have been confirmed by the researchers in many a study in the past (Han *et al.*, 1998; Narver and Slater, 1990; Pawar, *et al.*, 1994; Calantone, *et al.*, 1995; Cooper, 1993; Griffin, 1997). The question whether IC remains as a personal attribute with employees or can it be extended to the organization as an emergent property has been discussed in brief by few researchers in the past (Leavy, 1997).

Disruptive innovation theory got much momentum during the last decade from the product and customer perspective and several such case study literatures were published (Yu and Hang, 2010). However, a central argument remains unresolved among scholars on the resource-based drivers of disruptive innovation (Danneels, 2004; Christensen, 2006). The questions on what type of incumbent organization to initiate disruptive innovation (Ganguly *et al.*, 2010), which is the best way to identify the potential innovation threats of entrants (Raûi&Kampas, 2002) and a comparative study on the competitive advantage of entrants and incumbents (Keller & Husig, 2009) were addressed in the past research. Despite the good progress

made in the innovation research during the last decade, firm's internal capacity from the resource based view remained alien to such innovation studies.

Theoretical Underpinning

At a time when customer's voice was treated as the ultimate feedback for product innovation strategy, a research team led by Christensen came up with the concept of 'innovator's dilemma', which talked about the potential needs of the potential customers (Christensen, 1997; Christensen and Bower, 1996; Christensen and Raynor, 2003). This theory was ground breaking, since it changed the mainstream belief that incumbents are stronger than the entrants are in any economic and business context. Christensen argued that entrants would be able to disrupt the traditional market with innovative products, which are initially applicable to a niche group of customers and later with its latent potential, can sweep through the larger part of the market. Entrants rather than incumbents are able to get into this risky game of unknown market and uncertain products. The very element of uncertainty keeps incumbents away from building resources for the disruptive innovation and concentrates more on the product sustenance with no remarkable innovations. Christensen called this incumbent's situation as 'Innovator's dilemma' (Christensen and Bower, 1996). It is time for established companies to get rid of this dilemma and move resources into unknown territories of innovation. With augmented IC, a firm can overcome the dilemma and sustain the competitive advantage in the incumbents market.

With the advent of disruptive innovation theory, there were many attempts to build the assessment framework and models to measure the element of disruptiveness in innovation (Govindarajan and Kopalle, 2006). However there exists a need to measure the internal readiness and capability (capacity) of innovation in a firm to address the imminent disruptive innovation. Thus, our study is underpinned with the theory of disruptive innovation.

Innovation Capacity Constructs

On a close scrutiny of the available literature on innovation related to the human capital revealed seven closely linked constructs. These constructs though disparate in the innovation studies, when put together makes a reasonable model of IC. The constructs thus identified are Concurrent engineering, Customer research, Improvisation, Experimentation, Creative potential, Technology orientation and Competence management. Each of these constructs is explained briefly here.

Concurrent Engineering

According to Charney (1991), product development in traditional methods will run into risk of losing revenue targets. Concurrent engineering (CE) as an innovative method was a natural evolution in the product development space adopted by many

companies. Pooltonand Ismail (2000) explained CE as team based element when members within the team develop a sense of collective target for future products, instill mutual trust and respect and allow fostering alternate points of view. They also emphasized the need to integrate disparate inter disciplinary teams into singular entity with structured customer and product vision. CE as a concept focused on reducing the time gap between collecting latent needs of customers and converting them into new and improved products. This tame gap is crucial in defining competitive advantage of the firms. CE as the name suggests is the process of parallel development of products while the existing product is declining in terms of features and customer needs. People and teams have been the central theme of CE evolution where researchers recognized the need to promote inter-personnel relationships in teams (Vasilash&Bergstrom, 1991; Maliniak; 1991; Pugh, 1992). Investment in human capital as a definite success factor for innovative product development was called in by many scholars (e.g. Peters &Waterman, 1982; Peters, 1988; Pascale &Athos, 1981).

Customer Research

Real life negotiations between customers and the product sales team are essential to understand the potential needs of customers (Walker *et al.*, 2002). The body of knowledge around innovation studies highlights the importance of feedback loop as fundamental requirement for developing scientific, technological and market innovations (von Hippel, 1994; Lundvall, 2010). Leonard and Rayport (1997) developed 'empathic design' as an ethnographic method in collecting product feedback from different type of customers in natural environment. The feedback thus collected is analyzed by a cross functional team within the company. The observations and data are then developed into product alterations and prototypes. The method focuses on collecting latent requirements of customer, which generally traditional market feedback methods do not capture. While explaining about building IC, Lester et al. (1998) emphasized the need of deploying product designers with each distinct customer segment to collect their specific latent needs.

Improvisation

Intense competition and compressed time are more and more becoming the reality of business life today. Given this pressure, resonate the actual or latent needs of the customers into the products they want is a key issue firms facing currently (Leonard & Rayport, 1997; Leith & Riley, 1998; Fournier, *et al.*, 1998; Martin, 1999). The search for new techniques and methods in products development paved way to improvisation. Irby (1992) argues that improvisation is an ongoing process where the firms think constantly in the midst of action, pressure and time compression. To neutralize the compressed time, it is important to better the time gap between planning and implementation while developing new products

(Moorman and Miner, 1998). According to Bjurwill (1993), improvisation is the essence of innovation, where reading customer's requirements and reacting to them in parallel through improvised methods. Real time composition as explained by Pressing (1988) is also very important factor of improvisation.

Experimentation

Conventional models and systems are increasingly becoming inefficient to deal with the spiraling levels of turbulence in the business environment (Poolton & Ismail, 2000). This situation is forcing teams to adapt innovations, which calls for apparent need of teamwork, integration and trust among the team members. Relaxing rules and procedures can provide an important means to promote innovation and experimentation. Letting the members abandoning conventional procedures and allow to break rules will be favorable for experimentation (Freemantle, 1999). It is important for companies to allow employees to use own judgment in all business situations. Risk taking is an integral part of experimentation as it strengthens superiority in performance which, with the combination of organizational support, will influence collective IC of the firm when combined with supervisory support & encouragement positively inûuences product innovativeness (Caldwell & O'Reilly, 2003; Dewett, 2004)

Creative Potential

Innovation is endemic within each individual and hence managers should make an effort to ignite this in each team member to generate its collective potential. It is the brainpower rather than manpower that works in technology firms and tremendous amount of creative potential is housed within the brains of the individuals. Tapping this potential in the workplace is a challenge for managers of today. Canfield and Miller (1998) while explaining about creative potential of teams set about nurturing relationships by managers if they want the employees to be committed and creative. Inventory of Organizational Innovativeness (IOI) model developed by Tang (1999) mentions the need of dedicated time and resources for generating meaningful business and product ideas. The IOI model also touches upon importance of a diversely skilled workgroup for ensuring optimal creative potential. Further, Amabile and Grykiewicz (1989) emphasized the need of rewards and recognition within the team to encourage creativity.

Technology Orientation

The primary factor of any innovation process is technology. Both empirical and theoretical studies proved that technology not only brings new waves of innovation in products and processes, but it radically changes the rules of the game in business. Such tectonic shift in the way business is done due technological changes can destroy established markets and create fresh markets in unexpected geographies

(Tushman&Anderson, 1986). Business sensible and remarkable new innovations can clearly push firms to higher planes of competitive advantage (Gobeli & Brown, 1994). Further, Yamin *et al*. (1997) state that anticipating potential of new technologies and acquiring them in advance puts firms in much advantageous position than the competition. They suggest that firms with strong IC will constantly think about newer technologies and encourage people to leverage technological innovation. Within the ICT sector, any shift in contemporary technology will bring in incredible impact to the products and operations as technology is profusely embedded into the intrinsic systems of this sector. Technology orientation as an inbuilt component is integral to the innovation and is popular in innovation literature (Berry and Taggart, 1994). However, technology may not always be synonymous with innovation (Claver, *et al*., 1998; Kim &Mauborgne, 1999). Betz's (1998) argument on balancing view of technology orientation and innovation holds good for ICT companies which was further explained by Rothwell (1994) in his coupling model of innovation.

Competency Management

This factor is adopted from the Inventory of Organizational Innovativeness (IOI) model developed by Tang (1999). In his model, Tang explained how IC can be increased within a firm by managing competence. Rightful amount of intellectual capital should be built up and maintained to face the imminent changes in technology. Constant upgrade of skills and collective knowledge, timely sharing of information and managing the firm's intellectual assets properly are important corner stones for ensuring innovation capacity.

This study focuses on the interplay between these three constructs with an operational definition of IC expressed through a measurement model that can be used for further field research in this area. The items elaborated under each construct also provide guidance for practicing managers who are seeking to understand IC under changing business conditions.

Need of an Instrument

There have been many studies and experiments conducted about Innovation by both researchers and practitioners during the past two decades. However, the definition of IC has never been settled into a single agreed concept. Studies hitherto defined the Innovation as a crude combination of technology, products, customer research and market. Majority of the literature related to innovation points to the product development space using processes, methods and techniques. Measure of IC from a human capital perspective is not sufficiently explained in these studies. The instrument for such measurement is absent in the literature. The available measurement instruments for IC are disintegrated and dimension focused. It is thus imperative that a fitting definition to IC needs to be derived and an appropriate

measurement instrument be developed for future use. This study attempts to address this gap by focusing on the antecedents of IC and developing an empirical assessment model of IC.

Qualitative Research Questions

1. How do you define Innovation Capacity (IC)?
2. What are the factors that closely related to IC in general?

Research Methodology

To clear up the confusion prevailing in the concept of IC and further to develop constructs to arrive at an assessment framework, we followed the qualitative methodology using triangulation. To extend the assessment framework into a measurement model, further quantitative experiemnts are required with appropriate reliability and validity tests. Such mixed methodology gives a researcher several design choices through the experimentation phase. Studies from the pragmatist school of thought which interlocks both qualitative and quantitative approaches within different phases of the research process will be categorised into mixed methods (Tashakkori & Teddlie, 2008). Mixed methods are equal or superior in compariosn to other approaches in reserach. Like in any research, validity comes from effectiveness, appropriateness and thoroughness with which those methods are applied. Careful consideration is given while checking each evidence rather than applying a set of rules or adherence to an established method (Bazely, 2004).

Triangulation

Using multiple research methods will give confidence to the reseracher on the investigation of the question in hand. Such multipronged approach is referred as triangulation. Most research in social science is one using signle method and such reserach may be handicapped with data accuracy issues. Triangulation methodology is the mode of using more than two reserach methods in analysing the same piece of research (Mitchell, 1986). Triangulation can be applied at the time of initiatlreserachinvestigaion or at the time of data colelction (Bums & Grove, 1993). This particular study followed grounded theory, case studies and Delphi as the triangulation methods that to identify and fix the variables and categories in relation to ergonomics.

Grounded Theory

Grounded Theory as the names suggests is based on ground realities which let a researcher come out with a theoretical framworkof an observation with appropriate empirical observations with data support (Martin & Turner, 1986, p. 141). Grounded Theory gives a rigorous, systematic and elaborate model with a flexibility to the researcher to test initial hypothesis. It provides researcher with reasonable freedom

to explore the research area and allow issues to emerge (Bryant, 2002; Glaser, 1978, 1992, 1998, 2001). Grounded theory covers the important aspects of research with appropriate coverage on the bias of the researcher, options of appropriate data collection site, the process of data collection, coding and and study of the data and finally the results coming out of the data. Coding will be done in three stages through open coding, selective method and theoretical coding. In the first stage,a regular comparison is done in open coding, then memo, and distributes results in themes, categories and sub categories. The results of the first stage influence the subsequent theoretical sampling. In the selective coding, the researcher gets consolidated and saturated core categories. The final core categories are then sorted accordingly, theorized and written down with literature support. The final list of the coding gives a fair clarity on the concepts under study and a theoretical model. With the support of grounded theory methodology, this particular study identified the factors and the themes related to IC.

Case Study

In the initial stage, the researchers have conducted three preliminary case studies to explore factors related to IC. The case studies have supported the research to get a grip on the topic under study with the content. Thus, the first criteria used by the researchers include the short interviews with the senior level employees from different ICT companies in Malaysia and developed short caselets. Through the interviews, short cases have been developed. Case study interviews are often used as part of the initial assessment and arriving at explicit and implicit variables based on the topic under study. Some of the case study content, which supported the researchers to get some insight into the concept of IC and allied factors, has come up from case studies among the employees of the ICT companies.

Case 1: Regional Talent Head of a Global Consulting Firm

I have been working with ICT clients in this region over eleven years. Talent management has been an obvious and challenging task for these companies over the years. The fast and ever changing landscape of technology significantly alteres the skill requirement for ICT sector. For me, the only solution to manage such situation is to build internal innovation capacity with available resources. The first step in such capacity building is to have a collective organizational aspiration to build and manage competence required for the future. Given the highly competitive environment, companies should attempt to venture into concurrent engineering process to better manage the product development portfolio. Time is a significant factor in the go to market strategy as the new entrants are sweeping the market with innovative products. Most of my clients are incumbent players in the market and I have seen them losing the ground to entrants with unconventional products and services. While readying the internal competence for innovation building, it is

also important for the firms to look into the overall preparedness in technology orientation and experimentation. Employees need an open culture and supportive team to break rules and question conventional wisdom. These positive elements will definitely augment the aggregate Innovation capacity.

Case 2: Director of an Information Services Company

Our team develops mobile applications for our operator clients in Malaysia. Our application development requires inter-operability across all the operating systems. In our 18 years of product development experience, the past five years have been the most challenging period. We have been witnessing the intense technology changes in telecommunication sector. Our team is currently working on several versions of the Android operating system. Our development team is still grappling with the major updates happened in the telecom technology in 3G and LTE. We have been facing severe skill shortage to manage the customer's expectation in building innovative mobile applications. We have been trying to build competence by reevaluating the training and knowledge sharing needs. High levels of improvisation in terms of product development process are required for us to keep pace with the new technology products. We try to keep a diversity of upgraded skills in my team to ensure that we are ready for any anticipated technology changes. Weare sure the counterparts in other organizations are facing the similar challenges as well. Malaysia has a shortage of such domestic technical skills. Moreover, the new technology is usually originated in the west and same is made available commercially in this region by global companies. In the absence of any training on such technologies, our team finds it difficult to adapt to the new situations emerging frequently. I feel that companies operating in technology sector should continually do the internal assessment of capabilities to ensure they stay focused on innovation. Improvisation, experimentation and customer feedback are very important for us to re shape and re-engineer the products. Readiness to change is quintessential for the companies today as the climatic changes in the business are so rampant with the impending changes in global economic situations.

Case 3: Senior Manager of a Telecommunications Company

The researcher manages a team of people who sell technology solutions to our enterprise customers. With the advent of high-speed internet, there have been tremendous opportunities for mobile companies to offer innovative products. When we design a product, we keep in mind the best business interest of our customer so that our product can help improve their services. The competition in the mobile product space is intense in Malaysia and our team is facing unprecedented challenges in delivering high tech products. One of the major issues the researcher was facing today is the lack of skill sets required for the new technology space. Global products, which are available over the net, have increased the awareness of our customers

and they demand much more features in our product offerings. We have no other option but to continually experiment and improvise our products. The changing technology arena has also posed us challenges in terms of upgrading skills. Our company is taking all the efforts to train the team in the new technology;however, the speed of change in technology makes our skills obsolete overnight. The researcher feels that it is important for technology companies to build competence in anticipation and instill a culture of openness among the working teams. Our sales team could be the feedback providers to understand the latent requirements of our customers so that we can re-design the products accordingly. Keeping all the doors open to the market is the mantra we need to follow. Designing the finer structure of the Organization demands mindful intervention into the firms' performance by establishing solid improvement infrastructure. I strongly suggest that workplace are shaped to encourage creative mindsets and market focus in designing the change towards sustainable competence health and innovation capacity.

Delphi

One of the methods under triangulation followed in this study was Delphi technique which has provided exploratory insight into the major variables closely knit with the concepts under this study. The Delphi technique suggests a systematic interaction with a panel of experts who are cautiously selected based on their knowledge and experience in the specific subject (Sekaran & Bougie, 2010). The panel of experts is given a topic for elaboration with a set of questionnaires to answer in multiple rounds. The answers to the questionnaire are consolidated by the researchers and circulated back to the panel for further elaboration, considering the opinion from other members of the panel. The panel members are given chance to iterate the previous opinion based on the newly found information and collective outlook on the topic. The rounds may continue until the researchers stop the same after having convinced that the opinions have converged into an acceptable level of consensus. In the current business research space, Delphi technique is used to forecast long range business plans. The identity of the panel members are usually not revealed among the panel to ensure an independent judgment of the topic of discussion.

To conduct this Delphi study, the researchers identified a group of senior professionals who are closely associated with Talent and Organizational development process in Technology and Consulting companies across Malaysia. While identifying such a versatile team, the researchers have ensured maximum possible heterogeneity in terms of gender, industry segments and job roles. The identified panel members are from varied backgrounds like, Heads of HR, Sales Managers, Consultants, Directors, Technical Architects and Academicians. The selected panel included 25 male members (78%) and 7 female members (22%). These experts are well experienced and considered authority in their respective area of operations. Having sufficient breadth and depth of experience in the field,

these members were cautiously selected to give an opinion about IC. Out of the 32 experts approached for this study, 27 of them gave their consent and time to conduct semi-structured interviews with them. Three rounds of interviews with panel members were conducted during the period between December 2013 and May 2014. While the majority of the interview sessions took place face to face at the member's convenience in their respective offices, few sessions were completed over the telephone. Each panel member was briefed by the researchers in detail about the objective and expected outcome from the study. All the conversations were audio recorded and analyzed separately for further details. The procedural steps at each round followed in the Delphi technique were as follows.

Expert Panel Round 1

The first round of the Delphi the researchers set the context with the expert with few open ended questions. Open ended questionnaire helps in acquiring rudimentary facts related to the topic from the point of view of the expert which serves as an initial content sanitation of the topic (Custer, Scarcella, & Stewart, 1999).

The open ended questions posed to the experts in the first round were:

1. How do you define Innovation Capacity?
2. Which are the latent constructs of Innovation Capacity?
3. Which are the factors constitute the constructs of Innovation Capacity, contextualsing the topic to ICT sector?

At this stage, the panel members' independent ideas and understanding are brainstormed; brain written and their creative thoughts around the topic are triggered by the questions (Cuhls, 2001). They are given time to think through the questions and write down/record the answers before it is collated by the researchers.

Expert Panel Round 2

At this stage, specific factors of agreement and disagreement under each construct are identified and sorted out to bring about a consensus on the relative importance of categories and items (Ludwig, 1994). IC related dimensions and their respective factors were collected and consolidated in this round for further analysis. This is a foundational stage to derive a closer interface to implementation of IC as an important variable in Organizational studies by segregating distinct dimensions and arriving at unique and consistent factors of measure. The researchers consolidated and identified 7 distinct dimensions and 27 items under IC from the aggregated inputs given by the members.

Expert Panel Round 3

In this final round, a pre-finalized list of IC categories and their first order constructs with appropriate items were presented to the panelists. The panelists were requested to review the list to make any amendments to their opinions given in the second

round. Thematic apperception and itemization of the categories were made in this round. There were a total of 27 items identified in the second round. Upon further independent evaluation of these items by the panel, 6 items were identified as redundant or out of context by the panel. These items were removed from the list to form a final approved list of 21 items. All the dimensions and categories identified in the second round were approved by the panel and retained in the model. Through this consensus-oriented method, a final list of first order latent constructs of IC and their reflective factors were identified and approved by the panel. This research study thus developed a model that defines IC and the related dimensions and factors. The details of the analysis are incorporated in the discussion part.

TABLE 2: DELPHI TABLE ON IC

Dimension	*Factor*	*Number of experts*	*% of experts*	*Item Status*
Concurrent Engineering	Shared team vision	23	85%	
	Parallel products	21	78%	
	Empowerment	11	41%	Dropped
	Cross-functional integration	21	78%	
Customer Research	Customer negotiations	18	67%	
	Customer Feedback	12	44%	Dropped
	Customer agents	21	78%	
	Empathic design	23	85%	
Improvisation	Thinking in the midst of action	26	96%	
	Efficient planning and implementation.	23	85%	
	Reading and reacting in parallel	7	26%	Dropped
Experimentation	Relaxing rules and procedures	19	70%	
	Breaking rules	25	93%	
Creative Potential	Nurturing relationships	27	100%	
	Idea generation	10	37%	Dropped
	Time and resources for generating ideas	21	78%	
	Diversely skilled work groups	23	85%	
	Reward and recognition for creativity	19	70%	
Technology Orientation	Number of remarkable innovations	23	85%	
	Anticipate the potential of new technologies	26	96%	
	Acquire technology in advance of needs	21	78%	
	Constantly thinking of new technology	26	96%	
Competence	Build-up intellectual capital	20	74%	
Management	Training on potential skills	7	26%	Dropped
	Upgrade knowledge and skills	17	63%	
	Sharing and disseminating information	19	70%	
	Managing intellectual assets	26	96%	

The first dimension of the IC construct discussed by the panel members was Concurrent engineering. While most of the panel members agreed upon the items of shared vision, parallel products and cross-functional integration, only 11 members found empowerment as a requirement for successful concurrent engineering. As such due to low endorsement, this item was dropped from the list of items. The dimension of Customer research was one of most discussed area throughout the panel discussion period. Direct customer interactions to collect latent feedbacks were considered important by the panel members. Customer negotiations was approved by 67% of the members and Empathic design was approved by 85% of the members. Members felt that deploying customer agents was an important activity for feedback loop so as to improve the innovation capacity. Customer feedback was identified and a redundant item (44%) as it features in other items in the dimension. Under improvisation dimension, panel members approved two items, while reading and reacting in parallel scored the lowest (26%). The panel retained both the items in the Experimentation dimension (70% & 93%). Under the dimension, Creative potential all the members unanimously agreed that nurturing relationship within team is highly desirable to improve innovation capacity. Time, resources, diversity, rewards and recognition also were deemed suitable and essential for creative potential. Idea generation scored only 37% among the members and hence this item was dropped from the list. All the four items in the Technology orientation were found to be relevant by the panel and hence retained all of them. Among the five items posed to the panel under competence management, training on potential skill was not widely accepted by the members and scored only 27%. After dropping this item, the dimension had four high score items.

Discussion

This research study focused on developing an integrated measurement model for IC with clearly defined dimensions, which were hitherto observed and measured as independent items as explained in the literature from previous studies. Opinions of industry and academic experts who are closely associated with Organizational studies were collected to construct the IC assessment model. As observed and identified by the panel members through a Delphi exercise over six months, there exist 21 measurable factors, which form the bricks and stones of the IC model. The model developed in this study is also greatly supported by the Disruptive innovation theory conceived and elaborated by a range of scholars.

When a firm delivers all its committed targets to the stakeholders, it is said to have performed well. There are several key indicators to rightfully measure performance through Net Profit after Tax, Return on Capital Employed (ROCE), dividend to shareholders, market capitalization etc. To sustain health over a period of time in the business space, an organization needs to continually realign with market realities, quickly renew its internal energy sources and execute with

precision, more importantly faster than its closest competition. The essential elements of IC are different according to the business context the Organization operates in. However, the fundamental Organizational capabilities like concurrent engineering, improvisation, customer research, experimentation, creative potential, technology orientation, competence management etc. mediate the strength and direction of competence deficiency to alter the organizational health substantially. Global competition has given much required emphasis to the competitive advantage by recognizing differentiating factors in all markets. Domestic players in all markets saw a sudden influx of foreign products with lower price and higher quality. When investment in product development was no more an option to the companies, smaller firms, caught in the global competition started looking for innovation methods to match the quality and price of their foreign counterparts.

The first dimension of IC in this study is Concurrent engineering. Concurrent engineering featured as a significant contributor to IC in the literature studied, confirmed in the case studies through grounded theory and was selected as an antecedent to IC by the expert panel members as well. Customer research as a dimension to IC was one of the much-discussed areas by the panel members. Most of the innovation literature also mentioned customer as an essential feeder line in the innovation loop. Since most of the panel members were from the ICT background, Improvisation, Experimentation, Creative potential and Technology orientation were discussed thread bear by the panel members throughout the Delphi exercise. In the first round the concept Creative potential was concurrently taken up by many several members and supported by most of the rest. Anticipating emerging technologies, diversity skill building, thinking amidst action etc. were a few of the key words picked up and retained in the factor sheet by the researchers during the sessions. Idea generation and Reading and reacting in parallel were dropped from the fact sheet due to the low score from members. When five panel members raised the topic of Competence management in the first round, there were varied and distributed reaction from the rest of the members in the second round. While competency development as a whole was agreed upon as an important requirement for IC, training on potential skills was not considered to be a major change factor in IC. There was a convergence of opinion when discussed about the managing intellectual capital, upgrading skills and sharing of knowledge and information.

Implications

Through the journeys of profitable Organizations, it has been empirically proven that the intensity of IC can bring in intrinsic health to the Organizations. In this study, the researchers have attempted to clear the ambiguity around the IC concept by integrating the hitherto disparate constructs. The researchers, through a six months long, rigorous interactive sessions, contacted experts from the Industry and Academic fields to collect, collate and aggregate opinions to deduct reasonable

inferences to develop a an integrated IC assessment model. The model thus developed can be converted into an instrument to measure IC from a holistic perspective covering all the dimensions of organisational innovation. The model harmoniously interlocks the undisputed concepts of customer, products, technology and human resources. The researchers believe that this model can serve as a ready reckoner for those practitioners who are concerned about their firm's innovation capability in changing business situations and the resultant impact of it on their Organization's health. The model will have a positive influence on Technology Organizations where the waves of change sweep in at unprecedented speed. Barring the Inventory of Organizational Innovativeness (IOI) model developed by Tang (1999), which measures the effect of competence on innovation, no other established instrument is available today for Organizations to measure the IC.

Conclusion

This qualitative study throws light to the IC dimensions and further establishes the factors influencing IC, leading to the development of an integrated assessment model. Despite the fact that a few firms have understood the significance of measuring IC, they mostly do not know precisely what to measure, because of an absence of understanding of what constitutes a set of IC dimensions. By proposing, creating, and validating a multi-dimensional, operational measure of the IC, and by showing its viability in enhancing organizational performance, the present study gives practitioners a handy instrument for assessing the extensiveness of their current IC initiatives. The experts, while interacting through the Delphi technique expressed a uniform opinion regarding the IC dimensions and its factors. These experts were chosen based on their vast and varied experience in Organizational development activities in Malaysia and outside. This, we believe is a significant contribution to the body of knowledge. The model can further be expanded into a customizable, evidence-based instrument to measure IC, which we are sanguine that will be a considerable contribution to the industry.

This study is theoretical in nature, and the constructs of assessment model developed was compiled through an elaborate literature analysis. The constructs thus developed were further validated through a qualitative triangulation method to further build up into an assessment model. Empirical validation of this assessment model is required to further ratify the generalizability of the model. Researchers can examine the model's predictive power by administering the model in various technology organisations from the ICT sector. Further, such results may be compared with the existing assessment models to yeild additional insights.

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