A framework for improving innovation capability of SMEs to enhance competitiveness in the digital economy

Nissanka Janaratne

THIRD Dimension Consulting, Australia, contact – Email: nissanka.janaratne@3rdimension.com.au

Abstract:

SMEs have the opportunity grow two to three times faster when they embrace the digital economy. Yet, they face the pressure to continually innovate with the changes to the fundamentals of business operations from digital economy placing their performance more and more dependent on their innovation capability. However, SMEs are faced with the challenge of selecting an affordable framework that can be implemented successfully in a small and medium business environment. The study has focused on developing a framework suitable for SMEs to improve innovation capability to address shorter product life cycles and erosion of market boundaries that have resulted from the changes to the fundamentals of business operations in the digital economy. The proposed framework uses innovation pipeline as a leading measure to identify the gap in innovation performance resulting from the current state of innovation capability proactively so that SMEs can enhance their competitiveness in the digital economy.

Keywords: innovation capability, innovation pipeline, SMEs, innovation performance gap.

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INTRODUCTION

Small and medium businesses contribute about 55 per cent of economic output of Australian businesses and employ 70 per cent of Australia’s labour force. There is no single definition for an Australian small and medium business, which is most commonly defined by the number of employees or by annual turnover or, a combination of the two. Australian Bureau of Statistics defines a small business as an actively trading business with 0-19 employees and 20-199 employees as a medium-sized business.

According to Australian Bureau of Statistics, digital economy in Australia grew 25% in 2011-12 with Australian businesses earning 237 billion dollars in income from the sale of goods and services online. A dynamic and strong digital economy is critical for the economic growth in NSW and Australia. National digital economy strategy defines digital economy as “the global network of economic and social activities that are enabled by information and communication technologies such as the Internet, mobile and sensor networks”.

Digital economy is defined as social and economic activities that are enabled by digital technologies comprising of Internet, mobile technology platforms and ubiquitous sensors. Digital technologies are rapidly transforming both business practices and societies driving productivity, wealth, and profits to record highs (Brynjolfsson and McAfee, 2014). However, organisations and skills advance slowly creating an ever-increasing gap. This will result in industries being challenged, disrupted and transformed.

Many studies highlight that SMEs are the growth and job creation engines in Australia as well as in other regions of the world. A study conducted by European Commission in 2012 has revealed that European SMEs grow two to three times faster when they embrace the digital economy. Yet, MYOB Business Monitor 2013 Report has found at least one third of small to medium businesses reduce their performance potential by overlooking significant opportunities offered by the digital economy.

An organisation’s performance is more and more dependent on its innovation capability (Alasoini et al, 2007). Managing innovation capability is one of the basic elements of an innovative organisation. An organisation has to develop its innovation capability to become innovative. Sunila and Ukko (2012) posit that organisations devoting themselves to develop their innovation capability have better prospects to succeed in the future. However, many SMEs still face the challenge of finding an affordable framework that can improve their innovation capability (Nada et al, 2012). This study aims to address this gap with the proposed framework that can improve innovation capability of SMEs.

LITERATURE REVIEW

Innovation is one of the most important resources for SMEs to improve and sustain their level of competitiveness in the market (Keizer, 2002). According to an empirical study of SME innovation within the Australian wine industry increased innovative activities of South Australian SMEs have led to increased competitive advantage and exports (Aylward and Glynn, 2006). Enhancing product or service quality, lowering costs or restructuring are no longer sufficient to stay ahead in today’s hyper competition. Innovation pressures apply to large companies as well as SMEs (Vrakking and Cozijnsen, 1997).
Companies need to develop their innovation capability to become innovative. Managing innovation capability is one of the basic elements of an innovative organisation. According to Saunila and Ukko (2012) in today’s challenging environment, development of innovation capability is vital for organisations to be competitive and have better prospects to succeed in the future. Innovation capability is defined as an organisation’s potential to generate innovative outputs (Neely et al., 2001) or in more detail as its ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders (Lawson and Samson, 2001).

Measurement of innovation capability is critical to understand the current state and the future need for its development. However, measurement of innovation capability is difficult due to its intangible nature and as a result one has to resort to proxies that capture observable qualities that reflect them (Albaladejo and Romijn, 2000). Evolution of innovation metrics can be categorized to four generations (Gamal, 2011). The first generation of metrics focused on inputs while the second generation complemented input indicators by accounting for the intermediate outputs. The current practices of measurement consist of third generation metrics focusing on benchmarking of innovation capability based on surveys together with emerging fourth generation metrics based on knowledge indicators.

Innovation capability has traditionally been measured via questionnaires or other subjective assessment models (Saunila and Ukko, 2012). Best measures of innovation capability relate to the outputs that result from the utilization of a firm’s innovation capabilities although they are hard to quantify. Current literature provides a number of frameworks/models for measuring innovation capability that provide different perspectives of focus (Gamal, 2011 and Nada et al., 2012). Among them, diamond model (Tidd, Bessant and Pavitt, 2005), Kelly’s survey instrument (Kelly and Littman, 2006), and Hansen and Birkinshaw’s (2007) innovation value chain represent the foundation upon which innovation audit tools such as 1-innoCERT, Inno-Biz and IMProve have been developed.

The link between innovation capability and firm performance is significant in the presence of performance measurement (Saunila, Pekkola and Ukko, 2014). Therefore, the research study based on current literature of innovation capability has focused on using performance measurement as a tool for improving the performance of SMEs through innovation capability. A study of Australian and Thai SMEs on the effectiveness of innovation measurements found that those SMEs that used a balanced approach were more likely to perceive benefits of implemented innovations than those that used only a financial approach to measurement (Sawang, Unsworth and Sorbello, 2007). However, review of literature on metrics that are used to measure innovation performance highlight that they can only measure past performance and that many SMEs also did not actually use many of the metrics.

Innovation is becoming more and more distributed in the digital economy with the notions of value and industry being shaken up more often by firms from outside the industry or small start-ups who focus more on consumer needs rather than industry boundaries (Strategy Dynamics Global SA, 2013). Continuing rapid advances in digital technologies are reducing the product life cycles increasing pressure on organisations to manage them effectively to operate and compete successfully in the digital economy. As a result, market leaders generate a major portion of their revenue from products and services introduced within recent years (Sopheon, 2010).
As firms enter the digital world, businesses will need to digitalize business processes and invent new digital business models to seize transient business moments. These transient business moments demand a fast response from organisations to develop new capabilities to address these new opportunities. Organisations are no longer able to sustain their competitive advantage with improving their innovation capabilities using historic innovation performance data. Firms require adopting a culture of relentless and rapid business experimentation in order to survive and compete in the digital economy (Vernon, 2013), which highlights the increasing need for leading innovation performance indicators.

According to a Gartner January 2014 press release, organisations that use predictive business performance metrics will increase their profitability by 20 per cent. A number of studies have been devoted to examining the value and relevance of nonfinancial “leading indicators” motivated by the increasing importance of these indicators for growth (Gu, 2005). Leading metrics used in the industry include ideas generated, ideation sessions held, and pipeline while lagging indicators are new products and percentage of sales due to new products.

**CONCEPTUAL FRAMEWORK AND METHODOLOGY**

Based on current literature on improving innovation capability, the study focused on metrics or methods to measure its current condition and formulate a strategy for improvement (Galvez et al, 2013). Measures of innovation capability used in this study are based on outputs of innovative activities that have been found to be the best measures from previous research (Neely et al, 2005, Saunila and Ukko, 2012). However, despite research progress on innovation capability in the recent years with the inclusion of outputs as measures of innovation capability (Saunila and Ukko, 2012) or with the use of multivariate metrics (Galvez et al, 2013) firms still have to rely on historic data to improve innovation capability.

The study has found the use of historic data to be a gap in current literature on improving innovation capability to be competitive in the digital economy and proposes a framework to improve innovation capability using innovation outputs as a leading indicator. Output measures from current literature usually measure the results of successful innovations (Tura et al, 2008) that comprise mainly of finance based and non-finance based measures. Finance-based metrics such as return on investment and non-finance-based metrics such as customer retention, productivity or employee development have been found from review of literature (Sawang, Unsworth and Sorbello, 2007). In order to avoid the need to wait until innovations introduced in the market to show results to measure them the study proposes to use the “innovation pipeline” as an output measure of innovative activities of a company.

In recent years, the need for an innovation pipeline for building a systemic innovation capability has much received attention from researchers and consulting firms (McDonald, 2014, Hunt, 2013, Kelly, 2012, ProQuest, 2011). The definition of innovation pipeline used for this study is a structured flow of innovative projects that introduce new innovations (Jost, Lorenz and Mischke, 2005). The method of measuring the level of innovativeness of the projects in the pipeline is based on the degree of novelty (originality) embodied in the innovations and the technological complexity or the extent to which the development of these innovations required advanced technological expertise (Albaladejo and Romijn, 2000 and Capaldo et al (2003).
The level of innovativeness of project pipeline is measured based on the inherent degree of “uncertainty” of such projects (Jalonen and Lehtonen, 2011 and Janaratne, 2013) with levels of technological uncertainty and project novelty as given in Figure 1 and 2 (Shenhar and Dvir, 2007). The level of innovativeness of individual projects in the innovation pipeline can be measured using the proposed weights as shown in Figure 3 based on non-linear characteristic of technological complexity and market adoption (Asthana, 1995 and Kaplan, 2007).

**Figure 1: Measurement of Novelty of Innovation Pipeline**

<table>
<thead>
<tr>
<th>Level of project novelty</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Derivative project</td>
<td>Extending or improving existing products or services</td>
<td>Developing a new version of a personal computer using the same technology, upgrading a production line, streamlining organizational procedures</td>
</tr>
<tr>
<td>Platform project</td>
<td>Developing and producing new generations of existing product lines or new types of services to existing or new markets and customers</td>
<td>Building a new automobile generation, developing a new aircraft, creating a new generation of a cellular system</td>
</tr>
<tr>
<td>Breakthrough project</td>
<td>Introducing a new-to-the-world product or concept, a new idea, or a new use of a product that customers have never seen before</td>
<td>The first enterprise resource planning (ERP) package, the first microwave oven, the first Walkman, the Segway personal transportation system</td>
</tr>
</tbody>
</table>

**Figure 2: Measurement of Technology Complexity of Innovation Pipeline**

<table>
<thead>
<tr>
<th>LEVEL OF TECHNOLOGICAL UNCERTAINTY</th>
<th>Low-Tech</th>
<th>Medium-Tech</th>
<th>High-Tech</th>
<th>Super-High-Tech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitions</td>
<td>Uses only existing, well-established, and mature technologies</td>
<td>Mostly existing technologies, limited new technology or a new feature</td>
<td>Uses many new, recently developed, existing technologies</td>
<td>Key project technologies do not exist at the time of project initiation</td>
</tr>
<tr>
<td>Examples</td>
<td>Construction, road building, utilities, build-to-print</td>
<td>Derivatives or improvements of products; new models in established industries (e.g., appliances)</td>
<td>New systems in a fast-moving industry (e.g., computers, military systems)</td>
<td>New, unproven concepts beyond the technological state of the art (e.g., Apollo moon landing program)</td>
</tr>
</tbody>
</table>

The average level of innovativeness of projects in the pipeline is used to determine the planned “innovation zone” of the firm as shown in Figure 3. If an SME targets for an above industry growth in performance, the organisation can proactively assess the “innovation performance gap” which is the gap between the target innovation zone and the planned innovation zone. The innovation performance gap is conceptualized based on the link between innovation and organisational
performance from literature (Saunila and Ukko, 2012, Albaladejo and Romijn, 2000). Although innovation zone is used more frequently in literature to denote a physical zone with specific geographic boarders (Mikroglou and Khan, 2009), the study proposes to use it in an organisational perspective related to the level of market impact and technology progress (Kallbach, 2012).

**Figure 3: Innovation Zones**

<table>
<thead>
<tr>
<th>Weight</th>
<th>Technology</th>
<th>Novelty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low tech</td>
<td>Derivative</td>
</tr>
<tr>
<td>4</td>
<td>Medium tech</td>
<td>Platform</td>
</tr>
<tr>
<td>9</td>
<td>High tech</td>
<td>Breakthrough</td>
</tr>
<tr>
<td>16</td>
<td>Super high tech</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Innovation Zone</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low innovative zone</td>
<td>Less than 5</td>
</tr>
<tr>
<td>Medium innovative zone</td>
<td>5 to 10</td>
</tr>
<tr>
<td>High innovative zone</td>
<td>More than 10</td>
</tr>
</tbody>
</table>

In conceptualisation of innovation capability, the study uses the definition of innovation capability as the potential of an organisation to generate innovative outputs (Neely et al, 2001). Factors that form the innovation potential of an organisation can be divided into five categories as follows based on earlier literature on innovation capability (Saunila and Ukko, 2012, Tidd, Bessant and Pavitt, 2005) and on innovation audit tools such as the IMPprove assessment targeted for SMEs:

1. Strategy on innovation and related leadership and decision making processes
2. Organisational structure, culture and communication for innovation
3. Innovation process and life cycle management
4. Collaboration, external links and enabling factors
5. Individual creativity, learning and innovation results

Based on above definition of innovation capability, the study proposes to measure the “innovation capability gap” defined as the gap between the target innovation capability uplift required to generate the target innovation pipeline and the planned innovation capability uplift that would generate the planned innovation pipeline. Based on the outcome of innovation performance gap and innovation capability gap using the proposed framework as shown in Figure 4 an organisation
can proactively select areas to improve its innovation capability that would result in the target growth in performance to sustain competitiveness in the digital economy.

**Figure 4: Framework for Improving Innovation Capability**

**FINDINGS**

The study has been able to extend the current literature on frameworks to improve innovation capability that rely on historic measures of innovation performance (Saunila and Ukko, 2012, Nada et al, 2012, Galvez et al (2013) with the use of innovation pipeline as a leading indicator. The method used in the proposed framework to measure innovation pipeline as a leading indicator contributes to the current literature on how such leading indicators can be measured to improve innovation capability of SMEs to address the shorter product life cycles and erosion of market boundaries in the digital economy.

The use of innovation zones as a way to categorize a firm’s planned innovation performance provides with an easy to understand method for SMEs to take proactive action to improve their innovation capabilities. The study has been able to align the categorization approach with the predominant types of innovations (Kallbach, 2012) such as incremental, breakthrough, disruptive and game changing innovation types. The study found the use of innovation maturity classification (Esterhuizen, Schutte and Du Toit, 2012) to categorize innovation zones did not meet the purpose of the study, as firms with higher levels of maturity will continue to develop incremental innovations.

The study combined the current literature from project management discipline (Shenhar and Dvir, 2007) to measure innovation pipeline from innovation management discipline based on “uncertainty” (Jalonen and Lehtonen, 2011 and Janaratne, 2013) common to both disciplines for developing new products and managing innovative projects. The method of measurement has been a key finding of the study that made possible the utilization of innovation pipeline to improve innovation capability proactively in SMEs to sustain competitiveness in the digital economy.

**DISCUSSION**

Firms increasingly operate in fast changing and competitive environments with the rapid advances in digital technologies. Yet, firms are slow to develop dynamic capabilities (Teece, 2007) to sustain their competitive advantage with business strategies validated through “fail fast, learn fast”
experiments that are more critical in the digital economy (Vernon, 2013). Study could not find evidence from literature to support that firms are convinced that they can leverage innovation capability to build dynamic capabilities. Author is of the view that this is due to dominant use of historic measures in current frameworks to improve innovation capability of firms.

Innovation gap is defined as the gap between innovation expectations and performance. Most executives believe innovation is very important for the future success of their organisation while they are not satisfied with the innovation results their organisations are achieving. Although reasons such as lack of common understanding on what innovation is, how it happens, what prevents it or lack of innovative leaders are found in literature (Weiss and Legrand, 2011), author is of the view that lack of ways to assess innovation gap such as provided by the proposed framework can act as inhibitors to take timely action.

**Implications for policy and practice**

The proposed framework to improve innovation capability supports the policy focus of the “National Innovation Framework for Australia” produced by Business Council of Australia in conjunction with the Society for Knowledge Economics (2006) on improving the innovation capabilities. The framework also calls for more specific innovation capabilities at the organisational level to influence growth and competitiveness in the digital economy as Australia is behind its peers in digital innovations (PwC Study, 2014).

Literature contains several empirical studies on innovation and performance of Australian SMEs while some of them contain comparisons with SMEs from other countries. However, there is a lack of research studies in literature for frameworks focusing on performance measurement aspect (Saunila and Ukko, 2012) as well as affordable frameworks for SMEs (Nada et al, 2012). The study contributes to the practice on frameworks focusing on both of these aspects with the proposed framework.

**Limitations and future research directions**

Best way of measuring innovation capability from current literature is to use a multi-criteria approach (Galvez et al, 2013). The proposed framework measures innovation capability based on outputs of innovative activities (Neely et al, 2005, Saunila and Ukko, 2012) using innovation pipeline measured with technological uncertainty and project novelty. Use of two criteria is a limitation of the proposed framework based on current literature. On the other hand, the study has used a leading innovation measure to improve the innovation capability of firms that can be used in future research studies as current literature has a gap with the use of such innovation performance measures.

SMEs that use a balanced approach to measurement of innovation capability rather than those that use only financial approach are more likely to perceive benefits of implemented innovations (Sawang, Unsworth and Sorbello, 2007). Approach of the measures used in the study is limited to non-financial measures. Author acknowledges that the study should use a balanced approach to measurement of innovation capability with further improvements of the proposed framework while limiting them to the measures that are easily measured in a small and medium business environment.
Although the proposed framework has been developed based on literature review of frameworks as a conceptual framework to improve innovation capability its validity is not limited due to lack of empirical studies with SMEs as the framework has been developed based on research literature that include empirical studies. Author is of the view that the future direction of research on innovation should focus more on helping SMEs to improve their competitiveness in the digital economy as Australia is behind its global peers when it comes to digital innovation.

**CONCLUSIONS**

The focus of the study was to develop a framework to improve innovation capability of SMEs which do not usually have much available financial wealth and required planning infrastructure in order to be competitive in the digital economy (Nada *et al*, 2012). The need for the study was based on the previous research findings on the difficulties faced by SMEs to benefit from fast moving digital opportunities due their current digital maturity level against digital leaders who outperform their peers in every industry (Westerman *et al*, 2012).

The study found that the best way to approach the problem was to use the link between innovation capability and firm performance, which is significant in the presence of performance measurement (Saunila, Pekkola and Ukko, 2014). However, the study took the path of using a leading indicator such as innovation pipeline to improve innovation capability proactively to seize opportunities from rapid advances in digital technologies building a culture of relentless and rapid business experimentation.

The use of innovation zones to categorize potential innovation performance zones addresses the flexibility much required to improve innovation capability in a proactive manner in the digital economy. As a result, SMEs can use the assessment of the innovation performance gap proactively to gauge whether the company would achieve a high organic growth in performance based on the planned innovation capability uplift.

The company can then use the innovation capability gap from the proposed framework to determine the areas that are required to be uplifted to generate the innovation pipeline that can achieve the intended growth in performance. As a result, the proposed framework addresses another gap in measuring the innovation projects in terms of their impact on the overall goals of an organisation (Nada *et al*, 2012). This enables SMEs to respond to opportunities presented by rapid advances in digital technologies found in the digital economy.

**REFERENCES**


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