An exploratory study of business intelligence in knowledge-based South African SMEs

by

Shana R Ponelis

Department of Information Science, University of Pretoria, shana.ponelis@up.ac.za

Johannes J Britz

Department of Information Science, University of Pretoria

School of Information Studies, University of Wisconsin-Milwaukee, britz@uwm.edu

ABSTRACT

Small and medium-sized enterprises (SMEs) play an important part in all economies but particularly in developing economies. Non-survivalist or growth SMEs will drive economic growth and international competitiveness whilst survivalist SMEs play an important role to alleviate poverty and provide a source of income. Although resources are particularly scarce for survivalist SMEs growth SMEs also have limited resources that need to be utlised for maximum return. In terms of ICT growth SMEs tend to spend their available resources on operational systems. But these systems, whilst necessary are not sufficient. They are geared toward capturing data but not producing information. Business intelligence (BI) can provide decision makers, who in SMEs, are predominantly the owner-managers, with access to data that enables them to make informed decisions on where to apply their limited resources. BI requires operational systems be in place to gather the data which makes it a logical next step. Given the dearth of literature on the role of BI in SMEs this paper reports on an interpretive qualitative study, the purpose of which was to explore the use of BI in knowledge-based growth SMEs to support strategic, tactical and operational decision-making. The research results suggest that BI plays an important role in SMEs but that support and guidance can ensure that BI is used to fully exploit data for decision-making and concludes with implications and recommendations for future research. The paper may be of business value to SME owner-managers, vendors, policy makers and academic researchers.

Keywords:
Business intelligence, small and medium-sized enterprises, South Africa, owner-managers, decision-making, exploratory study, interpretive research, qualitative case studies

INTRODUCTION

Small and medium enterprises (SMEs) are an important part of all economies (Storey, 1994). The participation of SMEs in the knowledge economy is important not only for their own competitive advantage in the marketplace but also for the competitiveness of their country as a whole. Their contribution in economies is essential to most countries as they employ the majority of workers (Levy and Powell, 2005:373): according to the World Bank close to 140 million SMEs in 130 countries employed 65 percent of the labour force as at July 2006 (World Bank, 2006). It comes as no surprise that one of the most important roles of the SME sector in both developing countries and transitional economies is to serve as vehicles of economic development (UNIDO, 2003). This is reiteratred by Newberry (2006) stating that the majority of the world's emerging economies indicate that micro, small and medium enterprises will be the predominant enterprise for the foreseeable future as these enterprises play a key role in economic growth and development. To this end, government policies are geared towards supporting the growth of survivalist micro- and small enterprises through a variety of programs that include amongst others technical assistance, training, regulatory provisions, and policy interventions (O'Shea & Stevens, 1998) and South Africa is no exception.

South Africa has an estimated 2 million SMEs that employ an estimated 55% of the country's labor force. Of these businesses 87% are considered survivalist micro- and small enterprises, which confirms Stern's (2002) finding that most of the world's poor people work in the SME sector. In South Africa the SME sector is expected to fulfill a number of roles ranging from poverty alleviation and employment creation to international competitiveness. As a result of *apartheid* policies South Africa has a split economy which is reflected in the SME sector: the first economy comprises formally registered businesses whereas the second or informal economy comprises survivalist micro- and small enterprises. This results in a distinction between entrepreneurship where earnings are reinvested and capital accumulated over time in order to

grow the business versus proprietorship where businesses consume the surpluses generated, i.e. survivalist micro- and small enterprises.

In their 2000 study the Micro Enterprise Alliance (MEA) distinguished between organised and unorganised SME's in urban areas: organised enterprises have salaried employees and fixed premises whereas unorganised enterprises consist of artisans without fixed premises with few or no employees. On the other hand, the South African Global Entrepreneurship Monitor (GEM) report distinguishes formal and informal enterprises on the basis of legal status, formal being those with legally registered businesses and informal being unregistered businesses. The economic contribution of and education levels in these categories differ markedly: informal entrepreneurs employ 0.8 people on average whereas formal entrepreneurs employ 7.2 people on average; two-thirds of informal entrepreneurs have not completed high school compared to two-thirds of formal entrepreneurs (Foxcroft *et al.*, 2002). According to the 2009 GEM report (Herrington *et al.*, 2009) the only South African provinces where the percentage of formal enterprises were greater than the percentage of informal enterprises at the time of publication were Gauteng, the Western Cape and Northern Cape provinces.

Schreiner and Woller (2003:1569) state that most micro-enterprises in developing countries target the working poor and do not promote the "high-demand, fast-growth" SMEs that account for a larger share of jobs in developed countries such as the US where these SMEs are usually started by consultants or computer programmers "who have high human capital." Policy interventions are geared towards "graduating" second economy micro-enterprises into the first, as if the informal sector is a budding formal sector. The findings of the FinScope survey (African Response, 2007) show that this assumption is open to question. The extent of graduation would appear to be low, and it is difficult for people to climb the ladder out of the second economy (Napier and Hudson, 2007). Whilst providing the necessary support for the second economy survivalist businesses is important, it may be beneficial to also provide support in developing countries for formal, growth enterprises built on human capital that can create or are already creating employment for a greater number of people.

STATEMENT OF PROBLEM

The economic landscape in South Africa has changed dramatically in recent years: from a buoyant economic climate with an abundant availability of credit with relatively reliable and stable power supply, SMEs now find themselves challenged in ways they had never expected. Growth SMEs face obstacles such as tighter budgets, reduced access to credit, and a technology landscape more complex than ever. Organisations must be flexible and quick to respond to constantly changing business conditions. To do so, timely intelligence about the organisation, its processes, and its business partners must be available to inform decisions and actions to achieve or maintain a competitive advantage in the marketplace. Ensuring that high-quality information is consistently available and disseminated to those who need it in an organisation is "among the most challenging tasks of the modern coroporation and one of the most under appreciated contributors to high performance and competitive advantage" (Neilson *et al.*, 2010). The ability to utilise technology and information systems is a key influence upon the competitiveness of SMEs (Bergeron and Raymond, 1992; Levy and Powell, 2005:vii) with even micro-enterprises hindered from growth and efficient functioning by an inability to use information technology effectively (Kamal *et al.*, 2011).

According to Sen and Taylor (2007) it is "essential for small businesses in today's competitive environment to take a strategic approach to their information needs if they wish to develop and remain competitive." As SMEs grow in size and turnover they need ICT to process data to inform strategic planning and decision-making that seeks to improve their competitive advantage in the local and global marketplace (Duan and Kinman, 2000). As Burns (2007:330) phrases it 'bad decisions,' i.e. the opposite of good ones, often stem from a lack of reliable information or an unwillingness or inability to understand and interpret the available information. Decision-making, the process of making a reasoned or rational choice among alternatives (Mallach, 2000), is intertwined with management functions such as planning, co-ordination, monitoring, and control, all of which can require that decisions be made. Systems that support decision-making in organisations are therefore an important component in organisational information dissemination and have the potential to impact positively on performance and competitiveness. Making informed decisions is important for any organisation, but is especially crucial for SMEs as valuable time and money cannot be wasted on incorrect decisions when economic belts are

already tightened. Business intelligence (BI) is the most recent development of systems that support organisational decision-making. For example, an owner-manager may want to know not only the revenue generated per client but also how profitable each client is to decide which clients to target for future sales and marketing efforts.

As Welsh and White (1981) state in their seminal article: SMEs are not "little large businesses." Therefore it is not surprising that the literature indicates that SMEs do no adopt ICT in the same manner as large firms as a result of the fundamental differences between small and large organisations (Blili and Raymond, 1993; Welsh and White, 1981) yet most IS research is focused on large organisations even if this is not stated explicitly (Chesney, 2003:1,2). ICT solutions suitable for large organisations are also unlikely to suit SMEs due these differences (Duan and Kinman, 2000; Duan and Xu, 2009) but SMEs must contend with the same problems and decisions as large enterprises but with fewer resources (Lybaert, 1998:188), a condition referred to by Welsh and White (1981) as 'resource poverty.' According to Storey in his foreword to Levy and Powell (2005:vi) the "size-adjusted expenditure on items likely to yield primarily long-term returns, is lower amongst small than large firms." SMEs are slow to exploit opportunities offered by new technology to support their growth. The ICT adoption behaviour of SMEs is influenced by a range of factors that can be ascribed to their unique characteristics (Fink, 1998:244), chief amongst these being their limited resources, financial and otherwise.

Levy and Powell (2005:24) state that "SMEs have as much need for business intelligence as large firms." A market research study conducted in 2007 about BI in South Africa reflected a "high confidence in the value that BI could offer to business in general and to *small business establishments in particular* [own emphasis]" (Tustin and Venter, 2007) but in spite of the increasing interest in SMEs and BI there has been limited empirical research on the use of BI in SMEs in general and in South Africa in particular. There has, however, been a plethora of articles, white papers and even books published and/or sponsored by the ICT industry and vendors in an effort to expand their market beyond large firms, particularly to medium-sized enterprises (Jones, 2010; SAP AG, 2008; Scott, 2009; Swoyer, 2008). This increased promotion of BI to SMEs, the complexities of successfully implementing a BI system and the far-reaching business implications for SMEs justify a more in-depth look at the role of BI systems in these

enterprises.

The purpose of this study was therefore to engage with SMEs in South Africa to explore the use of BI in their enterprises in order to provide insight into the situation with regard to BI in South African SMEs. The research objectives were to understand how information is used in SMEs; if BI is used, to describe BI in the context of SMEs or if it is not used, to determine why not; and to indicate the implications of the research results and to suggest future research. Given the important role that SMEs can and ought to play in developing countries and their economies and the role that ICT can play to enable competitiveness of SMEs, this study makes an important, if modest, contribution to understanding how a specific ICT used for decision support, BI, is used in growth SMEs in South Africa. Most studies on support for SME management are more commonly from a social or economic viewpoint with few studies addressing decision support needs in the context of IT use (Duan and Xu, 2009:974). Arnott and Pervan (2008:688) argue that the relevance of decision support systems research can be improved if research agendas shift towards "the effective development and deployment of data warehouse and business intelligence systems" and thus this study also supports theoretical development in the field.

The study provides insight into industry practice and recommendations that may be of value to SME owner-managers, vendors, policy makers and academic researchers. The study can help participating SME owner-managers through the reflection that the research method engenders and other SME owner-mangers can benchmark their own use of BI against the cases and results. Insight into the nature of enterprise-level decision-making may be valuable to software vendors in order to develop products and marketing strategies suitable to SMEs whilst policy makers can develop strategies to increase the effective use of information using BI among SMEs. For academic researchers this qualitative study explored and developed propositions for further testing in future research. To this end, the paper is structured as follows: first, the key concepts, business intelligence and SMEs, are defined. Second, the methodology used in this study is outlined and motivated. Thereafter the findings are discussed followed by the implications and suggestions for further research.

BUSINESS INTELLIGENCE

There is little agreement in the literature on a common definition of BI (Pirttimäki, 2007; Turban, Sharda, Delen and King, 2011; Wixom and Watson, 2010). This is not unusual in a research field that is still being established. Pirttimäki (2007) remarks that definitions of BI vary depending on the perspective from which it is defined. Ponelis (2011) developed a definitional framework of BI (see Figure 1) using qualitative content analysis to analyse a selection of definitions and descriptions of BI in the literature by academics, practitioners and vendors of BI software.

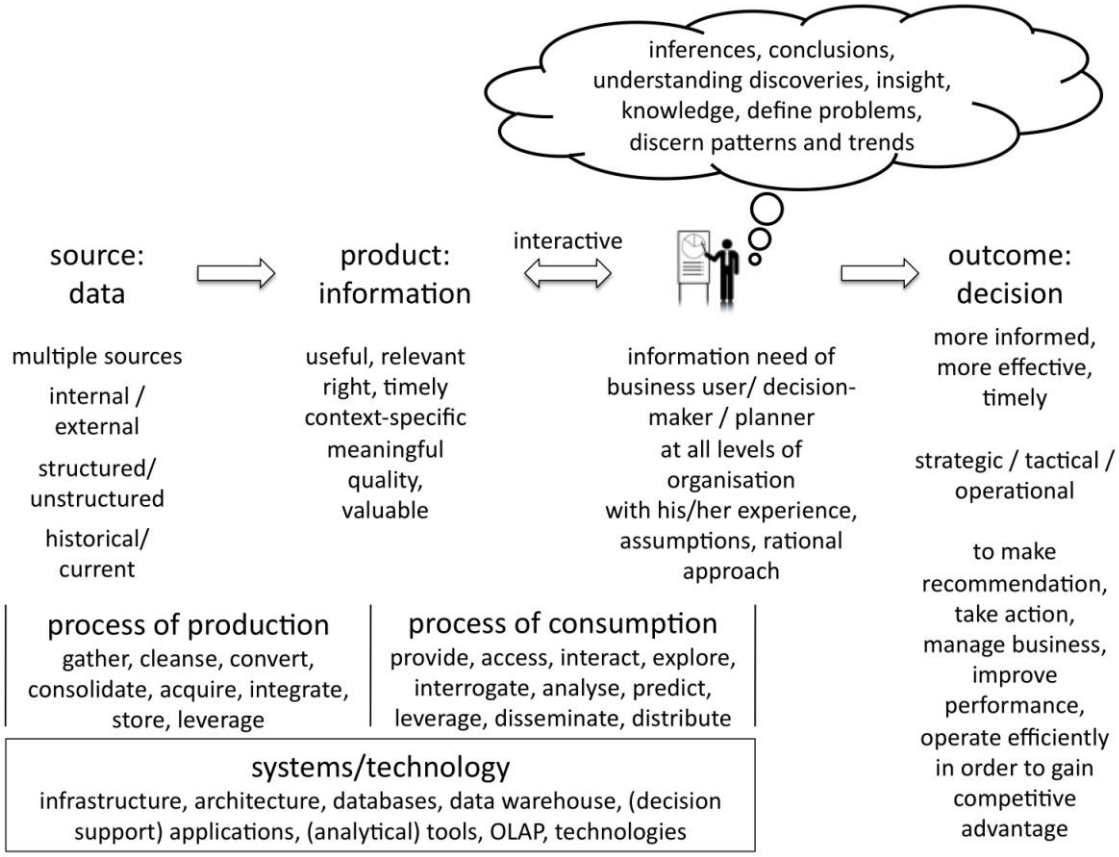

Figure 1. Business intelligence definitional framework (Ponelis, 2011)

Following the recommendations of Lin *et al.* (1993) and Chen (1989) one would expect that the simplest information needs, i.e. reporting needs would be satisfied first before progressing to analytical needs and again, satisfying analytical needs before progressing to predictive needs. In most organisations BI capabilities, once adopted, evolve from simple standard reports and queries showing what happened to more advanced analytics such as multi-dimensional analysis

that examine why it happened to data mining that predicts what might happen in future (Ponelis, 2009; Dyché, 2007).

The systems/technology used to support decision-making can either be informal or formal. Spreadsheets represent the simplest form of decision support and are often found in both SMEs (Levy and Powell, 2005) and large organizations (Chan and Storey, 1996) alike across the analytical spectrum (Kelly, 2008; McGill and Klobas, 2005). Although valuable, popular, widely available, and easy to use, spreadsheets are limited and have inherent drawbacks with regard to both processes of production and consumption: manual intervention is required to consolidate and update data, lack of control and security, maintenance of complex formulas is cumbersome, multiple versions of data is a frequent result, and limited functionality—although advanced spreadsheet skills can extend the functionality (Bradley, 2011), problems that formal BI solutions address. Thus rather than being a formal BI solution the extensive use of spreadsheets in an organisation is seen as evidence of an analytical culture and is a good indicator that a more formal BI solution may be needed. More formal solutions can either be hosted onsite or offsite on an on-demand basis. Onsite BI systems can either be developed bespoke whether in-house or consultants, or as purchased as packaged software (Duan and Xu, 2009) that is customised based on the needs and data of the enterprise. On-demand solutions refer to software as a service (SaaS) where the software is owned, delivered and managed remotely by one or more providers that is consumed anytime on a pay-for-use basis, or as a subscription based on usage metrics (Hostmann, 2009) typically web-based in the cloud.

SMALL AND MEDIUM-SIZED ENTERPRISES

The nature of SMEs, their unique yet diverse nature, and the important role of information in SMEs were discussed in the *Introduction, purpose and objectives*. As Burns (2007:10) points out one does not have to own a business to manage it; the majority of managers of SMEs, however, are also owners, hence the term owner-manager. Ownership can take many forms: a sole proprietorship, partnership, close corporation, or a limited liability company but regardless of the form, owner-managers significantly control the daily operations of their businesses and are the main decision-makers (Gibcus and Van Hoesel, 2008). In order to understand SMEs and to effect changes in such firms researchers should strive to see the world from the perspective of

this key SME decision-maker, the owner-manager (Hill and Wright, 2001). What is less clear is what exactly is considered as an SME. Most definitions now classify businesses based on their number of employees, turnover and/or total assets with the particular threshold being industry-specific. To simplify participant selection in this study SMEs are defined as those businesses with fewer than 200 employees.

METHODOLOGY

Gilmore and Carson (2000) advocate a qualitative research approach within the interpretive research paradigm when conducting research on the decision-making processes of SME owner-managers. Furthermore, when seeking understanding, as is the case in this exploratory research, case studies are the most appropriate method (Myers, 2009; Levy and Powell, 2005:6). Arnott and Pervan (2008:667) also advocate the use of case studies, in particular interpretive case studies to increase the relevance of research since case studies "can illuminate areas of contemporary practice in ways that studies such as laboratory experiments and surveys cannot." Although there is a dearth of literature on the role of BI in SMEs, the proposed research design has been utilised in a number of studies seeking to explore and understand specific aspects of SMEs that is similar in nature to this study (Hill and Scott, 2004; Fink and Disterer, 2006). Moreover, case-based research supports the relevance of the study since case studies are considered more persuasive to owner-managers than theoretical discussions (Storey in Levy and Powell, 2005:viii). For these reasons this study adopted an interpretivist research paradigm using qualitative case studies.

Data was collected through semi-structured, face-to-face interviews conducted with the owner-managers of seven organized, formal knowledge-based growth SMEs located in Gauteng. Owners of affiliated or franchise businesses may be influenced by the parent company in terms of technology used and therefore only independent, non-affiliated, non-franchisee businesses were considered. The SMEs were selected through purposive sampling. In interpretive research the number of participants does not determine the significance of the research but rather the information richness of the cases selected (Eisenhardt, 1989:537) but multiple cases were selected since evidence from multiple cases is "often considered more compelling" (Yin, 2009:53) and provide a valid basis for understanding (Levy and Powell, 2005:7). Due to the

large amounts of data produced together with the consequent difficulties of analysis Curran and Blackburn (2001:59) indicate that case studies in SME research are often fewer than ten.

Hill and Scott (2004:52) report that their prior research suggests that it is useful to "work with companies with strong commonality." Knowledge-based SMEs are defined as small and medium enterprises that have systemic, knowledge-based resources as its prime competitive tools (Duncan et al., 2001). Such enterprises offer products and services based on the knowledge and experience held within individuals and systems with the competitive advantage arising from being able to leverage this knowledge and experience. Knowledge-based SMEs continually gather information, develop skills and use experience to enhance their products and services (Levy and Powell, 2005:267-268). The expectation is that these knowledge-based firms would be more likely to use information for decision-making and have knowledge and experience of BI given the importance of intangible and systemic resources. Even so, given the lack of agreement on a definition for BI among experts, it is unlikely that owner-managers would have a common understanding of BI. The interviews therefore used the five components of the definitional framework of BI discussed above as themes to elicit how individuals make sense of their experiences and actions with regard to decision-making in their businesses. Furthermore, the selection of cases was limited to the Gauteng province, one of the 3 provinces where formal SMEs outnumber informal SMEs in South Africa, to ensure that the enterprises chosen were subject to similar macro-environmental factors. The owner-managers of seven suitable SMEs agreed to participate in the research. One SME, Case D, was omitted from further analysis because the owner-manager was unable to share sufficient information. The profile of the selected cases is provided in **Table 1**.

The face-to-face interviews were conducted over a four-week period during January 2011. Each interview lasted about 1 hour. Notes were taken during all of the interviews including notes of the observations made by the researcher during the interview. Permission to audio-record the interviews were given by three interviewees and supported by notes in case of equipment failure (audio-recording, although preferable, was not required since participants who would prefer not to be recorded may be reluctant to converse freely in accordance with Myers (2009:134)). Interviews were conducted face-to-face to establish rapport, build trust, and to identify any non-

verbal cues that warranted further questioning. All interviews were conducted at the participants' place of work, normally a quiet office, except in two instances where the participants with home offices requested that interviews be conducted in coffee shops.

Case[1]	Nature of business	Legal form	Est.	Emplo-yees[2]	Scope of operations
A	IT services and software	Private company	2000	10	National
B	E-learning platforms and content	Close corporation	2000[3]	13	Regional
C	Management consulting	Sole proprietorship	1995	1	International
D[4]	Environmental consulting services	Private company	1999	5	National
E	IT services and software	Private company	2001	130	International
F	IT services and software	Close corporation	2002	9	National
G	Graphic design	Close corporation	2009	1	International

Table 1: Profile of selected cases

No research is without limitation and this study is no exception. First, much of the evidence relied on data from one individual within each enterprise. Due to the nature of the data gathered it was not always possible to triangulate between sources and the integrity of the data gathered relies on the truthfulness of participants. Second, the reliability of interpretive results rests on the interpretative abilities of the researcher who is also subjectively involved in the research process. Strategies that were employed to overcome these limitations including acknowledging the researcher's subjective role including prior experience and assumptions and confirmation of the results with participants.

The transcriptions (where audio-recording was permitted) and notes were analysed following the process outlined by Cope (2005) that was amended to also include the data collection process itself as part of the analysis since as soon as the researcher started gathering data during the interviews the process of inductively analysing data commenced. The second level comprised the transcription of audio-recordings and capturing of notes. Next the transcripts and notes were developed into coherent and manageable write-ups (or case narratives) structured according to the definitional framework in order to enable analysis across the six cases. The fourth level of analysis was concerned with cross-case comparisons to seek out what is common and what is

[1] For ethical reasons cases used in this research are referred to as Case A through G.
[2] Employee count includes owner-manager(s).
[3] Current owner-manager bought business in 2006.
[4] Omitted from further analysis because the owner-manager did not share sufficient information.

particular in the cases by means of content analysis. Last, the findings were interpreted in the context of extant literature. The fourth and last levels of analysis are presented in the next section.

FINDINGS AND DISCUSSION

Several findings emerged with regard to the use of BI in knowledge-based growth SMEs in South Africa. The findings from the case studies are summarized in Table 2 and followed by discussion thereof in the context of extant literature.

1. ICT is seen as a means to achieve business objectives and inexpensive, flexible solutions that are easy to implement and use are preferred.
2. All owner-managers in the selected knowledge-based SMEs are well educated in their domains but not necessarily in the management and administration of a business.
3. A consensus among all the selected SMEs is that data plays an important role in managing their enterprises.
4. All enterprises use information generated from internal and external data sources for decision-making and would like to see improved access to existing as well as to additional data sources.
5. Data integration, manipulation and analysis are predominantly manual using internally developed spreadsheets or custom-developed spreadsheets provided by external parties.
6. Half of the SMEs need to share data with their clients to ensure good relationships and prompt payment.
7. SMEs prefer advice from those they already have relationships with and trust such as accounting and tax professionals; these sources are also considered less expensive compared to business consultants.
8. External assistance from trusted parties is sometimes required to assist with data analyis although owner-managers would prefer to do this by themselves and on a more regular basis.

Table 2: Key findings from the qualitative case studies of six South African knowledge-based growth SMEs

Not all the owner-managers referred explicitly to BI during the interviews but they all relied on BI as defined in the framework in Figure 1 above although the nature and number of sources, the systems and technology used as well as the processes of production and consumption varied. The owner-managers interviewed all expressed the desire to have improved access to data, both structured and unstructured as well as data from internal and particularly external sources, a finding that echoes that of Gordon and Key (1987) that a common problem for SME managers is a shortage of suitable information on which to base decisions. All owner-mangers were unanimous about the importance of data to managing their enterprises and hence their focus is on sources and the processes of production and consumption with technology and systems being a means to an end.

SMEs tend to have more limited internal and external source data available from which to generate BI. An entry-level accounting package, for example, stores substantially less data than financial modules in an enterprise resource planning (ERP) system. External data sources regarding industry-specific and/or competitor data is even more limited although there is a great need for such information. All the SMEs interviewed use accounting software such as Pastel or Accpac although the available add-on BI modules aren't used. Except for the two sole owners (Cases C and G) all SMEs had human resources and payroll systems and a way to keep track of customer relationships although not necessarily a formally developed system, for example, one SME created a wiki page for each customer (Case A). Several use SaaS systems to manage and keep track of projects (Teambox in Case B, Basecamp in Case G) as well as other systems such as document version control systems (CVS in Case A).

In terms of the systems and technology used to produce and consume information the study revealed a preference for inexpensive, flexible solutions that are easy to implement and use as a result of 'resource poverty,' a result that confirms previous research with regard to packages being preferred over in-house software development (Cragg and King, 1993; Fink, 1998). Although packaged software is preferred Heikkilä *et al*. (1991) in their exploratory study found that SMEs are often disappointed with their software packages; in particular, small businesses with less than 20 employees found packages too difficult to use whereas business with more than 50 employees found packages are dissatisfied with the adaptability of software packages to their particular needs. It is not surprising therefore that in contrast to earlier studies, this study revealed a preference amongst SMEs of all sizes for the more recently available open source, web-based applications over in-house packaged software. As an enterprise grows there is more internal data available that can be used as input to the decision-making process and the greater the need and potential for formalised BI systems and technology. Sole owners and owner-managers who work alongside employees appear to have a good grasp on what is happening in their businesses "in their heads" (Cases C, F and G) but this changes as SMEs increase in size and complexity, namely for owner-controllers where an enterprise is large enough for the owner to be solely concerned with managing the business (Cases A and B) or for owner-directors who control their business through developed structures based on delegation of managerial functions (Case E). Even in the medium-sized organisation (Case E) data integration, manipulation and

analysis are predominantly manual using internally developed spreadsheets or custom-developed spreadsheets provided by external parties. It would appear that SMEs find it challenging to make the transition from informal to formal BI and thus to make efficient use of progressively more advanced analysis as data volumes, sources and complexity increase. This may be due to the lack of formal management training, particularly ICT management and/or to the time pressures that owner/mangers operate under since they may be too busy with operational issues to give attention to ICT selection. Another reason may be that BI software packages are considered to have "too much stuffed" into them that makes them expensive and complex to deploy (Stodder, 2011) by large firms and have thus found little traction in the selected SMEs. Given the SMEs expressed preference for web-based applications SMEs may be more inclined to investigate SaaS offerings such as *Roambi* and *LITEBI* that offer dashboard visualisations that give users "unified views and access to multiple types of data, including unstructured [data]" (Stodder, 2011). These applications can address the shortcomings of spreadsheets and empower users to extract more business value from their data without ongoing external assistance to do so. In addition, it may well be that the availability of more analytical capability will enable more strategic planning.

As one would expect in knowledge-based firms the owner-managers are well educated with all holding tertiary degrees as highest qualification: 3 doctorates (Cases A, B, C), 2 honours degrees (Cases E and G) and a bachelor degree (Case F). However, the results support the statements by Blili and Raymond (1993) and Chesney (2003) that owner-managers have expertise in their respective professions and industries but not necessarily in management or the administration of a business. In Case C the owner/manager had extensive experience as a manager in a large organisation but even so was not prepared for entrepreneurial management, a finding that confirms that of Deakins and Freel (1998) where the transformation from a senior manager in a large organisation to a SME owner/manager is "fraught with difficulty for unprepared, but otherwise competent individuals." Even though the owner-manager's degree in Case F did include small business management-related subjects he indicated that at the time it was purely theoretical and was not very useful or helpful in his current situation as an owner-manager. In Case G the owner-manager indicated that he would like to see more pro-active support and advice at the time the need arises from trusted institutions such as the revenue service (SARS)

with regard to taxation and the registrar of companies (previously CIPRO, now CIPC) with regard to registration and ongoing filing requirements. These findings align with that of cognitive scientists, who found that a person does not collect unneeded facts and wait for a suitable moment in which to use them but rather seeks and makes use of facts when a problem presents itself (Calder, 2006:1362). Furthermore, Deakins and Freel (1998:153) found in their four case studies of four cases that "a large part of entrepreneurial learning is experiential."

Because of limited resources such as in-house BI support and expertise many SMEs have no choice but to rely external advisors but are often unsure about the quality of advice they receive (Igbaria et al., 1998) since the quality may vary considerably. It is a challenge for SMEs to identify trustworthy, affordable and proficient consultants and owner-managers prefer trusted and inexpensive sources (at least in terms of immediate direct costs) such as company employees, internet research, popular magazines and trade publications, and external advisors that include friends, relatives, another SME, ICT stores, and exhibitions (Chibelushi and Costello, 2009). The SMEs in this study were no different preferring advice from those they trust such as friends and acquaintances; these sources are also considered less expensive although the total cost wasn't considered, for example, if the advice turns out to be incorrect or inadequate.

For SMEs good relationships with their clients and creditors are vitally important since most SMEs are vulnerable to cash flow disruptions. Three of the six SMEs (Cases A, E and G) need to be able to proactively share information with their clients, particularly line item detail on invoices—the lack of which is often used as excuse to query and delay payment negatively impacting cash flow—either on paper or electronically. This requirement influenced their choice of system, a finding that confirms that of Bharati and Chaudhury (2006:93) that customers, apart from top management, have the most influence on small and medium firms' decisions to adopt ICTs. Apart from customers and top management legislation also impacts ICT decisions. For example, legislation regarding the requirements for issuing tax invoices (Value Added Tax Act 89 of 1991) and revenue service guidelines with regard to electronic tax invoices (*VAT404 Guide for Vendors* and *VATNEWS 20* issued by SARS) have affected SMEs with one SME needing to upgrade to a new version of their accounting software package (Case A) and another owner-

manager being uncertain whether his SaaS solution that allows clients access to electronic tax invoices complies with legislation (Case G).

SMEs require simple, inexpensive yet customisable BI solutions that ideally can be scaled up as needed as the business grows without requiring significant resources. The results of the study suggest that owner-managers who rely on informal data sources, such as social networks, and informal decision-making do so not from a lack of willingness to use formal data sources as suggested by earlier research (Gibcus and Van Hoesel, 2008; Hill and Scott, 2004) but due to a lack of knowledge of, access to, ready availability of such sources, particularly with regard to external data. Even with regard to available data external assistance from trusted parties is sometimes still required, for example to interpret financial data (Case A) or conduct real-time analysis of their data (Case B); these owner-managers indicated that they would prefer to be able to do this for themselves and on a more regular basis.

CONCLUSION, IMPLICATIONS AND FUTURE RESEARCH

This study has explored the role of BI in South African knowledge-based SMEs from the perspective of the key decision-maker, the owner-manager(s), in order to determine how to improve entrepreneurial practice, one of the two fundamental questions of entrepreneurship according to Bygrave (2007). The findings imply that owner-managers recognise the value of both information for decision-making and the role of systems/technology in supporting the production and access thereto. However, without the bespoke assessment of the potential together with guidance and support for using BI (and ICT overall) in their businesses they may well not use their existing data to support their decision-making to the extent that they could. Most owner-managers require assistance with advanced analysis and interpretation of their existing data as well as identification of potential additional sources of data. Whilst not all SMEs will benefit from having the entire spectrum of BI systems/technologies at hand, this study suggests that all SMEs have information needs and that BI can play a positive role in meeting these needs as stated by Turstin and Venter (2007) and as such it is worth considering the implications.

Matthews (2007) indicates that external ICT expertise and advice can be difficult to access for SMEs because such sources of support are underdeveloped in many countries, including South Africa, where more attention may be given to larger companies. The findings together with literature (e.g. Deakins and Freel, 1998) suggest that traditional consulting services may be neither optimal nor sufficient yet Duan and Xu (2009:976) intimate that professional support can enhance strategic planning in SMEs and Thong *et al.* (1997) concluded that IT projects in SMEs are more likely to succeed in the presence of high external expertise. The lack of support services and/or the relatively higher unit cost can hinder SMEs' efforts to improve, because consulting firms are often not able to provide appropriate cost-effective solutions for SMEs (Abor and Quartey, 2010). Whilst consulting services targeting SMEs are increasingly available in the South African market (*Amalgam IT Partners* and *Space Age Technologies* for example), none of the SMEs were aware that such services are available. Following Bharati and Chaudbury's (2006) suggestion offering outreach through a demonstration laboratory that showcases systems and technology together with relevant case studies of successful SMEs combined with best practices can improve awareness and understanding amongst owner-managers of the potential of BI as well as suitable options available to them at a time suitable to their experiential entrepreneurial learning. Exploring the potential value of a living lab is also worthwhile since the South African Council of Scientific and Industrial Research (CSIR) is already using living labs in demand-driven research. In a living lab the participating users are seen as co-creators of new services and products that are typically linked to the creation or application of ICTs or ICT-enabled services (LLiSA, 2009).

Both the literature and this study suggest that traditional training in entrepreneurship and small business management may not be as effective as previously thought. Deakins and Freel (1998) suggests incubator experience as a pre-cursor to entrepreneurship as well as mentoring support for new and early-stage entrepreneurs to guide entrepreneurs' reflection and learning from their experiences. Another option is to create a one-stop service: an enterprise development centre that provides entrepreneurship management education to existing business owner-managers as well as consulting services tailored specifically to SMEs in general and the contracting SME in particular when the need arises. Establishing a collective intermediate centre for competitive intelligence and technology watch as suggested by Izquierdo and Larreina (2005) may go some

way to address the deficit of external competitive, market and competitor data as well as legislative and regulatory changes affecting SMEs. Awareness of services such as these amongst SME owner-managers can be increased by marketing not only to SMEs directly but also to accounting and tax professionals through their professional bodies as well as through personal bankers from financial institutions' small business divisions since most formal, registered SMEs make use of these services (African Response, 2007) and presumably trusts these business partners. This is supported by the SME Survey (2007) that found business owners look to their accountants (72%) or financial institutions (59%) for business expertise with comparatively few who make use of business consultants (33%) and mentoring or coaching (9%). Even with awareness and trust another problem is the affordability of external advisers. One solution would be to subsidise services available to SMEs through, for example, enterprise development centres discussed earlier. The challenge for vendors, policy makers, government agencies, business advisers, and other stakeholders is to explore ways of embedding BI in SMEs from business inception and expanding BI in existing SMEs that, contrary to expectations, is evidently needed in the knowledge-based SME sector.

Formal, non-survivalist or growth SMEs play a significant role in a country's competitiveness and economic development and this study has shown that the provision of appropriate support with regard to BI is needed as BI plays a crucial role to support decision-making in SMEs of all sizes. The purpose of this study was not statistical generalisability but to explore the nature and use of BI in South African SMEs. Due to the interpretative approach, the results this research produced are highly contextual. Even so, important commonalities and themes were evident across cases that could not have been elicited without the use of an interpretivist approach. A future study can adopt a more rigorous, positivist approach based on the findings resulting from this study. Exploring the role of BI in other growth SMEs such as manufacturing and retail would also broaden understanding of supporting decision-making needs and the role of BI in meeting these needs. An action research methodology (Baskerville, 1999) can be used to apply BI interventions within SMEs to investigate different solutions in more depth similar to Kamal *et al*. (2011). Such research can also be a basis for developing case studies and best practices that can be used to share expertise with SMEs through various channels such as the enterprise development centres.

REFERENCES

1. Abor, Joshua and Quartey, Peter. 2010. Issues in SME Development in Ghana and South Africa. *International Research Journal of Finance and Economics*, 39:218-228.
2. African Response. 2007. *Small Business Survey Report Gauteng 2006* [online]. Available: http://www.finscope.co.za/sme.html (accessed October 1, 2010).
3. Arnott, D., and Pervan, G. 2008. Eight key issues for the decision support systems discipline. *Decision Support Systems*, 44(3):657-672.
4. Baskerville, R.L. 1999. Investigating Information Systems with Action Research [online]. *Communications of the Association for Information Systems*, Vol. 2: Article 19. Available: http://www.cis.gsu.edu/~rbaskerv/CAIS_2_19/CAIS_2_19.html (accessed July 24, 2011).
5. Bergeron, F. and Raymond, I. 1992. Planning of information systems to gain a competitive edge. *Journal of Small Business Management*, 30(1):21-26.
6. Bharati, P., and Chaudhury, A. 2006. Current Status of Technology Adoption: Micro, Small and Medium Manufacturing Firms in Boston. *Communications of the ACM*, 49(10):88-93
7. Blili, S., and Raymond, L. 1993. Information technology: threats and opportunities for small and medium-sized enterprises. *International Journal of Information Managemen*t, 13(6):439-448.
8. Bradley, Helen. 2011. Use Microsoft Excel for (Nearly) Everything [online]. Computerworld. Available: http://www.computerworld.com.au/article/378059/use_microsoft_excel_nearly_everything/ (accessed July 24, 2011).
9. Burns, P. 2007. *Entrepreneurship and Small Business*. Second Edition. Basingstoke, UK: Palgrave Macmillan.
10. Bygrave, W. D. 2007. The entrepreneurship paradigm (I) revisited. In: *Handbook of qualitative research methods in entrepreneurship*, H. Neergaard & J. Parm Ulhøi (Eds.) Cheltenham, UK: Edward Elgar Publishing, pp. 17-48.
11. Calder, Lendol. 2006. Uncoverage: Toward a Signature Pedagogy for the History Survey. *The Journal of American History,* 92(4):1358-1371.

12. Chan, Y.E. and Storey, V.C. 1996. The use of spreadsheets in organizations: Determinants and consequences. *Information & Management*, 31(3):119-134.
13. Chen, K-C. 1989. Developing Decision Support Systems for Small Business Management: A Case Study. *Journal of Small Business Management*, 27(3):11-22.
14. Chesney, T. 2003. *Competitive Information in Small Businesses*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
15. Cope, J. 2005. Researching Entrepreneurship through: Phenomenological Inquiry Philosophical and Methodological Issues. *International Small Business Journal*, 23(2): 163–189.
16. Cragg, P.B. and King, M. 1992. Information system sophistication and financial performance of small engineering firms. *European Journal of Information Systems*, 1(6):417-426.
17. Curran, J. and Blackburn, R.A. 2001. *Researching the Small Enterprise*. London: Sage Publications.
18. Deakins, David and Freel, Mark. 1998. Entrepreneurial learning and the growth process in SMEs. *The Learning Organization*, 5(3):144–155.
19. Duan, Y. and Kinman, R. 2000. Small manufacturing businesses: Meeting decision support needs. *Journal of Small Business and Enterprise Development*, 7(8):272-284.
20. Duan, Y. and Xu, M. 2009. Decision Support Systems in Small Businesses. In: *Encyclopedia of information science and technology*, 2nd edition, Khosrow-Pour, M. (Ed.). Hersey, PA: IGI Global, pp. 974-977.
21. Dyché, Jill. 2007. *BI Adoption Evolves, Part 1: The Baseline Pyramid Redux* [online]. http://www.b-eye-network.com/print/5424 (accessed June 12, 2011).
22. Eisenhardt, K.M. 1989. Buidling Theories from Case Study Research. *Academy of Management Review*, 14(4):532-550.
23. Fink, D. 1998. Guidelines for the Successful Adoption of Information Technology in Small and Medium Enterprises. *International Journal of Information Management*, 18(4):243-253.

24. Fink, D. and Disterer, G. 2006. International case studies: To what extent is ICT infused into the operations of SMEs? *Journal of Enterprise Information Management*, 19(6):608-624.
25. Foxcroft, L., Eric Wood, Jacqui Kew, Mike Herrington and Nick Segal. 2002. *Global Entrepreneurship Monitor: South African Executive Report 2002*. Cape Town: Graduate School of Business, University of Cape Town.
26. Gibcus, P. and Van Hoesel, P. (2008) Strategic decision-making processes in SMEs: an exploratory study. In: *Entrepreneurial strategic decision-making: a cognitive perspective*, Vermeulen, P.A.M. and Curseu, P.L. (Eds.) Cheltenham, UK: Edward Elgar Publishing, pp. 89-104.
27. Gilmore, A. and Carson, D. 2000. The demonstration of a methodology for assessing SME decision making. *Journal of Research in Marketing and Entrepreneurship*, 2(2):108-124.
28. Gordon, W. L. and Key, J. R. 1987. Artificial Intelligence in Support of Small Business Information Needs. *Journal of Systems Management*, 38(1), 24-28.
29. Harris, David. 2003. *Systems Analysis and Design for the Small Enterprise*, 3rd edition. Boston, MA:Thomson Course Technology.
30. Heikkilä, J., Saarinen, T. and Sääksjärvi, M. 1991. Success of software packages in small businesses: an exploratory study. *European Journal of Information Systems*, 1(3):159–170.
31. Herrington, M., Kew, J. and Kew, P. 2009. *Tracking Entrepreneurship In South Africa: A Gem Perspective* [online]. Available: http://www.gemconsortium.org/document.aspx?id=1033 (accessed October 11, 2010).
32. Hill, J. and Scott, T. 2004. A consideration of the roles of business intelligence and e-business in management and marketing decision making in knowledge-based and high-tech start-ups. *Qualitative Market Research: An International Journal*, 7(1):48-57.
33. Hill, J. and Wright, L . T. 2001. A qualitative research agenda for small to medium-sized enterprises. *Journal of Marketing Intelligence & Planning*, 19(6):432-443.
34. Hostmann, Bill. 2009. *Business Intelligence as a Service: Findings and Recommendations*. Gartner, Inc.

35. Izquierdo, J. and Larreina, S. 2005. Collective SME Approach to Technology Watch and Competitive Intelligence: The Role of Intermediate Centers. *Studies in Fuzziness and Soft Computing*, 185:181-189.

36. Jones, D. 2010. *The Shortcut Guide To Achieving Business Intelligence in Midsize Companies*. San Francisco, CA: Realtime Publishers.

37. Kamal, Mehruz, Andre, Charles and Augustyn, Matthew. 2011. Using Cloud-based Applications to Facilitate IT Adoption in Microenterprises. *MWAIS 2011 Proceedings*. Paper 4. Available: http://aisel.aisnet.org/mwais2011/4.

38. Kelly, J. 2008. Business intelligence users can't wean themselves off Microsoft Excel [online]. *SearchBusinessAnalytics.com*. Available: http://searchbusinessanalytics.techtarget.com/news/1288694/Business-intelligence-users-cant-wean-themselves-off-Microsoft-Excel (accessed July 24, 2011).

39. Levy, M. and Powell, P. 2005. *Strategies for Growth in SMEs: The Role of Information and Information Systems*. Elsevier Butterworth-Heinemann Information Systems Series. Oxford: Elsevier Butterworth-Heinemann.

40. Lin, B., Vassar, J. A. and Clark, L. S. 1993. Information Technology Strategies for Small Businesses. *Journal of Applied Business Research*, 9(2), 25-29.

41. LLiSA. 2009. Overview - Living Labs in Southern Africa [online]. Available: http://llisa.meraka.org.za/index.php/Overview (accessed July 22, 2011).

42. Lybaert, N. 1998. The information use in a SME: its importance and some elements of influence. *Small Business Economics*, 10(2): 171-191.

43. Mallach, E.G. 2000. *Decision Support and Data Warehouse Systems*. McGraw-Hill Higher Education.

44. McGill, T.J. and Klobas, J.E. 2005. The role of spreadsheet knowledge in user-developed application success. *Decision Support Systems*, 39(3):355-369.

45. Myers, M.D. 2009. *Qualitative research in business and management*. London, UK: Sage Publications.

46. Napier, M. and Hudson, J. 2007. Where cellphones rule. *Mail and Guardian*, 16 February 2007.

47. Neilson, G., Pasternack, B.A. and Mendes, D. 2010. The Four Bases of Organizational DNA. *Strategy+Business*, Autumn 2010, pp. 46-55.

48. Newberry, D. 2006. *The Importance of Small and Mid Sized Enterprise in Emerging Economies* [online], December 8, 2006. World Resources Institute. Available: http://www.wri.org/stories/2006/12/importance-small-and-mid-sized-enterprise-emerging-economies. Accessed June 10, 2010.

49. O'Shea, M. and Stevens, C. 1998. *Governments as Venture Capitalists*, The OECD Observer, Aug/Sep 1998, Issue 213, p26-29.

50. Pirttimäki, V.H. 2007. Conceptual analysis of business intelligence. *SA Journal of Information Management*, 9(2).

51. Ponelis, S.R. 2009. *Data Marts as Management Information Delivery Mechanisms: Utilisation in Manufacturing Organisations with Third Party Distribution*. University of Pretoria, Masters dissertation.

52. Ponelis, S.R. 2011. *A descriptive framework of business intelligence derived from definitions by academics, practitioners and vendors*. Unpublished manuscript.

53. SAP AG. 2008. *Business Intelligence: The Definitive Guide for Midsize Organizations*. SAP White Paper 50 088 770 (08/03).

54. Schreiner, M. and Woller, G. 2003. Microenterprise Development Programs in the United States and in the Developing World. *World Development*, 31(9):1567–1580.

55. Scott, J. 2009. SMBs craving business intelligence tools [online]. 7 May 2009. Available: http://www.itpro.co.uk/610764/smbs-craving-business-intelligence-tools (accessed June 12, 2011).

56. Sen, B.A. and Taylor, R. 2007. Determining the information needs of small and medium-sized enterprises: a critical success factor analysis. *Information Research*, 12(4), paper 329. Available: http://informationr.net/ir/12-4/paper329.html.

57. Stern, N. 2002. *A strategy for development.* The World Bank, Washington, DC.

58. Storey, D.J. 1994. *Understanding the Small Business Sector*. London: Thomson Learning.

59. Swoyer, Stephen. 2008. *BI Players Forge Roads into the Mid-Market* [online]. The Data Warehouse Institute. June 11, 2008. Available: http://tdwi.org/articles/2008/06/11/bi-players-forge-roads-into-the-midmarket.aspx?sc_lang=en (accessed June 12, 2011).

60. Thong J.Y.L., Yap C.S. and Raman, K.S. 1997. Environments for information systems implementation in small businesses. *Journal of Organizational Computing and Electronic Commerce*, 7(4), 253–278.

61. Turban, E., Sharda, R., Delen, D. and King, D. (2011) *Business intelligence: a managerial approach*. Second edition. Upper Saddle River, NJ: Prentice Hall.

62. Tustin, Deon, and Peet Venter. 2007. *BUSINESS INTELLIGENCE IN SOUTH AFRICA* (Research Report no 360). Pretoria: University of South Africa.

63. UNIDO. 2003. *Contribution to the World Summit on the Information Society (WSIS)*, February 19, 2003. Document WSIS/PC-2/CONTR/119-E.

64. Welsh, John A. and White, Jerry F. 1981. A small business is not a little big business. *Harvard Business Review*, 59(4):p18-27.

65. Wixom, B. and Watson, H. (2010) The BI-Based Organization. *International Journal of Business Intelligence Research*, 1(1):13-28.

66. World Bank. 2006. *International Financial Corporation Report: Micro, Small and Medium Enterprises*.

67. Yin, R. K. 2009. *Case Study Research: Design and Methods*. Fourth edition. Thousand Oaks, Calif.: SagePublications.