LINKING INNOVATION AND COLLABORATION AND; ORGANIZATIONAL AND ENVIRONMENTAL EVOLUTION TO FIRM PERFORMANCE

Dr Rajenlall Siriram

ABSTRACT

We are flooded with a multitude of technologies and firms are forced to be more innovative than other firms. Firms which are able to innovate and collaborate with other firms and; firms which are able to grow through organizational and environmental evolution may achieve better firm performance. In this paper a model is constructed to better understand the links which drive innovation and collaboration and a firm's organizational and environmental evolution and how this linkage may result in improvements in firm performance. A model is constructed and responses received from 232 firms. Structural equation modeling is used to test the model. Various linkages are proposed which show how the drivers strategy and leadership, culture and climate, planning and selection and; new products and services link to innovation and collaboration and; organizational and environmental evolution and; firm performance. Limitations of the model and opportunities to further research are also proposed. This paper makes a contribution to knowledge by proposing a model linking the strategic drivers to firstly innovation and collaboration and; secondly to organizational and environmental evolution and thirdly to better firm performance.

INTRODUCTION

Given the rapid pace of technological evolution, firms are flooded with new technologies and services. Firms are forced to become more competitive than other firms. Firms are in continual race to be better than other firms. Some researchers argue that firms who are able to innovate better than other firms perform better than those firms who do not innovate so successfully. In this paper it is proposed that firms who are able to innovate and collaborate and firm's who progress through an organizational and environmental evolution may perform better than other firms. A model is proposed to better understand the drivers, strategy and leadership, culture and climate, innovation planning and selection and new products and services and how these drivers link firstly to innovation and collaboration, secondly to the firm's organizational and environmental evolution and thirdly linking to firm performance. This paper makes a contribution to knowledge by firstly a) proposing a model to better understand the links in the innovation process, 20 hypothesis are tested, secondly b) does the firm's innovation and collaboration ability lead to better firm performance? c) does the firm's ability to develop and evolve through an organizational and environmental evolution lead to better firm performance. Limitations of the research and further research opportunities are also proposed. Important lessons for managers are discussed.

Literature Survey and Hypothesis Development

Many firms have not mustered the ability to develop and market new innovations and technologies successfully. Many have learnt invaluable lessons from past experiences. Bessant (2003) says innovation represents the core renewal process in any organization, he however also points out only one firm out of the Dow Jones 100 index actually made it through from the beginning to the end of the 20th century. Even though bringing new products to market play an important role in building competitive advantages which may significantly improve a firm's growth and profitability (Ali, 1994, Cooper 2000, Kleinschmidt and Cooper 1991), many have not mustered this core capability.

Veryzer (2003) points out even though innovation shows much promise it does not come easily. Given the rapid pace of business and technology evolutions firms need to get a better handle on innovation development and see more successes in bringing new innovations to market. The importance of firm innovation is also supported by Alegre and Chiva (2008) they argue the firm's ability to continuously generate innovations is one of its most critical capabilities. In an endeavor to improve innovation capability developing technology and innovation as dynamic capability is seen as an important competence to develop by at least the follwing, Cetindamar, Phaal and Probert (2009) and; Ellonen, Wikström, Jantunen (2009).

A vast amount of research has gone into the innovation arena some researchers like Takayama, Watanabe and Brown (2002) ask questions on whether firms innovate at the expense of stability. Other researchers examine at least the following:

- The strategic implications of innovation strategy, Anthony, Eyring and Gibson (2006);
- technological innovation, Wang, Lu and Chen (2008), Stock, Greis and Fischer (2002);
- innovation diffusion and the forecasting process associated with new innovations, Da Sliveira (2001), Mahajan, Muller and Bass (2009), Ilonen et al (2006), Gourville (2006), Gourville (2006); Watts and Porter (1997); Kumar, Nagpal and Venkatesan (2002), Winklhofer and Diamantopoulos (2003); Coates, Mahaffie and Hines (1994), Kayal (1999);
- new product development Scott (1999);
- how new innovations may be brought to market, Chakravorti (2004).

As can be seen there is much research in the innovation space and as such the concept of innovation is misused, many offer different interpretations, Linton (2009) gives some clarity in terms of understanding the language of innovation. He argues that the term innovation is often misused and although innovation itself can be very narrow, the phenomenon is broadly applicable. Therefore in order to simplify the term it is better to use three very different examples, to further explain the concept innovation. To better explain the concept of innovation an innovation may be seen as a product or sets of products, a manufacturing process and a service. He further argues that the intent is to consider innovation from two common types of end products: goods and services. From a product (goods) perspective Abernathy and Clark's (1985) work on understanding innovation and more specifically automotive innovation are used as examples. The innovations considered in this category include two critically important approaches introduced to the automotive industry by Japanese firms firstly statistical process control (SPC) and lean processes (JIT) and secondly the introduction of electronic components in manufacturing and social innovation achieved through fuel efficiency regulations this requires automobiles to be manufactured to a minimum level of fuel efficiency. From an SPC and JIT perspective, the overall effect to the industry has been a vast increase in product quality and a decline in overall production cost. From an electronic components perspective the introduction of electric components gave benefits in cost and performance. From these two examples it is shown, which types of innovations encompass product innovation. Having given examples of product innovation a manufacturing process is next considered many people think of products when considering innovations, however many
innovations involve processes to make a new or existing product. Some of these examples include the transition between Microsystems that has been the

experience over the last several decades and the anticipated move away from Microsystems to Nanotechnologies. The transition from Microsystems to nanotechnologies will have a tremendous impact on the way work will be conducted both in terms of equipment and procedures. Nanotechnologies may also offer challengers relating to social innovations. There are inherently philosophical differences with nanotechnologies as a manufacturing process-building a product up from an atom-by-atom basis is fundamentally different to the approach used by using Microsystems. Over a period of time manufacturing processes based on Microsystems will be replaced by Nanotechnologies. As with microsystems, some nanotechnology-based products will require no changes in behavior with users, while other products will offer added advantages with little or no change in user behavior and finally in other cases entirely new applications and products will enter the market place. The emergence of new innovations may be disruptive fundamentally changing the status quo. Next services are discussed. The role of innovation in services has not been as extensive as innovation in products and in manufacturing. As an example consider the competition for technologies in the telecommunications industry more specifically the coexistence between fixed line and wireless technologies. In a service, such as telephony, we are able to see the effect in different social innovations as these technologies are put in different counties and regions. As more technologies become able social networking impacts occur, fundamentally changing the behavior of people in that country or region.

Having considered innovation as a product, a manufacturing process and a service and seeing that such innovations may help firms grow, others like Ellonen, Wikström and Jantunen (2009) argue that there are many research studies, which have noted the firm's ability to innovate is idiosyncratic however Vrande et al (2009) and; Chesbrough and Graman (2009) have proposed open innovation as a new paradigm, showing that inflows and outflows of knowledge may be used to accelerate idiosyncratic innovation and also expand markets for the external use of that innovation. Some researchers see such innovations as idiosyncratic and others see such innovations as open source. There is argument to be made that firms that are innovative and collaborative may be achieve better firm performance than other firms i.e. firms which are more open to outside inputs are better positioned for better firm performance. Siriram (2011) argues these innovations maybe seen as affecting a firm's culture and climate as individuals in the firm may either accept or resist such innovations. In so doing affect the firm's organizational and environmental evolution and thus the firm's ability to grow. Furthermore Porter (1991) defines organizational and environmental evolution as criteria for competitive advantage, including generalized factors like generic technologies, related and supporting industries like home-based suppliers, associated demand, the firm's structure, rivalry and completion policies, and large government projects.

While there is an abundance of research on innovation, this paper makes a contribution to knowledge by shedding more light on answering some critical questions like;

- Q1: Can a model be developed to better understand the links in the innovation process from the drivers (strategy and leadership, culture and climate, planning and selection; and new products and services) to link firstly to innovation and collaboration; link secondly to organizational and environmental evolution and link thirdly to firm performance.
- Q2: Does the firm's innovation and collaboration ability lead to better firm performance.
- Q3: Does the firm's ability to develop and evolve through an organization and environmental evolution lead to better firm performance.

To answer the central questions it is important to develop a framework for innovation. Siriram (2011) proposes an investigative framework to test the convergence of newer technologies and firm collaboration postulating that technology convergence and firm collaboration may lead to better firm performance. The framework used by Siriram (2011) is adapted and used in this paper to investigate whether innovation and collaboration and; organizational and environmental evolution may lead to better firm performance. In developing the framework important hypothesis are tested. The framework is shown in Figure 1, and a summary of research hypothesis is shown in Table 1, Appendix 1. The framework and research hypothesis is next discussed.

The Drivers

Linking strategy and leadership to innovation have been proposed by at least Radas and Bozic (2009) they claim having a well-defined corporate strategy, sound management practices and organizational structures are important enablers for innovation. Siriram (2011) says developing a competitive strategy in terms of new technology adoption requires technology and business alignment as well as alignment in terms of firm strategic drivers.

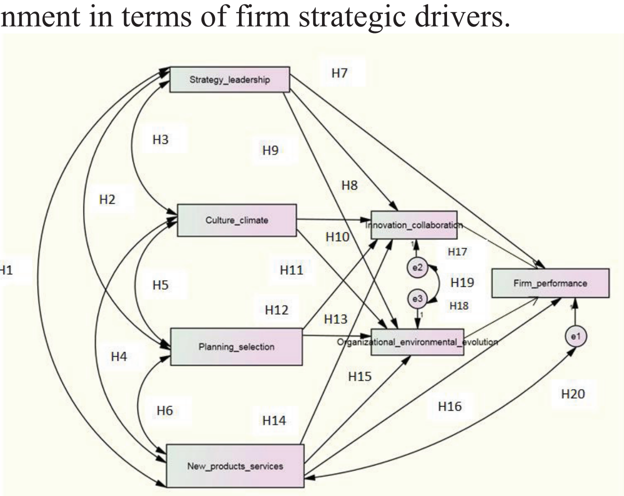

Figure 1: Framework for Hypothesis
The following hypothesis is formed:

- H1: Strategy and leadership has a positive impact on a firm's ability to develop new products and services.
- H2: Strategy and leadership has a positive effect on a firm's innovation planning and selection process.
- H3: Strategy and leadership has appositive effect on a firm's culture and climate.
  Next culture and climate are discussed.

Culture and climate

Cormican and O' Sullivan (2004) define a firm's 'culture' as being the values, norms, and beliefs; 'climate' as the policies, practices, and procedures. They see culture and climate as both an enabler and a barrier to sharing knowledge or innovation. So culture and climate may be seen as a factor when considering innovation. Innovations are often accompanied by resistance to change, affecting a firm's culture and climate and its organizational and environmental evolution. Therefore in terms of culture and climate, the following hypothesis is proposed.

- H4: A firm's culture and climate has a positive effect on the firm's ability to develop new products and services.
- H5: A firm's culture and climate has a postive effect on the firms' innovation planning and selection process.
  Next planning and selection is discussed.

Planning and selection

Given the effect of culture and climate on the firm's planning and selection process, the following hypothesis is formed.

- H6: A firm's planning and selection process has a positive effect on the firm's ability to develop new products and services.

Next the drivers to innovation and collaboration are discussed.

Drivers for Innovation and collaboration

Due to the investment in innovation firms are likely to invest in better planning and selection processes and in turn firm's therefore tend to spend more attention to foster an innovative culture and climate. An improvement in culture and climate may lead to better innovation and collaboration and be a catalyst for more innovations. This in turn may lead to an improvement in firm's performance. Therefore the following hypothesis is formed viz:.

- H8: A firm's strategy and leadership positively affects the firm's ability to innovate and collaborate
- H10: A firm's culture and climate positively affects the firm's ability to innovate and collaborate.
- H12: A firm's planning and selection process positively affects the firm's ability to innovate and collaborate.
- H14: A firm's ability to develop new products and services positively affects the firm's ability to innovate and collaborate.

  Links to organizational and environmental evolution are next discussed.

Drivers Organizational and environmental evolution

In terms of firms organizational and environmental evolution firm's who have fostered a positive view in terms of the drivers (strategy and leadership, culture and climate, planning and selection and new products and services) are likely to see links to the firm's organizational and environmental evolution. Therefore the following hypothesis are formed

- H9: A firm's strategy and leadership positively affects a firm's organizational and environmental evolution.
- H11: A firm's culture and climate has positively effects a firm's organizational and environmental evolution.
- H13: A firm's planning and selection process has a positive effect on a firm's organizational and environmental evolution.
- H15: A firm's ability to develop new products and services has a positive effect on a firm's organizational and environmental evolution.

Next drivers for firm performance are next discussed

Drivers for Firm Performance

Developing innovative capabilities may lead to better firm performance. Hence the following hypothesis is formed.

- H7: A firm's strategy and leadership has a positive effect on firm performance.
- H16: A firm's ability to develop new products and services has a positive effect on firm performance.
- H17: A firm's innovation and collaboration capability has a positive effect on firm performance.
- H18: A firm's organizational and environmental evolution has a positive effect on a firm's performance.
- H19 and H20 are links to the error terms (e2,e3) and e1 respectively.

This paper proposes exploratory research in the area of innovation, which may lead to better firm performance.

RESEARCH METHODOLOGY

Data Collection and Sample

The research consists of a survey process. The instrument used in the literature survey was developed through an extensive literature review. The industries selected included the electronics and electrical, information and communications technology, fast moving consumer goods (FMCG), Logistics and financial industries. Firms participating were selected by lists of germane publications. Firms operating within South Africa were selected. The following germane publications were used: Fortune magazine March 2007 edition number 4 was used, Financial mail top 100 firms, TOP technology companies in the South Africa and the Top information and communications technology (ICT) firms in South Africa. The methodology used to select the industry categories has been used elsewhere Siriram and Snaddon (2004) and Siriram (2011). This resulted in a total sample size of 565 firms. Given previous research evidence by Stoneman and Kwon (1996), the sample sizes were considered to be adequate. The literature review focused on the areas of strategic innovation management. The instrument consisted of 29 questions, all of which were used in the final study after testing. The majority of the questions consisted of 7 point Likert scales and some forced ranking questions were also used. The responses ranged from 1-7 and in each case 1-7 was defined. The response X = Not relevant/Do not know, was also made available.

The pre-test consisted of a sample of 30 respondents who were selected to test the overall, clarity, structure, relevance and wording. The pre-test was then followed up by a pilot test, which consisted of a sample size of 32. Cronbach alpha tests were performed for the pilot group. Cronbach alpha values below 0.728 were removed from the analysis. The instrument was modified and distributed to the main group. The normal procedures for exploratory type research were followed i.e. initial electronic contact was made through email, thereafter the instrument was made available through a website, which included a document summarizing the objectives of the research. During this research the electronic website largely improved the facilitation of responses. Several follow up personalized emails were sent over a 2 month period. In total 232 responses were received, i.e. a response rate of 41.06%, a profile of the research sample is shown in Table II. To ensure that the managers who responded did not differ substantially from those who did, we tested non-response bias by comparing early respondents with late respondents, the rationale behind this comparison is that late respondents show a greater resemblance to non-respondents than early respondents.

Confirmatory factor analysis was conducted to check the reliability and validity of the model. The Cronbach alpha ranges from 0.712 to 0.927 for 7 constructs, indicating a high internal consistency. A summary of the reliability tests are shown in Table III, Appendix 1.

The ‘means’ of several constructs were compared, and *t*-tests revealed no significant differences between the two groups, suggesting that non-response is not a major factor, Armstrong and Overton (1997). Table II shows the profile of the research sample. The research results are next discussed.

Respondent Characteristics	Number of respondents who answer (n=163)	Percentage (%)
Position in company		
1. Chairman/CEO/COO.	24	10.3%
2. Executive directors.	27	11.6%
3. Non executive directors/General managers.	44	19.0%
4. Functional specialits/middlemanagement	117	50.4%
5. Others e.g. Middle Managers etc,	20	8.6%
	232	
Firm catrgories		
1. National local company.	75	32.3%
2. Multi national company.	127	54.7%
3. Joint venture, mergers or strategic alliance.	20	8.6%
4. Other e.g. franchises.	10	4.3%
	232	
Education		
1. Postgraduate	63	27.2%
2. Bachelors	71	30.6%
3. Diploma	73	31.5%
4. Others e.g. Colleges, technical college	25	10.8%
	232	
Industry categories		
1. Electronics and Electrical engineering.	25	10.8%
2. Information Technology industry.	75	32.3%
3. Logistics.	25	10.8%
4. Financial.	35	15.1%
5. Fast moving consumer goods	27	11.6%
6. Resources and mining	15	6.5%
7. Manufacturing	12	5.2%
8. Construction	6	2.6%
9. Other	12	5.2%
	232	
Firm size		
1. Less than 100	35	15.1%
2. 100-2000	85	36.6%
3. 2000-5000	36	15.5%
4. 5000-10000	16	6.9%
5. 10000-50000	52	22.4%
6. More than 50000	8	3.4%
	232	

Table II. Profile of research sample

Analysis of Results

Table II summarizes the profile of the respondents. The sample was checked for sample representivity. Chi-squared distribution analyses revealed no significant differences between our sample and the population from which it was drawn in terms of industry distribution, number of employees and firm size.

In addition the discriminant validity of the instrument was verified by comparing the average variance extracted of each latent construct to the square of the correlation between this construct and every other construct used in the research. The result is shown in Table IV, confirming the discriminant validity: the square of the average variance extracted for each construct is greater than the levels of correlation involving the construct. The results of the inter-construct correlations also show that each construct shares larger variance with its own measures than other measures.

Variables	Strategy and leadership	Culture and climate	Planning and selection	New products and services	Innovation and collaboration	Organizational and environmental evolution	Firm performance
Strategy and leadership	0.806						
Culture and climate	0.525	0.713					
Planning and selection	0.663	0.709	0.726				
New products ad services	0.519	0.662	0.719	0.683			
Innovation and collaboration	0.613	0.621	0.708	0.644	0.708		
Organizational and environmental evolution	0.588	0.649	0.709	0.637	0.705	0.607	
Firm performance	0.489	0.486	0.543	0.485	0.446	0.472	0.687

*The shaded numbers in the diagonal are square roots of the average variance extracted

Table IV. Discriminant validity of constructs

Firstly as suggested by Anderson and Gerbing (1988), the 99% confidence intervals around the correlation parameter estimates between all possible pairs of scales, and established none of these intervals included one. Secondly the square of the correlation between any two constructs was less than the average extracted estimates (Fornell and Larcker, 1981). Overall, the results show an adequate level of reliability and validity.

The Structural Model

Structural equation modeling was used to test the investigative framework. The model was developed using AMOS 18.0. For the model fit indices the methodologies given by Hair et al (1998, p.620); Yang and Su (2008, p.1671); Williams and Hazer (1986, p.224) were used. 232 responses were received for structural equation modeling, which is acceptable (> 5* no. of distinct parameters, 5*28=140, Hair et al (1998)). The Chi-squared statistical significance level of 0.663 is above the minimum level of 0.05 and more conservative levels of 0.10. This indicates the model is a good fit. Table V, Appendix 1 shows the model fit indices. The normed Chi-square (X^2 / df) has a value of 1.583. This falls well within the recommended levels of 1.0 to 2.0, Hair et al (1998). The goodness of fit index (GFI) of 0.998 is also quite high, adjusting for model parsimony, the adjusted goodness of fit index (AGFI) value is 0.982, which is acceptable. The incremental fit indices i.e. Tucker-Lewis index (TLI) and Normed fit index (NFI) is 1.009 and 0.999 respectively and is above the recommended levels of 0.90, the RMSEA is at 0.001 below the suggested threshold value of 0.08. The research results are next discussed.

Discussion of Results

The main objective of the study is to understand links in the firms innovation process. Using the investigative model, Figure 1 and Figure 2, factors influencing innovation are studied to better understand how the impact of innovation on firm performance. The research results provide a strong overall validation of the investigative framework with 18 out of 20 hypotheses supported. The structural model is shown in Figure 2, based on these results Table VI summarizes the research hypothesis.

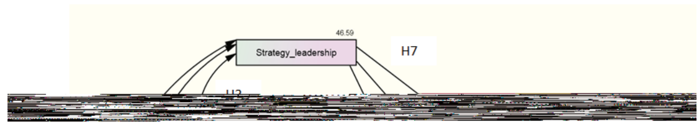

Figure 2. Research Results

18 out of 20 hypothesis were supported. Hypothesis H17 and H18 were not supported i.e. innovation and collaboration; and organizational and environmental links to firm performance. It is proposed other constructs be investigated to better understand how these hypotheses may influence firm performance as per the innovation framework. From this study it is evident innovation and collaboration may be improved through ensuring certain drivers are in place however no link to firm performance could be established. In terms of organizational and environmental evolution links from the drivers to organizational and environmental evolution could be established however no links from organizational and environmental evolution to firm performance could be established.

Limitations of Research

The research was limited by studying mainly South African firms. It would be interesting to compare the research to other counties like Europe, US and Eastern counties like China and India.

Hypothesis	Supported	Not Supported	Significance P-value
HI	√		15.831, p< 0.001
H2	√		25.456, p<0.001
H3	√		20.905, p<0.001
H4	√		25.251, p<0.001
H5	√		30.096, p<0.001
H6	√		18.537, p<0.001
H7	√		0.235, p<0.012
H8	√		0.307, p<0.001
H9	√		0.170, p<0.001
H10	√		0.041, p<0.001
H11	√		0.176, p<0.003
H12	√		0.427, p<0.002
H13	√		0.307, p<0.001
H14	√		0.570, p<0.001
H15	√		0.257, p<0.004
H16	√		1.040, p<0.001
H17		√	Not supported
H18		√	Not supported
H19	√		4.429, p<0.001
H20	√		-6.673, p<0.002

Table VI. Summary of Hypothesis

Further Research

Further research may involve the following:

- Comparing the relationships between different industry sectors.
- Expanding the research to include other countries, and comparing the differences between countries.
- Investigating other constructs for innovation and collaboration and; organizational and environmental evolution since no positive relationship to firm performance could be found for these two categories.

CONCLUSION

The research looked at how a firm's innovation and collaboration ability together with a firm's organizational and environmental evolution may lead to better firm performance. However, when Likert scales are used, one needs to be aware that they reflect only the attitude of individuals, and therefore in this case they serve as an indication of the respondent's attitudes' regarding the firm's ability to innovate. The linkages formed in the SEM are thus a reflection of the attitudes/perceptions of the respondents. Further research is required to form more robust claims about the actual contribution of innovation. Proof of the actual contribution of innovation needs to be seen in terms of operational benefits. To this end, case study analysis of real cases needs to be conducted. However, firms may be unwilling to disclosure actual data, and so case study research may be difficult to conduct.

From this research using SEM, several linkages were found 18 out of 20 hypothesis were supported. Further research is required to test the actual contribution of innovation and collaboration as well as a firm's organizational and environmental evolution. the three central questions posed:

- To better understand links in the innovation process. 18 out of 20 hypothesis were supported. Therefore we are able to get a better understanding of the links in the innovation process.

- Does firm's innovation and collaboration ability lead to better firm performance? From this reach we cannot verify that a firm's innovation and collaboration ability lead's to better firm performance.
- Does the firm's organizational and environmental evolution lead to better firm performance? From this research we could not verify that a firm's organizational and environmental evolution lead's to better firm performance.

Using the model developed in this research, several hypothesis were formed. Showing various links from the drivers to firstly innovation and collaboration and secondly to the firms organizational and environmental evolution.

ACKNOWLEDGEMENTS
The author would like to thank all participants of the research and Mrs Frances Hughes for proof reading and final document setting.

REFERENCES

Abernathy W.J., Clark, K.B., 1985. Innovation-mapping the winds of creatice destruction. Research Policy 14 (1), 3-22.

Alegre J., Chiva., 2008. Assessing the impact of organizational learning capability on product innovation performance: an empirical test. Technovatio, 28,315-326.

Ali, A., 1994. Pioneering vs incremental innovation: Review and research propositions. Journal of product innovation, 11, 46-61.

Anthony, S, C. Eyring M, E. Gibson L. 2006. Mapping your innovation strategy, Harvard business review, May, 1-11.

Armstrong, J, S., Overton, T, S. 1997. Estimating non-response bias in mail surveys. Journal of Marketing Research, 14(3),61-83.

Bessant, J. 2003. Challenges in Innovation Management, In: The international handbook of Innovation, Shavinina, L, V., Pergamon, 761-774.

Coates, J, F, Mahaffie, J, B, Hines A. 1994. Technological forecasting:1970-1993. Technological forecasting and social change,47,23-33.

Cooper, R, G,. 2000. Strategic marketing planning for radically new products, Journal of marketing, 64(January), 1-16.

Cormican, K, O'Sullivan, D. 2004. Auditing best practises foe effective product innovation management, Technovation, 24, 819-829.

Cetindamar, D. Phaal R. Probert D. 2009. Understanding technology management as a dynamic capability: A framework for technology management activities, Technovation, 29, 237-246.

Chakravorti, B. 2004. The new rules for bringing innovations to market, Harvard business review, March,27-35.

Chesbrough H, W, Garman A R. 2009. Use open innovation to cope in a Downturn, Harvard Business review, June, 1-19.

Da Silveira, G. 2001. Innovation diffusion:research agenda for developing economies. Technovation,21,767-773.

Ellonen H, Wikström P, Jantunen A. 2009. Linking dynamic-capability portfolios and innovation outcomes, Technovation, 29,753-762.

Table III: Reliability tests

Construct	Indicator	Mean	Standard Deviation	Corrected Item-to-total correlation	Cronbach Alpha	Composite Reliability	Factor Loading	Cronbach Alpaif item deleted	Average variance extracted
Strategy and Leadership	SE4	4.44	1.975	0.790	0.927	0.881	0.791	0.919	0.649
	SE3	4.50	1.849	0.847			0.843	0.899	
	SE2	4.66	1.884	0.870			0.850	0.891	
	SE1	4.70	1.843	0.813			0.694	0.910	
Culture and Climate	CC5	4.59	1.934	0.561	0.823	0.862	0.663	0.805	0.508
	CC4	4.44	1.671	0.742			0.791	0.756	
	CC3	4.28	1.910	0.503			0.760	0.822	
	CC2	3.74	1.829	0.665			0.776	0.774	
	CC1	4.27	1.877	0.636			0.633	0.782	
Planning and selection	PP4	4.39	1.767	0.590	0.805	0.817	0.768	0.770	0.528
	PP3	4.88	1.716	0.620			0.648	0.756	
	PP2	4.66	1.737	0.568			0.759	0.780	
	PP1	3.77	1.869	0.706			0.784	0.712	
New products and services	NP3	4.35	1.671	0.594	0.788	0.660	0.834	0.749	0.528
	NP2	3.97	1.806	0.703			0.676	0.629	
	NP1	4.43	1.857	0.595			0.866	0.751	
Innovation and collaboration	IC4	4.65	1.737	0.693	0.852	0.660	0.750	0.812	0.647
	IC3	4.34	1.809	0.749			0.782	0.788	
	IC2	4.09	1.785	0.725			0.823	0.798	
	IC1	3.80	1.801	0.608			0.822	0.848	
Organizational and environmental evolution	OE5	5.62	1.916	0.736	0.712	0.800	0.786	0.746	0.501
	OE4	3.88	1.923	0.755			0.824	0.661	
	OE3	3.80	1.796	0.677			0.729	0.602	
	OE2	4.21	1.674	0.638			0.745	0.652	
	OE1	3.71	1.588	0.719			0.725	0.628	
Firm performance	FP5	5.15	1.876	0.757	0.860	0.856	0.766	0.840	0.472
	FP4	4.57	2.001	0.622			0.697	0.844	
	FP3	5.12	1.843	0.756			0.639	0.814	
	FP2	4.68	2.243	0.633			0.675	0.845	
	FP1	4.50	2.277	0.652			0.676	0.813	

Table V: Model fit indices

Absolute fit indices		Relative fit indices		Parsimonious fit indices	
GF1	0.998	NFI	0.999	Normed chi-square	1.583
AGFI	0.982	IFI	1.001	PNFI	0.143
RMSEA	0.001	RFI	0.990	PGFI	0.107
ECVI	0.593	TLI	1.009	AIC	51.583