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# The Role of Business Analytics for Competitive Advantage of Small and Medium Enterprises

## Research-in-progress

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## Abstract

Small and Medium Enterprises (SMEs) are locomotives of economic development. They constitute an important proportion of enterprises globally, including in Australia. Hence, the Australian government recognises the importance of enabling the competitiveness of SMEs as a driving force of the economy of Australia. In recent years, there has been a rapid expansion of technological resources which are essential in enabling competitive advantage for SMEs. One type of technical resource that has gained increasing importance over the last decade is Business Analytics (BA). Research into BA, predominantly in the context of large organisations, has shown how BA contributes to business value and business performance. However, there's a lack of understanding of the role BA resources can play in obtaining competitive advantage in the SME context. By employing Resource-Based View (RBV) as theoretical underpinning, this research explores this gap and aims to provide a richer understanding of the role of BA capabilities and BA assets in enabling SMEs to create competitive advantage as well as an insight into how SMEs utilise BA resources to that end.

**Keywords** Business analytics (BA), Resource-Based View (RBV), competitive advantages, small and medium enterprises (SME)

## 1 Introduction

Competitiveness of Small and Medium Enterprises (SMEs) has been a driving force behind the economic prosperity of many countries, including that of Australia (Daly 2020; Karanikolas 2019). Since SMEs are the backbone of economies (The Organisation for Economic Co-operation and Development 2017), the competitiveness of the SME sector is an important goal. The importance of technology as an essential enabler of competitive advantages in large organizations is well documented in the literature (Gronum 2015; Mata et al. 1995; Ngah 2015). However, the question of how SMEs can effectively utilise their technology investments to realise competitive advantage warrants more in-depth analysis as SMEs operate in a unique environment in terms of their size, resources, challenges and opportunities as compared to large enterprises. These differences impact on how SMEs adopt and implement technology investment, such as Business Analytics (BA) (Krishnamoorthi and Mathew 2018). In contrast to large enterprises that are generally early adopters of BA (Hatta et al. 2015), SMEs generally take a precautionary approach in adopting BA (Boonsiritomachai 2014).

Many researchers have dedicated their efforts to developing models to answer how BA contributes to business performance, business value and competitive advantage for large enterprises (Krishnamoorthi and Mathew 2018; Seddon et al. 2017). However, it is important to keep in mind that large enterprises and SMEs differ in terms of their characteristics, e.g. with regard to flexibility, capabilities, management style and agility (English and Hoffman 2018). The limited existing research has noted that the different characteristics of SMEs will impact on how SMEs create competitive advantage as compared to large enterprises (Ngah 2015). However, they have not focused on how SMEs gained competitive advantage from BA (English and Hoffman 2018). Therefore, this research aims to explore in-depth how SMEs can gain competitive advantage from the use of BA, and how that might differ from large enterprises, where we already have a reasonably good understanding of the impact of BA usage. Further, it provides a contribution to practice by developing a rich understanding of SMEs' BA resources which will help SMEs make decisions more confidently on how to use BA resources in order to achieve competitive advantage, regardless of their current level of maturity. In addition, it provides contribution to the theory by developing a conceptual framework for the role of BA for competitive advantages of SMEs by using Resource-Bases View (RBV) as theoretical lens.

As a theoretical lens that will guide the research, the Resource-Based View (RBV) is adopted. RBV is a well-established theoretical perspective that is used to understand how competitive advantage is attained by enterprises using their resources effectively (Barney et al. 2011). Using RBV as the underpinning theoretical perspective, this study examines the role of BA as one of the technological resources that can enable the development of competitive advantage for SMEs. According to RBV, enterprises can achieve competitive advantage from their resources if the resources have attributes which fulfil specific criteria, referred to with the acronym VRIN (Valuable, Rare, In-imitable and Non-Substitutable). Thus, more research is required to extend the existing understanding of the operationalization of BA resources by SMEs.

From the perspective of RBV, resources are conceptualised as a combination of capabilities and assets, so BA resources can be understood as a combination of BA capabilities and BA assets (Wade and Hulland 2004). Hence, to explore the mechanism by which SMEs gain potential competitive advantage through BA capabilities and BA assets, this study presents a preliminary conceptual framework. This framework will pave the way for data collection from SMEs as future work in order to obtain in-depth perspectives on how they use BA assets and BA capabilities. This research aims to address the following research question: How do BA capabilities and BA assets play a role in enabling competitive advantages for SMEs?

The structure of this research-in-progress paper is as follows: the next section (section 2) provides a description of BA as a resource of enterprises including a definition of BA assets and capabilities; section 3 elaborates the notion of competitive advantages of SMEs; section 4 presents the proposed research framework; and section 5 concludes by outlining future work including the data to be collected as part of the study.

## 2 Business Analytics

Business analytics (BA) has emerged as an essential area of study for both practitioners and researchers in the last decade and has been used as a broader concept to encompass related terms, such as Business Intelligence (BI) or Business Intelligence and Analytics (BI&A) (Chen et al. 2012). It is generally defined as “a set of systems, techniques and technologies which analyse data to support an enterprise to better understand its business and market” (Chen et al. 2012 pg.1166).

By employing BA as a resource, an enterprise has an opportunity to generate information useful for the enterprise, in an adequate form and in a timely manner (Bose 2009). Projects which take into consideration the use of BA resources are organised around questions to which data may provide the answers and which can enable SMEs to gain an advantage over competitors. This differs from traditional projects which are organised around defined tasks, plans and outcomes. While the conventional IT project approach focuses on goals such as improving efficiency, reducing costs and increasing productivity with defined tasks and plans, a project involving on BA resources changes the way enterprises think and use data for operational and strategic decisions; it relies less on managers' assumptions and biases (Krishnamoorthi and Mathew 2018). Unlike traditional approaches (e.g. defined tasks and plans), a BA resource approach involves creating a decision-making strategy and seeking unique insights which enable the enterprise to serve stakeholders better than what competitors are able to do (Krishnamoorthi and Mathew 2018; Marchand and Peppard 2013). SMEs often have limitations associated with their greater dependency on individuals (generally the owners) for making key decisions, and the management style in SMEs differs from larger enterprises (Coyte et al. 2012; Man et al. 2002). Therefore, an investment in BA resources can change the way SMEs make decisions and can replace the managers' assumptions and biases with hard evidence based on data, which will make an important difference in their decision-making. Hence, SMEs need to understand the affordances of BA resources, the key components of BA resources and the differences which can be made by using BA assets and BA capabilities in gaining competitive advantage.

The characteristics of SMEs entail that their BA resources are often different to and more limited than those of large enterprises. Therefore, this study explores to what extent SMEs can apply BA assets and capabilities in a way similar to large enterprises and what BA assets and BA capabilities are available to them. The following section provides some background on the notion of competitive advantages of SMEs from the RBV perspective.

### 3 Competitive Advantage of SMEs

The concept of competitive advantage has been emphasized, directly or indirectly, in many studies. The seminal work of Porter and Millar (1985) is the starting point for most discussions on the concept of competitive advantage, based on a transformation of the value chain. Following Porter and Millar's (1985) work, Barney (1991) approached the debate on competitive advantage by focusing on a firm's strategic resources and argued that an enterprise gains competitive advantages "*when it is implementing a value-creating strategy not simultaneously being implemented by any current or potential competitors when these other firms are unable to duplicate benefits of this strategy*" (Barney 1991, pg. 102). Adding a time dimension, the author also refined the term 'sustainable competitive advantages' to mean long-time as opposed to temporary competitive advantage (Barney 1991).

As pointed out before, the characteristics of SMEs, e.g. regarding flexibility, management and entrepreneurship (Buckley and Chatterjee 2012; Guarda et al. 2013), often differ significantly from those of large enterprises. While these characteristics can potentially help SMEs to gain competitive advantage, they can also create issues if not utilised effectively. For example, according to English and Hoffman (2018), when SMEs have data in a precise form meeting the requirement of users, they can strategically process data with their BA resources to enable competitive advantages. However, SMEs have limited capacity to convert data into a form that fulfil the requirements. Another challenge to enabling competitive advantage of SMEs is the lack of transparency and knowledge about BA resource usage in the SMEs' market (English and Hoffman 2018). SMEs with little or no experience of using BA may face a challenge in understanding which BA resources are most suitable and how they can use their BA resources to enable competitive advantage (English and Hoffman 2018).

Different competitive advantage theories, such as Porter's five forces (Porter 1980), the Resource-Based View (RBV) and the Dynamic Capabilities theory (Eisenhardt and Martin 2000), shed light on different aspects to enabling competitive advantage for enterprises including SMEs. RBV emphasises how enterprises create temporary as well as sustainable competitive advantages from strategic resources that have specific attributes, namely validity, rarity, in-imitability and non-substitutability (Barney 1991). On the other hand, the dynamic capabilities theory focuses on the problem of competitive survival in response to changing environment and business conditions (Barney et al. 2011). Further, the root of dynamic capabilities theory lies in the RBV theory (Olszak 2014). Given that the aim of this research is to have a richer understanding of SMEs' competitive advantage gained from BA, RBV as a theory is well suited to the research's objectives. Therefore, it uses RBV as a theoretical perspective. Using this theoretical perspective, this research develops a preliminary conceptual framework that will be used to conceptualise how SMEs can gain competitive advantages from BA resources (i.e. BA assets and BA capabilities). The next section presents the preliminary conceptual framework that has been developed

by this study and will be used to obtain a better understanding of the role of BA capabilities and BA assets in gaining competitive advantages for SMEs.

## 4 Proposed research framework

The purpose of the RBV theory is to provide a framework for determining the strategic resources a firm can exploit to achieve (sustainable) competitive advantages. By employing the perspective of the RBV theory, SMEs can evaluate the level of their competitive advantage and determine if they are likely to be temporary only or more sustainable. To evaluate the level of competitive advantage, the beforementioned critical attributes of resources must be considered: (1) Value, (2) Rarity, (3) In-imitability and (4) Non-Substitutability (VRIN) (Barney 1991).

Barney (1991) argued that first, to enable competitive advantages, resources need to be rare (e.g. not broadly available) and valuable (e.g. contribute to efficiency and effectiveness). Second, to further enable *sustainable* competitive advantage, resources which are rare and valuable also need to be in-imitable (e.g. cannot be copied by rivals) and non-substitutable (e.g. cannot be countered by rivals with a substitute). These four criteria are enough to ensure sustainable competitive advantage can be achieved from the strategic resources of enterprises (Barney 1991; Wade and Hulland 2004).

Researchers define each VRIN criterion in different ways. For example, Wade and Hulland (2004) define the *value* criterion in terms of the value a resource has within the changing business environment and its capacity to track changes in the business environment. Cosic et al. (2015) and Barney (1991) define it in terms of value-creating strategy, which is implemented differently from its competitors. On the other hand, the *rarity* criterion for Barney (1991) refers to a resource which is not simultaneously being implemented by competitors. In contrast, Wade and Hulland (2004) refer to a rare resource which is not broadly available.

In terms of BA resources, Davenport and Harris (2007) state that several key factors help to fulfil the *value* criterion of BA resources, and these include data quality, enterprise-wide integration, leadership, well-chosen targets and people with analytical skills. Further, Krishnamoorthi and Mathew (2018) argue that BA resources in enterprises include complex BA capabilities and a unique BA infrastructure. Therefore, they argue that BA resources are usually *rare* because competitors cannot easily copy the BA resources due to complexity of BA capabilities.

Although BA resources have become more accessible over the last decade (Krishnamoorthi and Mathew 2018), which makes them more imitable, some BA resources, such as data management skills and data analytics skills, are likely to be more difficult to imitate. The reason behind this difficulty is that BA capabilities are uniquely developed for each enterprise (Koelbl et al. 2018; Krishnamoorthi and Mathew 2018; Wade and Hulland 2004). Although enterprises are likely to be able to develop analytics skills and analytics development capabilities through the hiring of relevant expertise or consultancies (Wade and Hulland 2004), not all the BA capabilities which enterprises need are readily available in this way (Arendt 2008; Wade and Hulland 2004). In-imitability is one of the necessary conditions for a resource to be suitable as a source of a sustainable competitive advantage as opposed to just a temporary one.

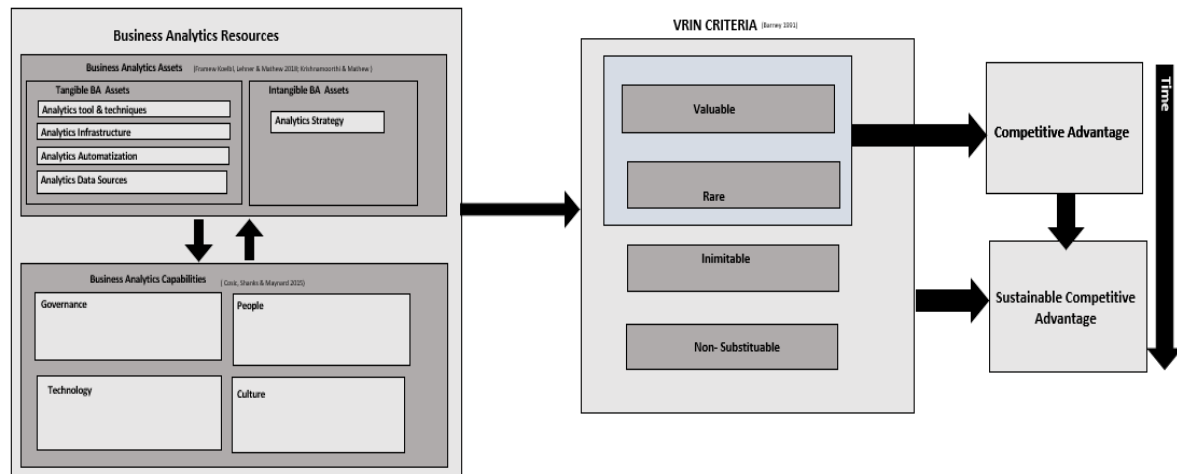
The last criterion that is vital in achieving a sustainable competitive advantage is *non-substitutability*. Non-substitutability refers to resources or capabilities that cannot be countered by a rival with a substitute (Cosic et al. 2015). It is also defined in terms of whether an existing equivalent resource is available to enterprises (Wade and Hulland 2004). For instance, BA assets may be substituted for with a strategic alternative, but when BA assets capabilities are used with BA capabilities developed by an SME, it can lead to competitive advantage.

Generally, these four criteria (VRIN) are used to evaluate the level (i.e., temporary or sustainable) of competitive advantage of an enterprise (Barney 1991). Although existing research from various area demonstrates how these four criteria are operationalised in enabling competitive advantages (Madhani 2010), there are gaps in the context of BA like enabling competitive advantage from BA capabilities (Krishnamoorthi and Mathew 2018) and how SMEs can enable competitive advantages from BA (English and Hoffman 2018). To fill this gap, this study develops a preliminary conceptual framework, which brings the BA capabilities, BA assets, BA resources and competitive advantages together and shows their relationship (see Figure 1). During the development of the preliminary conceptual framework, it adopts the VRIN criteria as a guide to evaluating the level of competitive advantage (see Figure 1). As a result, it proposes to evaluate BA capabilities and BA assets by using the VRIN criteria to understand the role of BA resources in SMEs gaining competitive advantage.

In the preliminary conceptual framework, this study categorises BA assets into tangible BA assets (i.e. BA tools, BA infrastructure) and intangible BA assets (i.e. BA strategy), by adopting the BA assets categorisation developed by Koelbl et al. (2018) (see Figure 1). Similarly, it categories BA capabilities (as skills needed to utilise BA assets in order to perform a specific task related to BA ) into four levels: governance, culture, technology and people (see Figure 1) by adopting the BA capabilities categorisation developed by Cosic et al. (2015).

Building on the proposed preliminary conceptual framework shown in Figure 1, this study will explore the role of BA in gaining competitive advantage by SMEs who have adopted BA resources and consequently will identify the BA assets and BA capabilities that have been useful in gaining competitive advantages for SMEs. With this preliminary conceptual framework, it aims to address the research question by evaluating the role of each of the following components, i.e. BA assets, BA capabilities and VRIN criteria. Moreover, the study will be exploring the points listed below in order to gain a better understanding of how SMEs obtain competitive advantage from BA resources relative to large enterprises:

- Differences in the extent of BA capabilities usage between SMEs and large enterprises
- Differences in the way SMEs use BA assets to enable competitive advantage compared to large enterprises
- Differences in the operationalisation of the criteria in evaluating the level of competitive advantage in SMEs



*Figure 1: Conceptual framework for the role of BA in enabling competitive advantages (Barney 1991; Cosic et al. 2015; Koelbl et al. 2018; Krishnamoorthi and Mathew 2018; Wade and Hulland 2004)*

This study argues that SMEs can enable competitive advantages from their BA resources. It is hypothesised that tangible BA assets may not be much different from those which other competitors or even large enterprises have access to, so they can be easily copied and therefore, may not help to enable competitive advantage. However, intangible BA assets and BA capabilities may provide unique infrastructures and competencies that facilitate SMEs' creation of competitive advantage.

## 5 Concluding remarks and future direction

In this research-in-progress paper, we focused on the role BA resources can play for SMEs in obtaining competitive advantages. This study will investigate the BA capabilities and BA assets that cause differences in creating competitive advantage when comparing SMEs with large enterprises. A preliminary conceptual framework has been developed to explore the role of BA assets and BA capabilities in enabling SMEs' competitive advantage. The research aims to get a better understanding of the criteria used by SMEs in evaluating BA assets and BA capabilities to create competitive advantage by using the RBV as a theoretical underpinning. The RBV perspective has been used as basis to develop the preliminary conceptual framework.

This exploratory study will take an interpretive research approach to explore how SMEs have achieved (or not achieved) competitive advantage from their BA resources (i.e. BA assets and BA capabilities) and how SMEs operationalise the criteria used for the evaluation of BA resources with respect to their potential as a source of competitive advantage. It will use a multiple case study method consisting of 7 cases and 20 interviews to gather data from different SMEs which have adopted BA from different industries. It will provide a rich understanding by conducting interviews with SME managers and explore the natural use of BA resources. The interview method is selected as the primary data collection method because interviews are critical data sources for gathering information about an individual's experience and capturing individual's stories about specific issues or problems (Hesse-Biber 2011). Documents (e.g. annual reports, activity report) will also be used as secondary sources of data for this case study research to increase the quality of the case study and provide data triangulation. Since this study uses the interpretive approach, data collection and data analysis will be conducted simultaneously. In qualitative case studies, a multi-stepped approach is advisable as qualitative case studies require careful empirical thinking (Yin 2017). Therefore, this study will use thematic analysis which includes six steps. Thematic analysis is one of the most common methods of identifying, analysing and reporting themes from data (Clarke and Braun 2013). It can be used for theoretical model building or finding solutions to real-world problems (Jones et al. 2013), and it is an appropriate approach to analysing different types of data (e.g. interviews and documentations). Since the data of this study will be collected from interviews and documents, there will be a large data set consisting of interviews and secondary documentation. Therefore, it will be necessary to sort and edit collected data. To ensure a rigorous approach to the data analysis, the thematic analysis will be carried out using Nvivo software to have precise textual data organised into codes and themes. These code and themes will map to components of preliminary conceptual framework and research question to produce a research report. As a result, this research will contribute to theory with developing a refined conceptual framework for SMEs' competitive advantage gained from BA resources by using the RBV theory, informed by the data. In addition, it will contribute to practice by providing a rich understanding for SME managers of how to gain competitive advantage from the use of BA resources.

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