



20th DMI: Academic Design Management Conference
Inflection Point: Design Research Meets Design Practice
Boston, USA, 22-29 July 2016

A Design Innovation Adoption Tool for SMEs

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The success of design led innovation practices in driving sustainable long-term growth in business revenue, shareholder value and company performance has been demonstrated in a number of studies. Notwithstanding the recognition and acceptance of design led innovation (DLI) as an impetus for growth, many commercial organizations struggle with the adoption of design based management concepts in practice. This is particularly evident in small and medium enterprises (SMEs) which are a key sector in most Western economies and a major driver of employment and economic growth. This paper addresses a significant gap in the practical adoption of design based management practices by SMEs. We present a new tool developed to assess adoption maturity across multiple facets of DLI. The purpose of this maturity assessment instrument is to provide utility to both design researchers as well as design practitioners. Maturity is assessed against an extension of the Danish Design Ladder while the firm's progress is gauged against four aspects of DLI implementation and two aspects of competitiveness. Each cell of this matrix contains a positioning statement to frame the maturity score. The derivation of the tool from well-established design research is discussed along with the results of initial research validating the tool with nine SMEs.

Keywords: *design led innovation, SME, implementation, maturity, assessment*

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Introduction

The growing academic and business recognition of the importance of design led approaches to innovation and growth is fostering closer collaboration between researchers and the private sector. Design led innovation (DLI) is a strategic avenue to increased business growth and competitiveness which combines the design concepts of envisaging radical business value propositions based on deep customer insights with the practical innovation issues of the subsequent alignment of the whole organization around these value propositions (Bucolo, 2016). The adoption of radically new ways of a company generating value is not a single event but a journey that may take years. The intent of this paper is to contribute a means to evaluate progress during this journey and identify some milestones along the pathway.

In the sections to follow we will first present a new tool - the DLI Maturity Assessment Instrument and discuss its application and intended use, its context and the reasons for its development. We will then consider the derivation of the tool and its underpinning logic and structure. We next present findings from the initial application of the instrument in practice and we finish with a brief discussion and our conclusions. The tool and this study form part of ongoing research into how small and medium sized companies adopt design led innovation. For the purpose of this paper, however, we seek to perform an early validation of the usefulness and viability of the tool itself; with the actual how of implementation being outside the scope of this immediate research.

A significant body of evidence now supports the view that investment in design and design led business approaches improves a company's competitiveness. "The results are compelling: companies that invest in design tend to be more innovative, more profitable and grow faster than those who do not." (European Commission, 2009, p. 2) The European Commission further observed that "the findings of micro-economic research on design are conclusive: the use of design has a positive impact on the performance of a company, measured in terms of for example profitability, share price, employment or exports" (p. 25). The Australian National Cultural Policy released in March 2013 recognized design led innovation "as one of the most important catalysts for effective innovation" ... "and providing a competitive edge for products and services" (Australian Government, 2013, p. 91). Significant studies of publicly listed corporations in both the United States and United Kingdom have found that the value of companies committed to design as a core element of their strategic

approach outperformed the main market index by over 200% over a 10-year period (Design Council, 2005; Westcott et al., 2013). Numerous studies and authors have also found a correlation between business wide use of design and increased competitiveness (Bucolo & Matthews, 2011; Cox, 2005; Ward, Runcie, & Morris, 2009; Whicher, Raulik-Murphy, & Cawood, 2011).

This strong evidence that design led innovation approaches improve business performance is supported by well researched insights as to how the business wide application of design thinking delivers organizational benefit (Lawson & Samson, 2001; Liedtka, 2015; Martin, 2004; Norman & Verganti, 2014; Verganti, 2009). Design researchers from Schon's seminal work 'The Reflective Practitioner' (1983) through Cross (1982, 2011) and Dorst (2011) have explored ways designers achieve these outcomes and why they are effective.

The majority of the work identified above has concentrated on the impact and value design brings to organization, while surprisingly little research has been done into how firms adopt and implement design led innovation over an extended period, particularly within small to medium enterprises (SMEs) which are the backbone of most economies. The reasons this is important will be discussed in the next section.

Background

The research project of which this tool forms a part is focused on an Australian context, although we believe the tool and the research are internationally applicable. Considering the situation in Australia, Healey noted that "in this country, and many others around the world, small to medium enterprises are the engine room of the economy" (2011, p. 1) and this holds true across virtually all world economies (Ayyagari, Beck, & Demirguc-Kunt, 2007). Design innovation was found "to be a critical factor for high performing small to medium enterprises to achieve their strategic goals and objectives" by Terziovski (2001). Yet, SMEs face unique challenges in the application of design based business principles. They lack the financial and human resources that large corporates can devote to developing and implementing new approaches and, because of their resource constraints, are generally more susceptible to the pressures and vagaries of domestic and international trade (Hollenstein, 2005). Conversely, it has been argued that it is easier for small and medium sized companies to make greater use of design to innovate than for larger organizations because they are nimbler in seeking better ways to grow and transform their businesses (Sharma & Poole, 2009). Vossion's (1998) study

of the relative strengths and weaknesses of small firms in innovation found SMEs “disproportionately responsible for significant innovations.”

Although the tool presented here is applicable to any SME seeking to adopt design led business practices, our research to date has focused upon micro-multinational companies, that is, SMEs with operations in more than one country. The significance of these small and medium-sized trans-national corporations has been recognized by researchers for over 20 years. Fujita (1995) considered the characteristics of these businesses, recognizing that their usually highly specialized or niche products give them relatively high market power in their market segments. He also recognized that compared to SMEs in general, micro-multinationals were larger (in terms of sales and employment) less labor-intensive and more productive, more export oriented and tended to have some advantage based on intangible assets. Simon has similarly been researching these companies, which he terms ‘Hidden Champions’, for over 30 years and has postulated that the continuing export success of Scandinavian and German language countries can be traced to small and mid-size companies that are active internationally (Simon, 1996, 2009). Technology and internet based services enable small businesses to operate internationally virtually from start-up and because of this and a number of other factors, micro-multinational firms are poised to be a key driver of economic growth and employment according to the Lisbon Council (Mettler & Williams, 2011). Typically, these are not firms which are struggling, instead these are firms trying to move from being ‘good’ to being ‘great’ and increasingly this includes the adoption of design led innovation practices.

Our paper presents the DLI Maturity Assessment Instrument, a tool we have developed to encourage adoption of design led innovation principles and help gauge the progress of DLI adoption by small and medium sized firms. The tool is not intended to assess design value or to replace existing design value measurement tools, instead it is meant to act as an implementation aid. That is, we are not trying to prove the value of design, rather, we are trying to assist in the adoption of a design led approach that has already been accepted by the firm. The paper will focus on the derivation, context and use of the instrument and includes feedback from testing with nine SMEs, predominantly within the manufacturing sector. The uncertainty facing the key stakeholders of SMEs attempting to adopt design led innovation principles across their whole organization, typically with no personal design background, is encapsulated in the question asked by many DLI engaged SMEs and which gave the title to a recent book, ‘Are

we there yet?’ (Bucolo, 2016). This instrument is intended to provide guidance to managers of SMEs on three basic but important DLI implementation questions: How am I progressing? Am I on the right path? What comes next?

Before discussing the derivation and structure of our Maturity Assessment Instrument tool, we will present the tool itself, its application and intended use and its development context.

DLI Maturity Assessment Instrument

The Maturity Assessment Instrument, shown below in Figure 1 (in three parts), is a qualitative matrix, where the six rows address key facets of the company’s adoption of design led innovation, while the five columns address the firm’s maturity in implementation of these elements. Each cell of the matrix contains a positioning statement to frame that maturity score.

Application and Intended Use

The instrument has been developed with a dual purpose and is targeted at two user groups. Firstly, at the Chief Executive Officers (CEOs) of small to medium firms who have adopted, or wish to adopt, the concepts of design led innovation and design-based business principles but are either not sure how far down the path of implementation they have progressed or unclear what to expect on their implementation journey. Design led innovation is a broad business approach which affects many aspects of an organization and progress in implementing these concepts and practices in an organization is rarely even across all facets of the company (Bucolo & Matthews, 2010). This assessment tool seeks to provide a more detailed assessment than is available with existing design led innovation maturity tools and in a format that is targeted to SME needs. The second target group is researchers wishing to compare implementation maturity between firms either in the short term or in longitudinal studies.

It is important to recognize that in using the tool a company’s compliance with the exact wording of the position statement is much less important than establishing the company’s alignment with the spirit of the statement. The outcome sought is not absolute accuracy but the ability for an individual SME to gauge relative progress over time or for comparable research insights to be made between firms.

Context

Our instrument has been developed as part of an ongoing research project into the adoption of DLI by Australian SMEs. Its purpose is to enable

researchers to draw comparisons between firms and to allow individual firms to readily gauge or measure the progress of their DLI implementation over time. The importance of SMEs measuring innovation to support their strategies for increased competitiveness was explored by McAdam and Keogh (2004) and identified by Whicher et al (2011). Yet the inability of these firms to gather meaningful comparative measures of their innovation progress is also well recognized (Freel, 2000; McAdam & Keogh, 2004; Moultrie, Clarkson, & Probert, 2006; Som & Kirner, 2008; Vossen, 1998).

Design Led Innovation (DLI) Maturity Assessment Instrument				
Level 1	Level 2	Level 3	Level 4	Level 5
A: Customer understanding and insight				
We have a good idea of what our customers want, although we have limited if any formal, regular mechanisms to gather this information. Our 'frontline' staff are in regular contact with their customers and provide feedback on most issues as they arise. We have been in business for many years and would not have survived without a solid understanding of what our customers want.	We understand the look and feel our customers expect from our products and services. This information is predominantly gathered by our sales and marketing staff and provided to those responsible for developing our products and services. We recognize that the 'look and feel' of our products can provide valuable competitive advantage. However, some of our products may be developed and released without broad customer input.	An understanding of our customers' wants and needs is a key input to our innovation processes. Most changes within the company can be traced back to an issue identified by a customer.	Insights gained from our understanding of our customers are an integral part of our business strategy and the development of business models. We employ a range of tools and techniques such as personas, narrative interviews and customer observations to develop deep customer insights and this learning is essential to the way we develop our company strategy. The importance of these insights is well understood by senior management. We have been surprised by some of the things we discovered about our customers.	A deep understanding of our customers combined with our insight into their expressed and latent needs has substantially transformed the way our company is organised, structured and positions itself within its markets. Regular, broad base understanding of our customers is seen by the directors of the business, all managers and most staff as absolutely essential for the ongoing development and growth of the company.
B: Customer Engagement and Co-design				
We operate in a very competitive industry and need to be careful what information we share with customers, as this can readily get back to our competitors. We seek customer input to our product/service design brief but the development work is normally protected through its confidentiality. Our product/service launch is usually the first time customers see a new offering. Solutions are typically based on our understanding of the functionality and aesthetics customers want.	Because we recognize that the 'look and feel' of our products can provide competitive advantage, we typically show products or service prototypes to customers and seek their input. We may use external design or market research resources, but generally this work is done 'in house'.	We consciously seek to engage our customers early in the development process. We test a number of a conceptual prototypes--seeking to avoid 'jumping to solutions' and look for user evaluations of our concepts.	We consistently use a structured but flexible approach to the engaging our customers in developing our business. Using our personas and deep customer insights as a starting point we will typically use a number of techniques to test and refine all important facets of a potential project with the customer, ensuring that we are concurrently testing business model options. All significant company developments require appropriate customer engagement as part of their development and approval process.	Engaging customers to test the core elements of our business transformation is viewed as a prerequisite at all levels of the business. We comfortably discuss and test radical propositions and concepts with customers using techniques such as provocation through narratives, refining our thinking to enhance our likelihood of success and to manage risk.

Figure 1 Design Led Innovation Maturity Assessment Instrument (Part I)

Design Led Innovation (DLI) Maturity Assessment Instrument				
Level 1	Level 2	Level 3	Level 4	Level 5
C: Alignment of the organization with design insights				
Our organizational structure and processes have evolved over time to meet the needs of the business. Restructuring of the company and its processes occurs as dictated by the needs of the company, the market and the economy.	We consciously seek to align our new product and service offerings with the customer needs we identify. This alignment is often not fully consistent with our broader company wide processes, procedures and structures.	Efforts are made to align the company's processes and structures to the needs identified through our customer understanding and co-design activities. This work is seen as an important part of every new project or innovation.	It is an important element of our company strategy that all facets of the business including our business model are aligned with our insights into customer needs. This alignment activity and the rationale behind it are understood and acted upon by more than half of our staff at a level appropriate to their role in the company.	The adoption of DLI concepts has and will continue to transform the business to ensure its ongoing alignment with the needs of its customers, its markets and its stakeholders. This alignment activity and the rationale behind it are accepted and embedded in the activities of nearly all staff at all levels of the business.
D: Adoption of DLI Mind-set, Culture and Approach				
A small number of people within the organization may be aware of DLI and design thinking concepts. These concepts and approaches are not widely understood or accepted within the company.	There is a growing understanding of DLI within a number of managers and their key staff. DLI is providing some valuable insights into the way we develop our products and services.	The concepts of DLI and design thinking more broadly are an important consideration in the way we approach any innovation within the company, be it product, service, business model, structure or process.	Virtually all senior managers and company directors understand and have adopted the concepts of DLI and see them as integral to the company's strategy and future development. It is clear that DLI will help to grow and enhance the business.	Directors, managers and most staff recognize that their adoption of DLI concepts is a driver of transformational change within the business. It is accepted and understood that today's solutions are not necessarily the answer for tomorrow's problems.

Figure 1 Design Led Innovation Maturity Assessment Instrument (Part II)

Design Led Innovation (DLI) Maturity Assessment Instrument				
Level 1	Level 2	Level 3	Level 4	Level 5
E: Competitiveness - Commercial Performance				
DLI and design thinking concepts have, as yet, had no commercial impact on our competitiveness.	The competitiveness of the specific products and/or services where we adopted DLI principles has improved. We are able to identify that performance indicators such as revenue, margins and market share for these products and services has been positively impacted.	The adoption of DLI at a process level within the company has improved the competitiveness of the business elements involved. Financial indicators of competitiveness such as revenue, gross margins, market share, and customer feedback show improvements attributable to DLI.	DLI has had a positive impact on all or significant parts of the business. Our business indicators such as turnover, profitability, market share and export earnings have improved significantly as a direct consequence of adopting DLI as a key element of our business strategy.	DLI has had a major positive impact on the competitiveness of this organization. DLI principles have transformed the way we capture value for our stakeholders as well the way we create value for our customers. Our business indicators such as turnover, profitability, market share and export earnings have improved substantially as a direct consequence of our DLI engagement. We are a very different business as a result of our engagement with DLI.
F: Competitiveness - Human Factors				
DLI and design thinking concepts have, as yet, had no impact on our organizational competitiveness or staff skills. If asked, most employees would see the future as much like the past, but with more competition.	The products and services where we have adopted DLI are more competitive, more attuned to our customer needs and are solving genuine, identified customer problems. There is limited but growing perception of the way that DLI principles can improve the competitiveness of the company's offerings.	There is a increasing understanding that DLI concepts and the integration of design thinking are an important part of our ability to compete and to grow the business. We understand the staff skills and organizational capabilities that we need to develop, although this is still a work in process. We know we are more competitive than before we engaged with DLI, but we recognize there is so much more that we could do.	DLI has given clarity to the future of the business. We know our value proposition is aligned to our customers' needs. We have clarity and agreement throughout the company about our business model, the way we generate value and the way we capture value. Consequently, we are significantly more competitive and we have the staff skills and organizational capabilities to maintain this position.	The board, management and most staff recognize that DLI has had a substantial impact on the way we view the future of this business. We have very significantly changed our market positioning and the way we interact with our customers. Rival firms have difficulty competing with our value proposition as we have changed the basis of competition. Most employees feel excited about the future of business.

Figure 1 Design Led Innovation Maturity Assessment Instrument (Part III)

Successful innovation within small to medium firms requires close alignment between strategic intent, resources, and management capabilities (Edwards, Delbridge, & Munday, 2005), and innovation failures in these firms are due in large part to resource and capability constraints (Hewitt-Dundas, 2006). Thus, small and medium enterprises tend to suffer failures of implementation more often than failures of strategy. Consequently, support in implementing new strategic approaches like DLI, such as the instrument presented in this paper, are particularly relevant to SMEs.

The setting of company strategy, vision and direction is a board responsibility that usually involves the CEO, while implementing this intent is the CEO's responsibility. These responsibilities typically also include establishing the firm's market position and how it interacts with its customers; forming and maintaining its business model; and the company wide alignment of resources and processes to achieve these ends (Australian Institute of Company Directors, 2013). All of these activities are equally integral to implementing design led innovation. Senior managers and other staff are usually delegated the execution of these initiatives, but the CEO carries the responsibility. For this reason our Maturity Assessment Instrument is focused on the CEO. Others in the organization may have more detailed, or even more accurate information as to the state of DLI adoption. However, it is what the CEO believes or perceives the company situation to be that drives their decisions, behavior and how the business chooses to compete.

At the academic level scholars willingly and openly exchange ideas and research into the value and benefits of design, its application and its economic significance. For individual firms the application of design led innovation techniques is much less about a scholarly interchange and much more like a battle in the trenches of domestic and international competition; at stake is their future growth and sometimes their very survival. National level comparisons of design capability (for example Moultrie & Livesey, 2009) are of little practical value to an individual enterprise. Firms that compete internationally need to understand the local strengths of the companies with which they compete. Wider adoption of the tool presented in this paper would permit direct firm level comparison of the maturity of DLI adoption between countries and may highlight regional or geographical differences.

Why another design maturity tool?

Process maturity models are a well-established academic tool (Maier, Moultrie, & Clarkson, 2012) and in the area of business are typically built

around organizational function and innovation capability constructs (see for example Essmann & du Preez, 2009). An internet search for innovation and design maturity models will reveal any number of proprietary models developed by consulting and design houses, commercial operators and innovation engaged bloggers. The majority appear to be targeted at large corporates rather than SMEs. Few provide any insight into their derivation or underpinning theoretical foundations, either academic or business based, and hence provide a minimal basis for rigorous research.

Some of these tools focus on design thinking and are quite comprehensive, presenting an online assessment driven by a short questionnaire and maturity scores and reports based upon the company's categorization of design capabilities (Girling, 2015). Although providing some level of altruistic design support may well be a consideration in offering these surveys, most are presented as a means to generate new clientele and their theoretical foundation is not available. The majority of clients listed on the websites of these commercial operators are large corporations not SMEs.

Our purpose in developing the instrument presented here is to have a tool that is solidly founded both in design research and proven implementation practices, is useful to researchers, has no commercial conflict of interest, and focuses specifically on the needs of SMEs by being:

- framed and presented in SME relevant language,
- detailed enough to be valuable yet self-contained and simple to use,
- an initial and ongoing measure of progress, and
- a guide to likely implementation milestones.

It is not the purpose of this tool to help firms measure the value or benefits of design and design thinking. There are other instruments purpose developed for this task such as the Design Value Map (Design Management Institute, n.d.-a) or the Design Value Scorecard (Westcott et al., 2013). The Design Management Institute has developed a Design Maturity Matrix (Design Management Institute, 2015) as an element of its Value of Design initiative (Design Management Institute, n.d.-b) the. The description of this Maturity Matrix and the accompanying Design Value Map appear to be focused on larger businesses and to be assessing the maturity of design use in order to assess the value of design, in other words, proving that design is a worthwhile corporate or business investment. The Design Maturity Matrix bears some superficial resemblance to the tool presented here. The horizontal axis of the Maturity Matrix is 'Design Application' which looks at

the breadth of design application in the firm and which maps to Levels 2, 3 and 4 of the Danish Design Ladder (Danish Design Centre, 2003) discussed below. The vertical axis defines five maturity levels from 'Initial' to 'Optimized'. Our instrument differs in that the maturity level is determined by the breadth of design application and this maturity is considered across different facets of DLI implementation.

The next section discusses in more detail the research background and derivation of the tool we are presenting.

Derivation of the Instrument

The five columns of the DLI Maturity Assessment Instrument correspond to the steps of the Danish Design Ladder including Bucolo's (2016) extension, "Design as Organizational Transformation" (depicted in Figure 3). The columns constitute an assessment of the level of design maturity. The rows reflect specific aspects of design competency, with the first four of the six rows representing key facets of design led innovation and the last two rows assessing its impact. Together, the columns and rows thus provide a quantified and repeatable measure of design maturity across multiple indicators of DLI adoption and its effect.

The derivation of this matrix will be discussed in this section.

Columns: Maturity Levels

The Danish Design Ladder was created in 2001 as a communication mechanism to illustrate the "variation in companies' use of design" (Melander, 2015). The model was developed by the Danish Design Centre and used to frame part of a study of the economic impact of design (Kretzschmar, 2003) which, when repeated in 2007, demonstrated that climbing the rungs of the ladder increased companies' tangible economic gains (Danish Design Centre, 2003). The ladder comprises four levels, each broadly defining a successively more intensive and influential use of design by an organization. These levels were originally defined as shown in Figure 2.

Subsequent revision of the Danish Design ladder has retitled Level 4 as Design as Strategy and made minor updates to the wording of the level definitions, although the concepts expressed have not changed (Melander, 2015).

The Danish Design Centre's Design Ladder is a well-accepted design maturity assessment tool. The levels or stages of design maturity have been used in a range of applications by numerous scholars and authors for more

than a decade. Following the original application of the design ladder to assess the economic impact of design in Denmark, it has been similarly used at a national level for Enterprise Ireland (Tormey, 2007), in design policy development for Iceland (Ministry of Industries and Innovation, 2014) and in initial analysis of New Zealand’s ‘Better by Design’ program (Fleetwood, 2005).

The Design Ladder has been used to assess the return on investment for design (Whicher et al., 2011); to assess levels of design by the European Commission (2009); by de Mozota (2006) in developing her four powers of design which informed the DMI Design Value Scorecard (Westcott et al., 2013); by Yström & Karlsson (2010) to analyze the perceptions of design by SMEs and to support individual manufacturing firms (Doherty, Wrigley, Matthews, & Bucolo, 2014; Thurston & Cawood, 2011). As noted by Whicher and her colleagues (2011), “the Design Ladder is proving to be a successful tool for evaluating design.”

An additional two-step extension of the design ladder has been proposed by Bucolo (2016, p. 87) where Steps 5 and 6 are ‘Design as community and organizational transformation’ and ‘Design as national competitive strategy’ respectively (see Figure 3), but since the later step has no relevance when considering an individual SME, it has been ignored for this application. Our instrument makes a distinction between Level 4 which is the business wide application of DLI to a company’s existing strategy and Level 5 which is the use of DLI to effect radical transformation of the entire organization.

Despite its widespread acceptance, the Danish Design Ladder treats design as a single concept and thus provides no granularity or insight into different aspects and applications of design within an organization. It does, however, provide a proven set of design maturity levels which have been incorporated into our assessment tool.

The definition of the columns of our instrument are set out in Table 1. The maturity level described in each column corresponds to a step of the extended Danish Design Ladder.

Table 1 Design Led Innovation Maturity Assessment Instrument Columns

Columns	Application of DLI Practices and Principles
Level 1	No Design Led Innovation
Level 2	Used in product and service innovation
Level 3	Embedded in company systems and processes

Level 4	Integral to the company strategy and business models
Level 5	Key driver of radical transformation of the entire business

Rows: DLI Elements

Both the Danish Design Ladder (Danish Design Centre, 2003) and extended design ladder group all aspects of design maturity into a single step which provides no detailed feedback on different facets of DLI implementation. Our tool seeks to balance the need for a finer level of discrimination and assessment with practical usability and relevance from an SME perspective. To this end the six rows of the tool comprise four key facets of DLI implementation and two outcomes of the approach, see Table 2.

Table 2 Design Led Innovation Maturity Assessment Instrument Rows

Row	Design Led Innovation Elements
A	Customer understanding and insight
B	Customer engagement and co-design
C	Alignment of the organization with design insights
D	Adoption of DLI mind-set, culture and approach
E	Competitiveness – commercial performance
F	Competitiveness – human factors

The first four elements of Table 2 represent a distillation of the research findings of many authors in the design thinking and design led innovation field (Brown, 2008; d.school Stanford, n.d.; de Mozota, 2002) combined with the authors’ knowledge gained from experience in implementing design led business approaches in practice. The number of steps has been minimized to simplify the tool for SME use, although the steps of the common design thinking process models all map into these elements and their corresponding position statements. Examples are: Brown’s (2008) three design thinking spaces, inspiration, ideation and implementation, map to rows A, B and C respectively; the first two of the Stanford d.school’s five-step design thinking process (d.school Stanford, n.d.) and its many variants map to row A and the other three steps to row B; and all except four of de

Mozota's 21 characteristic variables of design management (de Mozota, 2002) can be mapped into the first four rows of our instrument.

As a user-centered approach, customer centricity and the generation of customer insights are common to all business applications of design thinking and design led innovation, its outcome being customer insights with this aspect of DLI addressed by row A.

Our thinking in developing rows B, C and D has paralleled that of Carlgren, Rauth and Elmquist ((2013) cited in van den Broek & Villem, 2013, p. 21) in their model depicting the relationship between principles, mind-set, practices and techniques in the practical implementation of design led innovation principles to business. The implementation of the principles of DLI are too abstract to be measured directly, but are embedded in both the mind-sets of those involved (addressed by row D) and the practices and behaviors they demonstrate (addressed by row C). The DLI techniques used to engage and to co-design with customers (addressed by row B) both support and influence the organization's DLI practices and mind-set.

In assessing the maturity of a firm's DLI outcomes, considered under the broad category of competitiveness, the initial version of this tool addressed only the commercial impact of its DLI activities (addressed by row E).

Two prototyping interviews to test the maturity assessment tool were conducted prior to the commencement of the research study and the participant feedback was used to modify the tool. This prototype testing resulted in the addition of a sixth element: the human factors of competitiveness (addressed by row F). Feedback from these interviewees highlighted the significance of the improvement made to the competitiveness of a small to medium firm by a change in the employees' view of the business's future.

The prototype interviews made clear that an SME may have been engaged in implementing DLI for some years may have made significant gains all four of the elements embodied in rows A to D, yet these efforts could have generated minimal impact on the firm's revenue, margins, profitability or staff numbers. However, if the organization feels it has moved from a position of uncertainty and despondency about its future to one of optimism and excitement about the future then this represents a significant change in the firm's competitive position, at least at the human level. This is the factor embodied in row E.

The maturity level distinctions of these six elements are captured in the positioning statements which are discussed in the next section.

Positioning Statements

A consideration in the development of this style of instrument was the potential variability inherent in self-assessment. Accuracy and variability in self-assessment was the subject of a widely cited study by two researchers who identified what has become known as the Dunning-Kruger effect (Kruger & Dunning, 1999). They demonstrated that people with no prior skill or competence in a task will fail to recognize both their own lack of skill and also the extent of that lack, resulting in over-optimistic assessment of their performance. Equally, this same paper also showed that with training or deeper understanding, self-evaluation accuracy improves. Consequently, presenting anyone with an assessment tool comprising only the column and row headings of the matrix in Figure 1, but without giving them any understanding the definitions or distinctions between each element, risked both high variation between participant responses and overoptimistic assessments. The positioning statements within the matrix have been framed to provide an increased understanding of maturity for each of the facets of DLI being assessed and thus to improve assessment accuracy.

Deliberately positive wording in the positioning statements supports participants' willingness to identify with their relevant level of DLI maturity, and the confidentiality of the result is intended to offset the natural human desire to be perceived as performing well in comparison of their peers (Festinger, 1954) and to enhance honesty in the responses. This approach is consistent with the first author's 35 years' experience in industry and consulting to SMEs.

Results and Discussion

To date the tool has been used as part of semi-structured interviews with nine CEOs of small and medium-sized businesses, predominantly in the manufacturing sector, regarding the adoption of design led innovation practices within their firms. Participants' companies had all been engaged with DLI for between three and six years and so had reasonable understanding of the many facets and issues involved in implementing design led innovation. As part of the interview process respondents were asked to indicate:

- whether the maturity levels were recognizable stages through which they had passed or could feasibly pass,
- whether they or other companies would have found this instrument useful when starting their DLI implementation, and

- what changes they believed should be made to the instrument.

Recognizable stages of progress

Every respondent recognized the levels of maturity as stages through which they had passed, that they “made sense” (Company G) and were “fairly clearly differentiated” (Company G). The common view of those interviewed was that maturity levels they had not yet reached looked to be reasonably distinct descriptions of maturity phases and to be achievable.

“I definitely recognized those stages of maturity and they’re relevant to our journey” (Company B).

“I enjoyed the progressions, they were reasonable. It helps put a bit of structure around it and makes you think.” (Company P).

“I think it’s a very good model, and I think the wording is very good.” (Company C).

Taken together, these results suggest that the maturity levels and positioning statements within the instrument are both valid and relevant to the SME community at which the tool is targeted and that it will provide a useful guide to SMEs seeking to monitor the progress of their DLI implementation.

Implementation guide

Five of the nine CEOs interviewed offered comment on the Maturity Assessment Instrument as a “valuable tool as a guide to implementation” (Company B) which “... would have been helpful, it would have demystified it a bit.” (Company E). The CEO of Company F commented:

“Is it useful? Absolutely, because what it does, it’s almost a roadmap. It gives you somewhere to put your compass and go: I’m here, so I know what here looks like and I know what there looks like, and then it’s a case of well ‘What do I need to do to get from here to there?’ This is quite valuable I think.”

Another CEO with reference to maturity levels 2, 3 and 4 stated:

“There was never any instruction on how this [DLI implementation] might occur and that’s why it’s taken so long, because you fumble your way through that bit in the middle.” “It’s really this bit in the middle that is the most important part. When you start you have no idea how you’re going to transform to get to there [Level 5]. Level 5 was important because that’s the process of self-reflection and asking ‘What kind of business are we really?’”

The commonality and strength of these views indicate that the second purpose of the tool, that of providing a guide to assist SMEs in their adoption of DLI will also be achieved.

Suggested changes

The participant responses regarding the structure of the tool which were received during the prototyping phase and which resulted in the addition of Row F, were not included in the research study responses considered here.

Most CEOs interviewed felt that they were unable to offer valid comments, since the course and timeframe of the interview did not give them sufficient time to offer considered input. Excluding the input discussed above received during the prototyping phase, only two interviewees offered suggestions for changes to the instrument. Both felt that the lowest level of maturity may be an overoptimistic assessment of the starting point for many SMEs. One CEO expressed this jokingly when considering Level 1 of Customer understanding and insight in relation to where they had started the DLI journey: "... that's Level 1? You need about a minus3 for 'You've got no idea what you're doing'" (Company G). Another CEO with considerable experience on business councils and exposure to other firms and other CEOs offered the following observation:

I think in almost every one of these you're too kind on Level 1. I think there are a lot of organizations that sit here, still aspiring to a 1. ... I think your dressing up Level 1 to give people a false sense of how good they are. I think a lot of people, if they were honest with themselves, wouldn't even get two or one. I believe Level 1 is still an accomplishment that a lot of businesses don't reach. I can tell you that there is a lot of businesses out there that don't register on your scale (Company F).

These comments indicate that the position statements defining this level of maturity may be an overly generous assessment of SME capability although there is no particular relevance either to the ongoing research or the SME community in scoring a maturity level lower than that of No Design Led Innovation. It is certainly possible that there is a spectrum of SME competencies all of which may lack design led innovation capability. This is potentially an interesting avenue for future research. Our current position is that, by wording the position statements at the upper end of this possible spectrum, we have encompassed its full range. The Level 1 set of position statements endeavor to define a lack of DLI in an otherwise capable SME.

Company F had achieved high levels of maturity in most DLI elements and the CEO also offered that “there could be more in there about people and culture. I think it is fundamental to this journey.”

The centrality and importance of changing culture and mind-sets in the implementation of DLI is a recurring theme in our ongoing research and will almost certainly be a significant aspect of this research study. Addressed specifically as one of the six facets of DLI being assessed for maturity, mind-set, culture and approach is already an important element within the tool.

Directions for Future Research

As identified above, many of the innovation constraints facing SMEs are common to most economies and we believe that this instrument will find broader application than its current Australian research purpose. The intention of developing this maturity assessment instrument has been to provide utility to researchers as well as practitioners. Scholars wishing to compare implementation maturity between firms either in the short term or in longitudinal studies may find this tool beneficial.

The objective of this paper was to present the tool and initial research findings into its validation with CEOs from a subset of firms.

The value of this tool to other researchers remains untested. It is hoped that this paper will prompt further research and investigation to assess the broader applicability of the instrument in implementation studies in other geographical and economic contexts. It would also be interesting to assess the applicability of this tool with larger organizations.

Research with the tool to date has been focused upon the CEO since it is their belief or perceptions about their organization that drives executive decision making and behaviors. Future research could involve use of the tool with other members of the organization in addition to the CEO.

This instrument is a core element of an ongoing research study into how small and medium sized companies adopt DLI, and further interviews are currently underway. In addition to gathering research data through the use of the tool these investigations will also involve refining the matrix itself. These analyses will form the basis for further research and dissemination through publication.

Conclusion

In this paper we have offered a new tool to assess the maturity of an organization’s adoption of design led innovation. As distinct from other

tools that tend to provide an overall assessment of design maturity, this tool provides a more fine-grained assessment taking into account multiple business facets of design. Our tool seeks to balance the need for a finer level of discrimination and assessment with practical usability and relevance from an SME perspective.

Initial research using the DLI Maturity Assessment Instrument with a sample of nine interviews has found it to be a useful means to gauge implementation progress and to guide adoption of design led innovation within small and medium sized firms. Our findings indicate that it may be an important practical addition to an SME's DLI toolkit, providing CEOs and managers of SMEs with a "means with which to participate as co-designers in the design process" (Sanders & Stappers, 2014, p. 9) of the company's future. A key strength of the present study was the unanimity of positive feedback from the Chief Executive Officers interviewed. The research indicates that the tool can fulfil its purpose of allowing individual SMEs to readily gauge or measure the progress of their DLI implementation and of providing some guidance and visibility of the next steps in a firms' adoption of design led innovation practices.

The grounding of this tool in design practice provides a foundation for a contribution to theory through research into how companies, particularly small to medium enterprises, adopt and implement design led practices. This contribution is the focus of our ongoing research.

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