

Buchanan's design thinking matrix: implications for SMMEs

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Introduction

This paper, *Buchanan's design thinking matrix: implications for SMMEs*, is presented at the International DMI Education Conference, Paris, 2008. The title of the conference is *Design Thinking: New Challenges for Designers, Managers and Organizations*.

Design thinking has been a topic of discussion in the design discipline and discourse for many years, but the sharing of ideas between design and management creates an exciting challenge. Design thinking is one of the design concepts that is often universally understood, but nevertheless lacks a clear definition. Owen (2007:17) defines design thinking as “in many ways, the obverse of scientific thinking”: scientists sift through facts to discover insights, while designers invent new patterns and concepts to address facts and possibilities. However, the development of the understanding of design ability and how designers think is seen as “embarrassingly slow” (Cross 2007:49).¹ At this multi- and interdisciplinary conference, design thinking – an already complex topic – is extended into the business and management domain, creating new possibilities for theory building and the sharing of ideas and practice.

One of the broadest design thinking frameworks is the matrix developed by Richard Buchanan. Buchanan, a well-known design theorist and head of doctoral studies at Carnegie Mellon in the United States of America, describes design in four broad areas, which he calls ‘orders’. These are *communication* (signs and words), *construction* (things), *strategic planning* (action) and *systemic integration* (thought). Buchanan then intersects these orders with designer abilities, which are *inventing*, *judging*, *deciding* and *evaluating*. Buchanan describes this matrix as the history of design thinking, formed through encounters with new problems (Buchanan 1998:13). A new problem can, for example, be the complex and ever-changing environment within which human participants are involved in design. Participants include not only the designer, but also the design client (the organisation) and the design user.

¹ Professor Nigel Cross is a leading design researcher, and the concepts of a designerly way of thinking and knowing were first clearly articulated by him in the late 1970s.

Buchanan (2001:10) explains that the orders are places, or topics, for discovery rather than categories with a fixed meaning. He proposes his matrix as a heuristic device for investigating the “shifting debate about design in the contemporary world” (Buchanan 1998:13).² This therefore allows for a variety of interpretations and applications. The purpose of this paper is to search for an understanding of design thinking specifically in the small, medium and micro enterprise (SMME, or small business) sector, proposing Buchanan’s matrix as a possible framework. However, the meaning of the matrix needs to be understood before any SMME contexts can be explored. It is against this background that the matrix is first expanded into a functional design thinking framework.³ Three universal management aspects are used as a structure for this, namely *underlying assumptions, organisational structures and processes* and *value determinants*, and they are relevant for businesses of all sizes. The paper then proceeds to explore design thinking in the SMME sector, following the interpretation of Buchanan’s matrix.

For many people worldwide, establishing an SMME is their only way of making a living. This is especially relevant in developing countries such as South Africa, where many people still live in poverty. In addition to formal small businesses, South Africa also has a budding ‘alternative economy’ (the so-called second economy) that consists of informal entrepreneurial activities. The SMME is seen as the bridge between the second and first economies, and therefore plays an essential role in development. SMMEs in South Africa are classified as micro (5 employees), very small (20 employees), small (50 employees) and medium (200 employees) enterprises. Turnover and asset figures are also used as part of the classification, and these vary according to industry [see the website of the Department of Trade and Industry (dti), www.dti.gov.za, for a comprehensive classification].

Although South Africa has seen a lot of growth in the number of new SMMEs, the rate of business failure is worrying funding agencies, since output does not always match financial input (Damane 2006). However, examples are found in both developing and developed countries (such as Korea and Sweden respectively) of the use of a design-driven economic strategy to turn innovative ideas into world-class brands. It therefore follows that the following speculative question *should* be asked: could

² The matrix as a model was developed and extended by Buchanan over a period of nearly 15 years. The discourse was expanded upon by Golsby-Smith (1996) and, more recently, in the Winter 2008 edition of *Design Issues* (in which several authors presented case studies).

³ This paper builds on an unpublished conference paper presented by Van Zyl & Sauthoff (2001) at the Design Educators’ Forum of South Africa (DEFSA) held in Johannesburg on 10 September 2001.

South African entrepreneurs⁴ have a better success rate if they were to understand the value and importance of design, and if they were able to embrace innate creativity through design thinking? This question is, of course, not an easy one to answer; this paper is only an exploratory start, and is therefore presented as a work in progress. I conclude with a brief reflection on my own teaching in the field of design thinking.

Buchanan’s matrix

Buchanan’s matrix (Figure 1) is described and discussed in several articles published over more than a decade (Buchanan 1998; 2001; 2008). The theory originated as an exploration of pluralism, the changing world, and the changing role of design and the designer.

In this section of the paper, the four orders of the matrix are briefly discussed and expanded upon in a tabled format. Various written sources from design and management are used for this expansion (Long & Vickers-Kogh 1995; Sunter 1996 and 1999; Senge 1990). My own experiences as an information designer – working with several corporates, SMMEs and start-up businesses over 20 years, and lately as a design lecturer teaching business students – undoubtedly adds to my interpretations.

	Communication Signs and words	Construction Things	Strategic planning Action	Systemic integration Thought
Inventing	Signs, symbols and images	→	→	→
Judging		Physical objects	→	→
Deciding			Activities, services and processes	→
Evaluating				Systems, environments, ideas and values

Figure 1: Buchanan’s matrix (Buchanan 1998:13)

According to Buchanan, the four orders should not be seen as areas of traditional disciplinary practice or specific outcomes (e.g. graphic versus product design), but as four broad areas of design thinking that are common to all design professions and applications. In addition, the matrix is not only

⁴ The person who starts and runs an SMME is called an entrepreneur throughout this paper.

described as the history of the disciplines of design thinking, but also as the developmental career path of designers (Buchanan 1998:13).

First and second-order design thinking (inventing and judging)

The first and second orders of the matrix are discussed together. These orders can historically be sited in the industrialisation period (1750s to 1950s). This time was characterised by the development of large, stable market leaders that focused on local competition and market share (or size). Business plans were developed by executive management for periods of 10 years and longer (Ferreira 2000; Sunter 1996). Many enterprises that began during this time currently feature as one of the top 100 brands (for example, Coca-Cola).

Designers in these orders generally worked in a modernist paradigm, with a focus on aesthetics and functionality. According to Sauthoff (1999:6), the designer was employed at the border of a client organisation and was often thought of as a stylist. Studio activity was limited to problem solving for specific ad hoc projects, and design projects often had few direct links to strategic operations in an organisation.

Designers in these orders operate with a focus on form and function, without regard for broader concerns such as human experience (Buchanan 2001:13). The first and second orders are briefly summarised below in Table 1.

Underlying assumptions*	Organisational structures and processes**	Value determinants***
<ul style="list-style-type: none"> • Businesses work within a neoclassical paradigm • Design works within a modernist paradigm, seen in terms of style/form and function 	<ul style="list-style-type: none"> • Management is project-specific and tactical in nature • Design buying is often a one-on-one activity, and designers are briefed to provide physical embodiments of form and function 	<ul style="list-style-type: none"> • System of supply and demand, maximising profit for the business, maximising utility for the user (neoclassical values) • Market share, corporate size and dominance • Value limited to a specific project with little concern for the long-term effect on users
<p>* Underlying assumptions: fundamental assumptions, conscious or unconscious beliefs and cultural systems ** A purposive selection that is relevant to the design process and designer-client relationship *** Value(s) as determined by internal and external factors, both in design and business</p>		

Table 1: First and second orders

Third-order design thinking (deciding)

Historically, the third order, or *strategic planning*, commenced at the end of World War II. Sunter (1996:58) identifies 1948 as the start of the fourth Kondratieff wave, with the catalysts being the Bretton Woods Agreement and the Marshall Plan, which were aimed at stabilising the World Monetary Fund and providing financial aid for war-torn European countries.

The word 'strategy' first appeared in management literature in the 1950s. Questions such as "What is our business?", "What should it be?" and "What is our distinctive competence in relation to competitors?" were asked by management leaders such as Drucker and Selznick (Long & Vickers-Koch 1995:9). In 1962, seminal management theorist Chandler defined strategy as "the determination of the basic long-term goals and objectives of an enterprise, and the adoption of action and the allocation of resources necessary for carrying out these goals" (Long & Vickers-Koch 1995:9). Focus was placed on external evaluation and action plans. Capabilities and the development of internal potential, which enabled organisations to deal with competitive environments, were second in priority and only became integral components of business strategy in the late 1970s. Value was determined by the shareholders' perceptions and not by the customer or end user. Attention was on the allocation of financial resources to strategic business units (SBUs), and on the balance of portfolios, rather than on growing the company as a whole. Strategic plans were made by executive management and delegated down through a corporate hierarchy (Long & Vickers-Koch 1995:9-11).

This business shift resulted in a concomitant shift in design thinking. Strategic planning became part of design processes and design thinking. Buchanan (1998:14) extends the design disciplines (as seen in the first and second orders, namely signs, symbols, images and objects) beyond their traditional boundaries, and defines the third order as a discipline of design thinking with third-order design consultancies. Even today, many managers feel safe in this rational and scientifically-driven third-order environment, where design is expressed in terms of return on investment (ROI), fixed and well-formulated design briefs, and clear definitions of labour. Problem solving is limited to exploring what exists.

Underlying assumptions	Organisational structures and processes	Value determinants
<ul style="list-style-type: none"> • Positivist thinking • Analytical approach guided by logic and research, objectivity and rationality, quantitative evaluation, linear thinking and numerical forecasting • Leadership is expressed through the management of processes and technical skills • Fit the firm to the environment and lock markets • National and international focus • Closed systems with exclusive technologies • Problem solving is limited to finding out what exists 	<ul style="list-style-type: none"> • Design clients' organisational structure is hierarchical with fixed boundaries • Critical information is often kept confidential • Employees are distant from strategic decision making and activities • Expansion into non-core areas of operation (SBUs engage in partitioned activities) • Demographic view of the market • Use of mass media • Design audits are used to evaluate design against strategic intent • Systemisation of methods and processes (e.g. design methods) • Designer is seen as a supplier – he/she is given only the necessary information for the task, and has contact with only the designated line manager • Designer receives a fixed brief, and the design is limited to the tasks that have been set out in the brief, with predictable outcomes • Design industry has clear differentiation between specialities e.g. printer, reproduction, typesetter • Clear structures of industry division, e.g. above the line and below the line 	<ul style="list-style-type: none"> • Accountability is based on costs (ROI) from the design client's perspective • Project evaluation is restricted to the client's strategy (i.e. the end user is not considered or is not the main focus) with fixed criteria for evaluation • Shareholder perceptions and tangible assets

Table 2: Third order

Fourth-order design thinking (evaluating)

The next shift was towards fourth-order design, which is described as *systemic integration*. Fourth-order design thinking embraces pluralism and systems thinking, and shifts towards knowledge-based and learning organisations. The fourth order is marked in management theory by an evolution of the question “What is our business?” to “What *capabilities* do we need to develop and nurture in order to take full advantage of those changes?” (Long & Vickers-Koch 1995:11). Commencing in the 1980s, a major catalyst for systemic integration was the development of the microcomputer and the immediate availability of information (Sunter 1996:59).

Over the last two decades, communication design has come to play an increasingly important role in organisations that make optimal use of the digital medium, and where communication is thought of as synergistic and holistic. Design thinking has become progressively integrated into key organisational

activities. Client-designer interaction occurs at the senior management level, and teams and mutually beneficial alliances are formed to deal with tasks that are too complex to handle on an individual basis. The designer’s role includes the provision of insight and knowledge, rather than only technical skill and isolated project management. Design writing in the fourth order moves from a consideration of the object and the design management process, to the psychological and cultural contexts that give meaning and value to designs and the various disciplines of design (Margolin & Buchanan 1995). The consumer or end user is placed in the spotlight, and user feedback is regarded as an active learning tool.

Underlying assumptions	Organisational structures and processes	Value determinants
<ul style="list-style-type: none"> • Paradigm is one of systems thinking and systemic integration • Qualitative thinking and scenario planning • Leadership is expressed through flexibility and the ability to learn • Environments and markets are created to fit the organisation • Outcomes are changing and unpredictable • Global • Design thinking considers the widest context of design; it is synergistic and humanistic • Anticipation of client and market needs • Open system with democratised technologies • Problem-solving paradigms are extended to finding out what might exist 	<ul style="list-style-type: none"> • Skills-based organisational structures with no boundaries • Participation and communication are key; employees are empowered, the client is part of the design team, and alliances are regarded as partnerships from which new insights can be learnt • Suppliers function as an extension of the organisation • Information is made available and dialogue is ongoing • Focus on core activities • Small and manoeuvrable • Outsourcing • Consumer or user is seen as an individual from whom one can learn • Specialist areas fade and the designer is in full control of the process; the designer empowers the client through the sharing of knowledge, and technology is democratised • Design brief is considered to be a learning process involving continuous dialogue with the client and user; broader and more complex domain of operation • Multidisciplinary teams for complex tasks • Customised media 	<ul style="list-style-type: none"> • Perception and position (intangibles) • Accountability stretches beyond the task • Contextual evaluation • Risk and accountability become higher, and decisions encompass informed decision making, motivated choice and trust • Leadership through the provision of design information and a vision for the future

Table 3: Fourth order

The ability to learn in an organisation becomes a critical factor in leadership, and problem-solving paradigms shift to focus on what might exist and the creation of a vision for the future. Designers and

design thinking are integrated, with designers' roles often being extended beyond physical design activities to intellectual and emotional design thinking.

Buchanan's matrix is further extended upon by Golsby-Smith (1996:5) in Figure 2, which demonstrates that the orders do not replace each other but rather build on each other. This is described as a widening of the design domain.

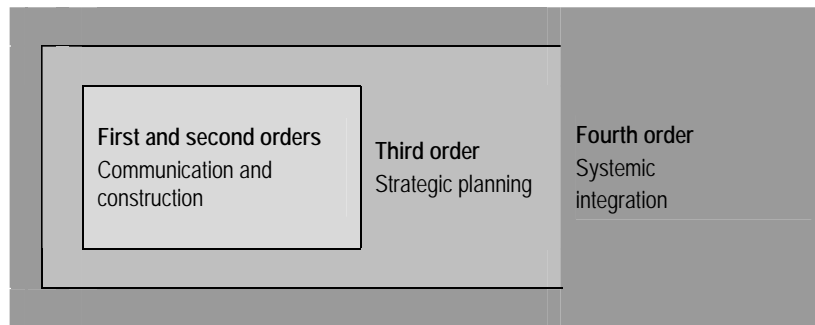


Figure 2: Widening domain for design (adapted from Golsby-Smith 1996:5)

SMME and design thinking

Each of the orders analysed in the previous section of this paper constitutes a design thinking space with a set of human abilities and a way of understanding (knowledge, experience and instinct) that influence a way of doing and judging. All humans have some design ability, and Buchanan formulates these abilities as invention, judgement, decision making and evaluation (Buchanan 1998:13). Please note that these abilities do not directly include actual designing. Design thinking is therefore a construct based on a system of various factors and influences, including the fundamental underlying assumptions, values and processes.

Design thinking is closely related to creative thinking. Owen (2007:17) explains two different creative thinking domains: the *finders* who discover through analysis, and the *makers* who invent and synthesise. Owen (2007:17), uses the term 'applied creativity' which includes 'knowing' and does not exclude 'doing'. The 'doing' can involve various processes and people that are driven by the design thinking.

Every entrepreneur who starts an enterprise is involved in a synthesising process. This process does not only include the services or products that the entrepreneur plans to make or sell, but also the construction of his/her business. This is also true for a one-person business. Entrepreneurs therefore

take an intangible business idea and make it concrete. Design thinking is therefore not restricted to the design of products or brand identity, or to the management of design,⁵ but extends to include the design of the organisation. The entrepreneur may have an ‘idea’, but without design thinking, that idea might never be synthesised.

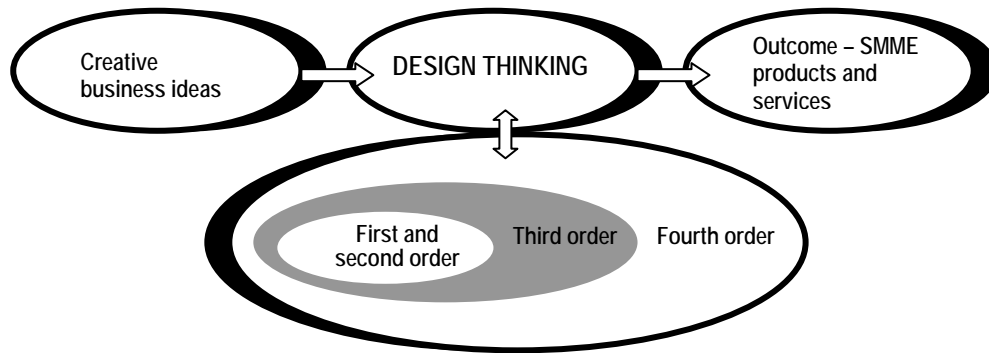


Figure 3: From idea to enterprise – a flexible and developmental design thinking model

First and second-order design can be likened to an SMME’s first encounter with design. Typically, these are the newcomers to the world of business and design who realise that they need a specific solution to a specific problem. Brazier (2004:61) describes them as businesses that classically have a specific design need, such as a product, website or brochure. Sometimes, this need is not recognised as a design need. For example, one of the first needs realised by SMMEs is the need for stationery, and particularly a business card. This need is often interpreted as a printing need whereas it is, in fact, a need for visual identification and differentiation. Lack of awareness often results in many organisational identities being designed by printing technicians.

Lack of funds also plays a big role, with the fees of many professional designers being simply outside the reach of these newcomers. Limited funds in conjunction with the increased availability of software and design templates also might lead to do-it-yourself design.

The entrepreneur faces enormous challenges during the start of an enterprise. The space in which an entrepreneur operates is a very insecure environment, and entrepreneurs are constantly challenged with new encounters: a first business or a new idea that can be a product or service; the challenges of

⁵ More information on the effective management of design for SMMEs can be found in Bruce, Cooper & Vasques (1999:297-315); De Mozota (2002:88-103); and Cawood, Lewis & Raulik (2004:71-76).

finding finance; and, just as the business is established, the challenge of managing and sustaining the business. Many entrepreneurs' business decisions are made without any formal business training and with very little professional guidance.

Designers are often chosen on the basis of price or word-of-mouth references from acquaintances, resulting in the selection of immature or inexperienced designers. Brazier (2004:61) points out that designers sometimes 'simply want to design', and have no interest in (or awareness of) the lack of design skills within the client company. However, in those cases where this first design encounter is a tactical success and the entrepreneurs' general managerial skills improve, design may start to play a more strategic role, and this next step is possibly a move to the third order.

The **third order** can be likened to an SMME in its growth stage, where some development and structure start to form and participants 'discover' the need for management. The third order offers a rational and clear approach to design, and design can be explained in no uncertain terms: this is what you spend, and this is what you get! Currently, the majority of large businesses in South Africa operate within the third-order model, with little regard for issues such as accountability. The current financial models and structures are third-order in nature, and when an entrepreneur wants to apply for funding, these third-order paradigms are still used to evaluate business plans. However, a small third-order enterprise still differs from a large organisational structure: in an SMME, limited staff numbers means that the owner and other employees are likely to be involved in design decisions whereas, in large organisations, design decisions are often delegated to inappropriate people. In South Africa, this person is often the procurement manager,⁶ whose responsibility is limited to ensuring preferential procurement (as part of Black Economic Empowerment policies).

Many of the strategies described in third-order design thinking are very useful and practical, and will assist any design client in advancing design to the point where it becomes a useful part of the enterprise. This could, for example, be the preparation of a clear brief with planned desired outcomes, and a more systematised design decision process based on a positive designer-client relationship.

However, the qualitative and holistic **fourth-order approach**, driven by instinct and pure guts, is beyond the comprehension of most well-managed strategic third-order enterprises. This is the space in

⁶ Procurement managers are one of the role-players in South Africa's Black Economic Empowerment (BEE) policies, which are aimed at aiding transformation. More information on this is available on the dti website, www.dti.org.za.

which many entrepreneurs operate, often without any management training or experience, and sometimes with the most rudimentary financial background. These entrepreneurs seldom have funds, but they believe in themselves and in what they can achieve. These entrepreneurs are also far closer to prospective users, and often, ideas originate from user perspectives and needs. Imagination (the notion of what might be) plays a more prominent role than research and careful forward planning, and thinking processes are organic in nature.

In the fourth order, alternative ways are sought to develop product ideas, leading to new ways of communicating ideas and producing mock-ups. Designers are integrated into the thinking process and are not kept at arm's length. Such enterprises are small, nimble and adjustable, and are able to adapt speedily to changes in the marketplace. Design entrepreneurship is another example of fourth-order design thinking, where designers create and use business opportunities.

It is important to point out that a third-order designer would find it very difficult to work with a fourth-order design client, and might not recognise the difference in design thinking. Such a client might be perceived as being impossible and chaotic. A fourth-order design brief would most likely be a learning or open brief that barely states the design problem. Fourth-order thinkers would continue to rework ideas, moving into various related and unrelated solutions.

Teaching design thinking

Buchanan (1998:3) states that we are currently in the middle of a design thinking 'revolution', with design moving from servile activity to what he calls 'new knowledge' production – part of this being the practical significance for economic development and the well-being of citizens.

I agree with Buchanan when he proceeds to explain that, although we possess great knowledge, our knowledge is often fragmented. He also points out that we need better understanding so as to act knowledgeably and responsibly in *practical* life (Buchanan 2001:6). However, the challenge is how to teach design thinking to the non-designers, in this case the entrepreneur.

One obvious way, although not easily implemented, is to build an understanding of design thinking into design courses. However, the way in which designers think and operate does not prepare them for this task. An inexperienced designer might be a brilliant design problem-solver (first and second

order), but may have limited insight into the client organisation's needs. Designers often struggle to describe and explain what they do, and often prefer to let the design 'speak' for itself.

Many entrepreneurs never go to university and, especially in South Africa, might have a low level of literacy and incomplete formal schooling. Schools in South Africa only recently started to include design into the syllabus, with design now being a Grade 12 subject for the first time. However, the content is still positioned in an ambiguous place between art and technology. Art and design are still seen as 'luxury' subjects and are only offered by select schools. Even at tertiary level, no formal design management qualification exists, and design education is still mostly directed at designers.

The need for courses with design thinking/management type of content is evident. The University of Pretoria initiated some design modules at Honours level for business students, and is currently overwhelmed by student numbers (with very few suitable lecturers). I have successfully based my syllabus on the four orders of design, exposing students to design form and then to strategic thinking, before venturing into the domain of systemic integration. This is achieved by showing, workshopping and researching related topics.

Another challenge is the lack of government support in South Africa. SMME development agencies, departments such as the dti, and the Industrial Development Corporation (IDC) have no design policies that can serve to provide guidance, and they offer no design support. The private design and business sectors, however, realised the need for design education, and they create awareness through events and promotional activities such as the Design Indaba. The South African Bureau of Standards (SABS) Design Institute also plays an important role in terms of promoting design.

Substantial literature is available on the development of, and challenges faced by, SMMEs in South Africa. For example, studies investigate the links between creativity and innovation, as well as the factors responsible for the growth of small businesses.⁷ However, research (and even the mention of design as part of entrepreneurial activity in South Africa) is mostly absent, except for a limited number of studies in the fields of marketing and branding.

The integrative nature of entrepreneurship becomes clear in the Global Entrepreneurship Monitor (GEM) 2006 South African Report. This seminal research makes it clear that South Africa performs

⁷ Dockel & Lighthelm 2005; Pretorius, Millard & Kruger 2005.

below average when compared with other countries, and that this performance has declined over the years in which South Africa has been part of the study (Global Entrepreneurship Monitor 2006:27).⁸ Focus areas such as the development of entrepreneurship in rural areas and among women are highlighted, as well as entrepreneurship in schools and the public sector (Global Entrepreneurship Monitor 2006:43). The SMME and entrepreneur in South Africa are seen as the backbone of the growing economy, but some red flags exist. Currently, only 5.29% of South Africa's population is involved in early-stage entrepreneurship, and this figure is down from 9.4% in 2001 (Maas & Herrington 2007:54). The lack of an entrepreneurial mindset and skills, inadequate access to finance, substandard infrastructure, and onerous regulations are contributors to this decline.

Conclusion and the way forward

Although the South African population is generally very creative, the promotion of design thinking as a real contributor to growth in the country is still a long way off. It is clear that design thinking can form a bridge from idea to synthesised reality. As such, design thinking can be invaluable in assisting entrepreneurs to clearly define which products and services they intend to offer, where their SMMEs are positioned in the marketplace, and what their unique value propositions are. This is especially critical given that South African entrepreneurs seldom have adequate schooling and tertiary training, and that the local entrepreneurial culture – and its associated enablers, such as financial assistance and facilitative regulations – is still very much in a development phase.

The development of theories and applications to advance design thinking to the point where it becomes a valuable entrepreneurial enabler is therefore imperative. This is perhaps more urgent in a developing country, where there are often limited resources and where every business success matters. Since a vast number of South Africans depend on the SMME sector as a means of survival, each successful business contributes – albeit in a small way – to increased economic growth and prosperity.

I found Buchanan's matrix a useful and thought-provoking theory that is flexible enough to be interpreted in many ways. Since this research is a work in progress, my next step will be to develop research methods to empirically position the four orders of design thinking in the SMME sector, and more importantly, to develop ways to reach out to the entrepreneur and develop designerly ways of assistance. This conference is definitely a big help in this regard.

⁸ South Africa first took part in this global study in 2001.

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