

# Antecedents of Business Intelligence Implementation for Addressing Organizational Agility in Small Business Context

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## **Abstract**

*Research on business intelligence (BI) has been rapidly proliferated in the field of information systems (IS). However, a limited number of studies has discovered its practical value and impact in business sectors. A lack of research on BI implementation specifically within small businesses may have an adverse impact on the effective decision making, especially to meet the demand of their organizational agility.*

*The aim of this study is to conduct a theoretical analysis to identify antecedents of BI implementation in the small business context for improving the decision-making capability towards organizational agility. We operate a literature survey within the IS research domain to reveal the insights about the relation between BI and organizational agility. In this regard, 75 key articles have been reviewed and analyzed to find contributions towards BI and its impact on organizational agility. It is anticipated that the important antecedents are organizational, technological and personnel capabilities for BI implementation. The findings provide valuable insights for further research on BI implementation, especially to address organizational agility in small businesses.*

**Keywords:** environmental changes, organizational agility, information management, business intelligence, factors of BI implementation

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## Introduction

Industry practitioners and researchers have created enormous demand of employing business intelligence (BI) systems to improve decision making. Many studies have reported the increasing use of BI systems in cost savings, increasing revenue, and maximising return on investments for businesses (Watson & Wixom, 2007; Jourdan et al., 2008). Although BI research is one of the growing trends in information systems (IS) research such as BI application development (Cheng et al., 2009), technical capacity development of BI (Sahay & Ranjan, 2008), impact of BI (Williams & Williams, 2010), and success factors of BI implementation (Yeoh & Popovič, 2016), new relationship development for representing BI's practical impact has been yet to be explored. A lack of research on BI implementation specifically within the small business sector represents a major concern, bearing serious negative impact for effective business decision making, when it is important to consider changing situations of business. It is, therefore, essential for exploratory investigation, determining or "identifying critical knowledge gaps" in particular of finding insights/factors (Webster & Watson, 2002), and for the advancement of research within the specific area. Recent research shows importance of finding insights on specific area of research using exploratory research methodologies (Piccoli & Ives, 2005) and then proposes an agenda for conducting further research (Brocke & Sinnl, 2011; Mithas et al., 2011). This implies the importance of conducting exploratory investigation to reveal useful insights on BI implementation in small business context for sustainable business decision making.

Our study aims to examine relevant studies addressing various capabilities related to BI implementations and their impacts. From these existing bodies of knowledge we then analyse selected studies to find the relationships defined previously to BI implementation. From the relationships we

finally proposed a BI implementation framework. We reviewed 75 IS papers and analysed 56 of them, which are mostly related to the issue raised in this study (e.g. Jansen et al., 2005; Oyelaran-Oyeyinka & Lal, 2006; Garbie, 2011; Roldan et al., 2014; Shirokova et al., 2014; Harraf et al., 2015). Over the past years several studies (e.g. Gangadharan & Swami, 2004; Dodson et al., 2008; Richards et al., 2011; Chen & Siau, 2012; Guarda et al., 2013; Bijker & Hart, 2013; Mathrani, 2014) have been explored on BI implementation. However they only focus on BI adoption, benefits, adaptability and flexibility, decision making process, solution and the use for business development. IS researchers are yet to be investigating required antecedents of BI implementation, particularly in achieving organizational agility. It is also suggested that BI research bears significance if it "*can help raise the awareness of opportunities and threats in marketplaces, then motivations of responding follows*" (Chen & Siau, 2012, p.5), which leads to achieve organizational agility (Harraf et al., 2015). Motivating from this, we attempt to identify antecedents related to BI implementation in achieving organizational agility.

While information and communications technology (ICT) impacts are vital for society and business community, businesses generate various information demand due to rapid industrial revolution, globalization, and rapid changes from growing competitive market (Al-ma, 2013). Competitive environment influences new inclusions in relevant technologies, while factors such as market competition, business policy and global partnership are interconnected (Roldan et al., 2014). These dynamisms offer diverse opportunities for small businesses such as technological flexibility, low cost networking, high labor cost reduction, and rapid communication. Although small businesses respond to opportunities in some instances, they seem incapable and may face difficulties for meeting all challenges, relevant to these opportunities (Guarda et al., 2013). Due to

the lack of infrastructure and skilled users, and poorly handling process of technology, small businesses face the threats of information security which impede business growing performance (Keller et al., 2005). Uncertain changes may impact business closure of small businesses (Coleman et al., 2010; Irijayanti & Azis, 2012). Thus, unanticipated changes create both opportunities and threats for businesses (Stodder, 2013). Taking opportunities and encountering threats become a challenge for business survival and development (Bajgoric, 2000; Guarda et al., 2013). However, unpacking knowledge black-box becomes important (Jansen et al., 2005; Naudé, 2010) in relation to make sense and quickly respond to those changes, which refer to organizational agility (Cepeda et al., 2012; Chen et al., 2014).

BI has widely been recognised in helping business organizations in analysing the effects of business environmental behaviour (Shollo & Kautz, 2010; Singh & Singh, 2013). Rapid and often uncertain changes and environmental volatility (e.g. market deregulation, market competition, new emergent in technology, and business dynamisms) in the business environment (Cavalcante et al., 2011) create diverse opportunities for business decision makers for their information exploration. For example, the task for information exploration and producing decision support is important for meeting the demand of the rapidly changing need and also for gaining competitive advantages. This matter has recently brought the attention of both IS researchers and practitioners (Jansen et al., 2005; Chen et al., 2012; Al-ma, 2013). It is particular significant for small businesses (Guarda et al., 2013) as they have limited capacity and resources in terms of information management (Antlova, 2009; Ponelis & Britz, 2011). In this regard, achieving organizational agility (e.g. ability of sensing and quick responding to changes) in small business becomes a key business imperative (Tallon, 2008; Harraf et al., 2015).

Thus, the organizational agility became one of the goals of business organisations to study about unanticipated environmental changes (Tallon, 2008). Organizational agility is characterised with flexibility and adaptability (Chen & Siau, 2012).

As managing information with appropriate level of adequacy, accuracy and timeliness generates knowledge acquisition (Brinkhues et al., 2014) about the changing phenomenon, information management appears flexibility in businesses. Further, high quality decision helps to restructure the business ability and order for change adaptation in businesses (Stodder, 2013; Guarda et al., 2013) that appears adaptability. Therefore, information management and the decision making are considered as key necessities for organizational agility in businesses. From the view of corporate performance management (Richards et al., 2011), BI conducts information management and produces effective decision support for businesses (Chen & Siau, 2012; Guarda et al., 2013). IS literature suggests that BI implementation is the reliable enabler of flexibility and adaptability for businesses (e.g. Burton et al., 2006; Chen & Siau, 2012; Chen et al., 2014). So while considering to sense and respond upon the changes which refer to organizational agility, strategy for implementing BI should be carefully developed to ensure the organizational agility. Implementation refers to the integration of physical presence of something and its actual usage in practice (Surry & Ely, 2002). Pishdad & Haider (2013) argue that implementation of something is an ongoing process. As organizational agility is an ongoing process (Harraf et al., 2015), the studies on BI implementation have been of interested key research area, that may directly link to achieve organizational agility followed by required antecedents met in small businesses in regards to conduct unanticipated changes.

The antecedents are based and defined as situations or events that occurred previously, in our cases, our attempt goes to find out

antecedents as previously defined information systems capabilities (such as information management capability). Like to Mithas et al. (2011), in which theoretical antecedents as “the IT capabilities related to performance” were identified, we aim to identify the theoretical antecedents of BI implementation that may contribute to a structured framework to represent complexity for small business.

The paper is structured as follows. The next section includes a background detail of the existing BI studies for organizational agility, the role of BI implementation in achieving agility, and antecedents of BI implementation. The section after that describes the adopted methodology for conducting the study. The next section presents findings in terms of important relationship schema based on our theoretical analysis. Finally, the discussion and conclusion section presents a summary, contributions, and limitations of the study followed by outlining possible future research efforts.

## Study Background

### ***BI and Organizational Agility***

Business intelligence (BI) is defined as “*the process of integration of data from disparate internal and external data sources, applying analysis tools and techniques to understand the information within the data, making decisions, and taking actions based on this gained insight*” (Gangadharan & Swami, 2004, p.139). BI uses certain technology for the flexibility of information organization and transformation into the decision making process (Sherehiy et al., 2007; Chen & Siau, 2012). Further, BI provides decision support aids for organizations to determine the adaptation of those changes in businesses (Pourshahid et al., 2011). BI is logically found as the source of flexibility and adaptability which characterises organizational agility (Chen & Siau, 2012; Singh & Singh, 2013). Based on the result

from the discussion above, BI has been acknowledged as an enabler of organizational agility (Sangari & Razmi, 2015). Therefore, the study attempts to review literature on how BI addresses organizational agility in businesses.

Organizational agility is the combination of core competencies to comprehend the effects of diverse changes in business performance, to differentiate competitive needs, and to take the decision and to gain competitive advantages (Harraf et al., 2015). As changing environments have significant impacts on business performance order, achieving organizational agility takes place in retaining growing performance (Roldan et al., 2014). In this regard, scanning the environmental changes (Blome et al., 2013) and responding to those changes become important for the business success (Harraf et al., 2015). Sensing and quickly responding to those changes are key activities of organizational agility (Deep et al., 2008). IS accumulates diverse stakeholders; market competition; new inclusion in the market; and newness in the business policy in a large network (Nepelski & De Prato, 2015). Effectiveness of sensing this IS-led effect has the positive impact on responding effectively to those changes (Harraf et al., 2015). However, organizational agility integrates required technology, technological personnel and the system of information organization (Garbie, 2011), which deliver flexibility of conducting changes. It also integrates the decision making, which delivers adaptability of determining action to adjust businesses beyond those changes (Boso et al., 2013). Investigating how IS impacts require flexibility and adaptability for achieving organizational agility becomes a concern.

BI is an ‘IS-led’ application (Williams & Williams, 2010) of disseminating, assimilating, and exploiting information into the decision making application, which lead to the adaptation of changes (Gangadharan & Swami, 2004). In the context of organizational agility, BI has two positive impacts such as (1) information

management creates flexibility of conducting the competitive environment and (2) the decision making process creates adaptability in terms of change adaptation. In this regard, BI considers data quality, authenticity, consistency and relevancy for creating value of analysed outcomes (Mathrani, 2014). In relation to the decision making process, BI aids in data mining; analysing; synthesising, making the decision, and predicting future views for conducting unanticipated changes (Citroen, 2011; Guarda et al., 2013). For the decision making, BI exploits processed information

into the meaningful form and provides determination of change adaptation in businesses (Popovic et al., 2012; Guarda et al., 2013). Indeed, BI creates the accuracy and adequacy of information and the reliability of the decision making and timeliness of responding to environmental changes (Zhi & Guixian, 2010), which lead to the organizational agility. Thus, the implementation of BI becomes a fundamental topic of study in terms of achieving organizational agility. Table 1 represents existing example research on BI implementation.

<b>Table 1 - Literature related to BI impacts on organizational agility</b>		
<b>Issues/Keywords</b>	<b>Key Findings</b>	<b>Authors</b>
• Business environmental changes	<ul style="list-style-type: none"> <li>• Changes for businesses in competitive environment</li> <li>• Competitive influences in turning the business directions</li> <li>• Adversative climate for affecting business performance</li> <li>• Technological advancement for business changes</li> </ul>	Datta (2011), Kahn & Kotchen (2010), Nepelski & De Prato (2015).
• Understanding the need of agility	<ul style="list-style-type: none"> <li>• Agility in surviving business operations</li> <li>• Flexibility and adaptability for effective business operations</li> </ul>	Kharabe (2012), Chen & Siau (2012).
• Information management	<ul style="list-style-type: none"> <li>• Information organization for agility</li> <li>• BI contributing for big scattered data.</li> <li>• BI as corporate tool for impacting on corporate decision</li> </ul>	Ponelis & Britz (2011), Citroen (2011), Popovic et al. (2012).
• BI as conduit of sensing business environmental changes	<ul style="list-style-type: none"> <li>• BI for addressing automation of data transformation</li> <li>• BI for operating corporate roles in business environment</li> <li>• BI for working on successful decision making</li> </ul>	Zhi & Guixian (2010), Richards et al. (2011), Chen et al. (2012), Guillemette et al. (2014), Yeoh & Popović (2016).
• How BI success	<ul style="list-style-type: none"> <li>• Business performance for improved information management and organizational capability</li> </ul>	Mithas et al. (2011), Brinkhues et al. (2014).
• Required capabilities	<ul style="list-style-type: none"> <li>• Organizational capability to sense environmental changes</li> <li>• Technologies for channelling flexibility to sense changes</li> </ul>	Jansen et al. (2005), Chuang & Schechter (2015), Chakravarty et al. (2013).
• Small business as study context	<ul style="list-style-type: none"> <li>• Effects of environmental changes in small business</li> <li>• Increasing rate of business closure and survival</li> <li>• Lack of capability as barrier for rapid communication and new innovation</li> <li>• replacing of obsolete framework for enhancing technological collaboration in businesses</li> </ul>	Zainun Tuanmat & Smith (2011), Coleman et al. (2010), Vrgovic et al. (2012), Haug et al. (2011).

## **The Role of BI Implementation**

One of the key roles of BI system is to determine the business performance measurement, differentiate business problems, integrate information, forecast the business future, and plan relevant to the desired performance (Singh & Singh, 2013). In this regard, new and complex information emerging from diverse changes open a new challenge for organizations (Gangadharan & Swami, 2004). However, intelligible organization and process of information is vital for comprehending and conducting those changes (Guarda et al., 2013). The use of BI has been amplified due to the information management and the decision making process (as stated earlier) that guide organizations to conduct the business environment (Citroen, 2011; Guarda et al., 2013, Miah, 2014). Rodionov & Tsvetkova (2015) define information management integrates three levels of IS applications for three kinds of impact:

- Information infrastructure (technology) - for easing information supply chain management;
- Information organization - for generating information usability; and
- Information administration - for addressing usable information into the desired application (e.g. decision making).

If information organization originates knowledge (Gangadharan & Swami, 2004) about what has happened; what is happening, and what could happen (Stodder, 2013), information administration can be referred to as the process of knowledge exploitation to make the decision. As BI takes the major part of information system which enables organizations to understand customer needs through processing and transmitting required information (Martinsons, 1994), BI became a conductor of information management. BI also leads to the decision making process using given information which guides organizations to gain their desired

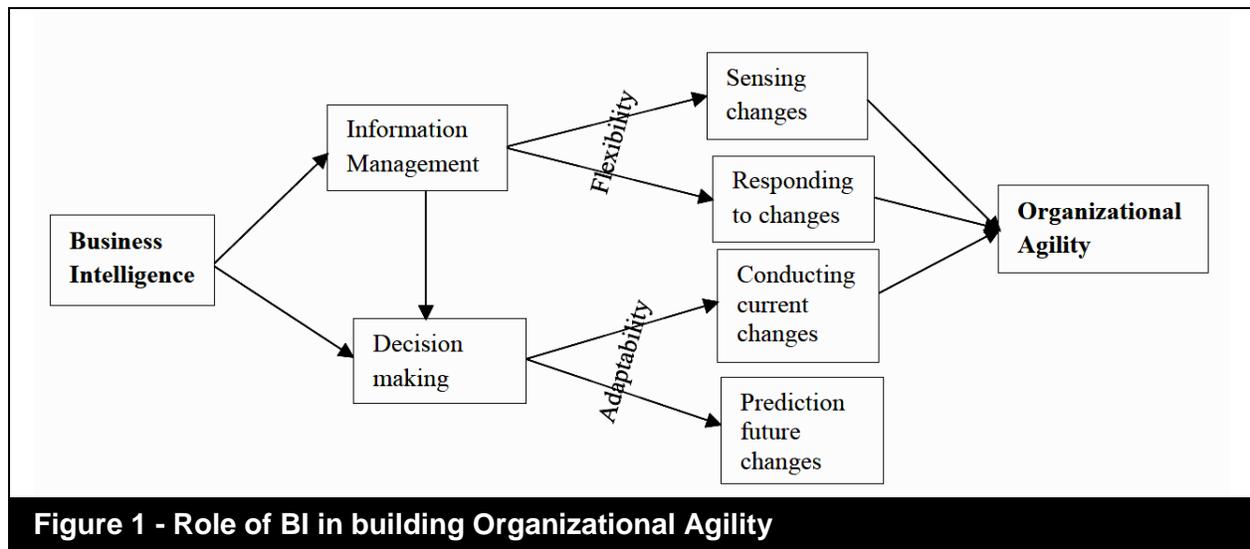
performance (Burton et al., 2006; Watson, 2009). As BI conducts both information management and the decision making process are antecedents of organizational agility, it can be considered as the corporate performance management (Richards et al., 2011).

The decision making creates the business value followed by customer cooperation, changing environment adaptation, and responding to the competitive necessities (Pourshahid et al., 2011). Furthermore, the decision making provides the cost deduction, flexibility of logistics, new technology adoption, business operation regulation (Harraf et al., 2015). However, the quality decision making depends on the quality information (Ponelis & Britz, 2011; Citroen, 2011). BI integrates both historical and current data, synthesises them, produces a message and exploits it into the decision making application (Burton et al., 2006). As BI produces the accuracy and authenticity of information as the vital resource of the decision-making, organizations consider BI as the reliable aid of making the decision. From the aspect of organizational agility, BI processes current information for predicting possible future changes. In terms of future prediction, BI has been recognised as early warning system (Trinh et al., 2012).

In the context of corporate performance management, BI conducts a relationship between information management and the decision making. According to Isik et al. (2013), the process of conducting information and its related issues and the decision making are closely related antecedents of organizational agility. BI does not only conduct the information management in terms of quality information, but also uses that valued information in the decision making. In this regard, BI leads to the comparison analysis between historical and current data emerges a message organizations use to analyse the business environment (Singh & Singh, 2013) and provides decision makers that inimitable message for making the decision and predicting future environment of businesses

(Trinh et al., 2012). The prediction becomes an early warning system (e.g. ESs) which enables organizations be ready for conducting future uncertain changes (Trinh et al., 2012). Indeed, information management and the decision making are measures of flexibility and adaptability respectively which characterise

organizational agility. Therefore, BI is identified as a conduit of achieving organizational agility in businesses. How BI as a corporate performance leads to both information management and the decision making, which are antecedents of organizational agility, is shown in the figure 1 below.



**Figure 1 - Role of BI in building Organizational Agility**

As shown in figure 1, BI is found as the best conductor of both information management and decision-support. Although BI is the aid of the decision making process, quality information is the evident for quality decision. Therefore, arrow pointed from information management to the decision making illustrate relationships between them. As stated earlier that information management produces flexibility organizations require to execute sensing and responding activities and the decision making produces the adaptability to conduct current changes and predict possible future changes, which lead to achieve organizational agility in businesses. As BI appears the leading factor of information management and the decision making, which turn into achieving organizational agility in businesses, BI implementation becomes business imperative for enabling organizational agility. However, what antecedents make BI implementation

particularly in small business remain a concern.

### ***Small Business as A Context of BI Implementation***

The participation of small business in the world economic development has been recognized since 1940s (Ionita, 2013). Growing contributions of small businesses in diverse instances (e.g. job creation, social responsibility, environmental performance, and revenue increase) (Sin Tan et al., 2010; Cavalcante et al., 2011) demand attention for more studies on issues related to small business performance (Nkwe, 2012). However, constant changes in the business environment (business dynamism, new emergent in technology, and climate changes) cause change in the business goal setting that requires reviewing the business decision (Karanasios, 2011; Cavalcante et al., 2011; Guarda et al., 2013), which affect business to discontinue

business performance order (Zainun Tuanmat & Smith, 2011). Their disordered performance provides them into the big challenge of business survival (Coleman et al., 2010; Guarda et al., 2013). Even, uncertain changes may cause business exclusion (Irjayanti & Azis, 2012). Although BI implementation has been recognized for achieving organizational agility (Chen & Siau, 2012) that may stop business exclusion, the study remains a concern about the capability of small businesses. For example, small business is characterized with limited capacity in terms of IS driven application (Antlova, 2009; Ponelis & Britz, 2011; Vrgovic et al., 2012). Therefore, research becomes on demand to explore what antecedents can be appropriate for BI implementation in small businesses, which entailed this study. It is important to note that research on BI in small business context is not new field (e.g. Grabova et al., 2010; Ponelis & Britz, 2011; Guarda et al., 2013; Ponis & Christou, 2013). But, research on antecedents of BI implementation particularly for addressing organizational agility in small business is still sparse.

## **Research Methodology**

Because BI research is typically published in many IS journals, our search goes to the leading IS journals as the source of literature. Our study began with reviewing literature in relation to identify how organizations can achieve agility in businesses. Our focus is on the topic area of BI implementation and its link to organizational agility. Considering the issue, the study reviewed literature fragmented into four phases; such as for the finding on how environmental changes necessitate organizational agility, relation between BI and organizational agility, the role of BI, and antecedents to be proposed for BI

implementation. A list of impactful journals in which BI research were published, were searched to find BI implementation (such as MIS Quarterly, CAIS, Information Systems Management, Journal of Applied Business Research, International Journal of Trade, Economics and Finance, Journal of Information Systems and Technology Management, Information & Management, Information Systems Frontiers, IIMB Management Review, International Journal of Production Research, JAIS, Information System Research, Information Systems Journal, Decision Support Systems, Journal of management information systems). From those journals, a number of key studies was reviewed (e.g. Burton et al., 2006; Shollo & Kautz, 2010; Grabova et al., 2010; Ponelis & Britz, 2011; Chen et al., 2012; Popovic et al., 2012; Mavengere, 2013; Demirkan & Delen, 2013; Guarda et al., 2013). Table 2 highlights BI related articles (for providing an example details) with source journals.

We conducted several searches using an array of keywords (such as “business environmental changes”, “organizational agility”, “business intelligence”, “BI” and “business”, “BI and technological collaboration”, “decision making” and “small businesses” and many other relevant words) from the year 2004 to 2016 and throughout the searching; we found 75 articles. After screening them, we selected 56 articles for our analysis which seemed relevant for the analysis that we conducted. After the abstracts were reviewed, we come up with only 41 articles that provided complete research on BI implementation within an organisational context. Also the selected articles provided adequate understanding in relation to BI adoption and organisational agility and other relevant issues which were the anticipated aspects of the study. Based on insights of reviewed articles, we processed to establish the framework related to BI implementation.

**Table 2 - Sample details and their source journals**

Journals	Relations of BI	Articles
<ul style="list-style-type: none"> <li>Communications of the Association for Information Systems.</li> <li>Information Systems Management.</li> </ul>	BI implementation.	Negash (2004) Jourdan et al. (2008)
<ul style="list-style-type: none"> <li>Journal of applied business research.</li> <li>The International Journal of Logistics Management.</li> </ul>	BI impacts on organizational agility.	Harraf et al. (2015) Sangari & Razmi (2015)
<ul style="list-style-type: none"> <li>ACM SIGMOD record</li> <li>International Journal of Trade, Economics and Finance</li> </ul>	BI in small businesses.	Grabova et al. (2010) Guarda et al. (2013)
<ul style="list-style-type: none"> <li>MIS Quarterly</li> <li>Journal of Information Systems and Technology Management</li> </ul>	BI for information management.	Chen et al. (2012) Affeldt & Junior (2013)
<ul style="list-style-type: none"> <li>Decision Support Systems</li> <li>Information &amp; Management</li> </ul>	BI for decision making.	Popovic et al. (2012) Isik et al. (2013)
<ul style="list-style-type: none"> <li>Water resources management</li> <li>Information Systems Frontiers</li> </ul>	BI to adaptation and prediction.	Giupponi (2014) Fang et al. (2015)
<ul style="list-style-type: none"> <li>Communications of the Association for Information Systems,</li> <li>IIMB Management Review.</li> <li>Twentieth Americas Conference on Information Systems</li> </ul>	IS offers flexibility	Trinh et al. (2012) Seethamraju & Sundar (2013) Brinkhues et al. (2014)
<ul style="list-style-type: none"> <li>International Journal of Production Research</li> <li>TDWI Research</li> </ul>	Organizational agility	Blome et al. (2013) Seethamraju & Sundar (2013) Stodder (2013) Trinh et al. (2012)

**First Stage:** we reviewed the literature related to the effects of business environmental changes on business performance (e.g. Datta, 2011; Darnall et al., 2008; Kahn & Kotchen, 2010; Nepelski & De Prato, 2015). The literature argues that constantly changing environment becomes the issue for small business' survival. The analysis of literature suggests achieving organizational agility in businesses to improve business potency.

**Second Stage:** To find a concept of and effects of organizational agility, we reviewed literature related to the organisational agility. The concepts of McCann et al. (2009), Trinh et al. (2012), Kharabe (2012), Chen & Siau (2012), and Stodder (2013) helped to find a method for identifying definition of

organizational agility and its unanticipated change factors.

**Third Stage:** In this stage, we reviewed literature related to applying BI implementation to achieve organizational agility, such as Negash (2004), Grabova et al. (2010), Shollo & Kautz (2010), Richards et al. (2011), Poneis & Britz (2011), Isik et al. (2013), Bijker & Hart (2013), and Chen et al. (2014). These studies highlighted the importance, performance, impact, and role of BI in affecting business performance.

**Fourth Stage:** Finally, we reviewed literature to find antecedents of BI implementation. Although the solution about antecedents of BI implementation has not much studied, Mithas et al. (2011), Chen et

al. (2012), Seethamraju & Sundar (2013), Zain et al. (2014), and Brinkhues et al. (2014) have focused on the importance of studying BI antecedents. The following section explains findings that are generated from the literature.

## **Findings - Antecedents of BI Implementation**

The major advantage of this study is to identify the underlying relationships among antecedents in relation to BI implementation for addressing organizational agility. Information management and the decision making have been recognized for flexibility and adaptability respectively, which characterizes organizational agility. Although BI facilitates in conducting information management and the decision making process, the decision making depends on appropriate information management as indicated previously. Thus, information management seems the vital issue for BI implementation. Indeed, further literature review identified that information management based antecedents of BI implementation may create an impact for effective information management for improving businesses performance. The components of information management are information management technology, information organization, and information administration.

Although readiness of BI-based technology meets information infrastructure based demand in organizations (Piccoli & Ives, 2005; Chakravarty et al., 2013), how it does impact on knowledge creation that is also become a concern. According to Piccoli & Ives (2005), technology cannot be a complete solution for knowledge generation. As a result, it is obvious that BI technology necessitates personnel skills for organising and administering information turns into knowledge generation, which is considered for decision support (Fink & Neumann, 2007). Thus, technology and personnel skills are recognised as the two necessities

for conducting the process of information management. However, considering limited capability of small businesses, these two necessities become important for them. As it is common for small businesses that they suffer from adequate resource allocation (Haug et al., 2011; Vrgovic et al., 2012), which may constrain to afford these identified necessities, the study proposes appropriate capability of small businesses. A number of studies propose diverse factors, which would enhance the firm's capability in terms of information management presented in table 3.

As shown in table 3, information management has been focussed as the key issue for decision support (Chai et al., 2013; Kruke & Olsen, 2012). Therefore, factors related to information management become concern. Technological capability, skilled personnel and organizational capability are proposed as factors of information management, which leads to BI implementation in businesses. Manager's clear vision about the need of BI performance (Richards et al., 2011) necessitates IS-driven influences (Piccoli & Ives, 2005; Commander et al., 2011), that leads to BI implementation success (Burton et al., 2006). From the view of IS-driven influences, the study has identified two necessities such as technology and personnel skills. As limited capability of small business is the major barrier to offer the necessities, enhancing technological and personnel capabilities are suggested for business decision support (Fink & Neumann, 2007; Jevtic et al., 2013; Isik et al., 2013; Sook-Ling et al., 2015). Technological capability comforts information access, information organization, transmission and knowledge creation (Chakravarty et al., 2013; Isik et al., 2013; Chen et al., 2014; Sook-Ling et al., 2015). On the other hand, personnel capability helps to create the usability of given information using relevant IT technology (Burton et al., 2006; Nieto & Santamarla, 2010; Van Der Boor et al., 2014). Thus, it does imply that personnel capability and technology affect each other,

which impacts organizational capability development (Isik et al., 2013). As stated earlier that information management integrates technology and personnel skills (Piccoli & Ives, 2005). Thus, technological and personnel capabilities are logically considered to facilitate information management in small businesses. Brinkhues et al. (2014) cited from Rumelt (1991) that information management depends on firm's organizational capability.

Bijker & Hart (2013) noted that IS-driven performance depends on organizational context in relation to BI implementation as organizational capability integrates IS-based capability. Further, Isik et al. (2013) argued that BI implementation depends on organizational capability. In summary, we can argue that organizational capability is one of the leading antecedents, which have linked to technological, and personnel capabilities and BI implementation.

<b>Table 3 - Identified factors for information management</b>		
<b>Factors</b>	<b>Effects</b>	<b>References</b>
• Factors of decision support	• Knowledge creation and accumulation • Information management provides the source of knowledge for decision support.	Chai et al. (2013), Kruke & Olsen (2012).
• Factors of IS capability.	• Technology and personnel capabilities lead to IS driven performance of small business.	Bo & Qiuyan (2012), Kannabiran & Dharmalingam (2012)
• IT-dependent strategic initiative	• Initiative of achieving competitive advantages associated with IS-driven efficiency.	Piccoli & Ives (2005) Commander et al. (2011)
• Personnel capability	• Relevant skill enhances personnel capability in conducting business, technology and data analysis and assess BI success.	Burton et al. (2006), Nieto & Santamarla (2010), Van Der Boor et al. (2014)
• IT and personnel capability	• IT infrastructure has significant impact on user's skill development and vice versa.	Fink & Neumann (2007), Jevtic et al., (2013)
• Technological capabilities	• Adequacy and accuracy of technological capability provide organizations quality information, transamination, user access and knowledge generation are necessary for BI success.	Isik et al. (2013), Chen et al. (2014), Sook-Ling et al. (2015)
• Organizational capability.	• As conducting IS depends on organizational strength, enhancing organizational capability should be on priority.	Bijker & Hart (2013), Brinkhues et al. (2014)
• Organizational capability of small business for IS capability.	• As small business is incapable in enhancing IS based capability, enhancing organizational capability appears to be business imperative.	Matthews (2007), Low et al. (2011),
• Factors related to organizational capability.	• Internal and external factors (resources, environmental support, and intrinsic capability) enhance organizational capability in small business.	Apulu et al. (2011), Manuere et al. (2012), Apulu (2012), Azam & Quaddus (2012).

The above discussion represents organizational capability as the leading factor of information management in small businesses (Matthews, 2007; Low et al., 2011). As information management requires combined effects of technological and personnel capabilities, organizational capability should integrate technological and personnel capabilities. Finally, organizational capability appears the main antecedent of BI implementation to address organizational agility (Bo & Qiuyan, 2012; Bijker & Hart, 2013; Brinkhues et al., 2014). Although our findings suggest organizational capability for BI implementation, it is important to consider factors related to organizational capability. Different studies proposed different factors from different angles. After a number of studies (e.g. Apulu et al., 2011; Manuere et al., 2012; Azam & Quaddus, 2012) are analysed considering small business

context, our findings suggest firm's physical resources, environmental facilities, and organization's intrinsic strength. With regards to the view of physical resources, Isik et al. (2013) defines organisational capability includes tangible and intangible resources (e.g. computer, handheld device, internet. Sin Tan et al. (2010) identified environmental facilities such as financial environment, IS-based environment, cost efficiency, balancing between cost and return and networking among business partners. The intrinsic strength is one of the key influencers of organizational capability that integrates experiences, stability, and relevant attributes which must be rare, inimitable, and non-substitutable to be sold and transferable to others (Barney, 1991). The following figure 2 represents how antecedents and elements are related to BI implementation.

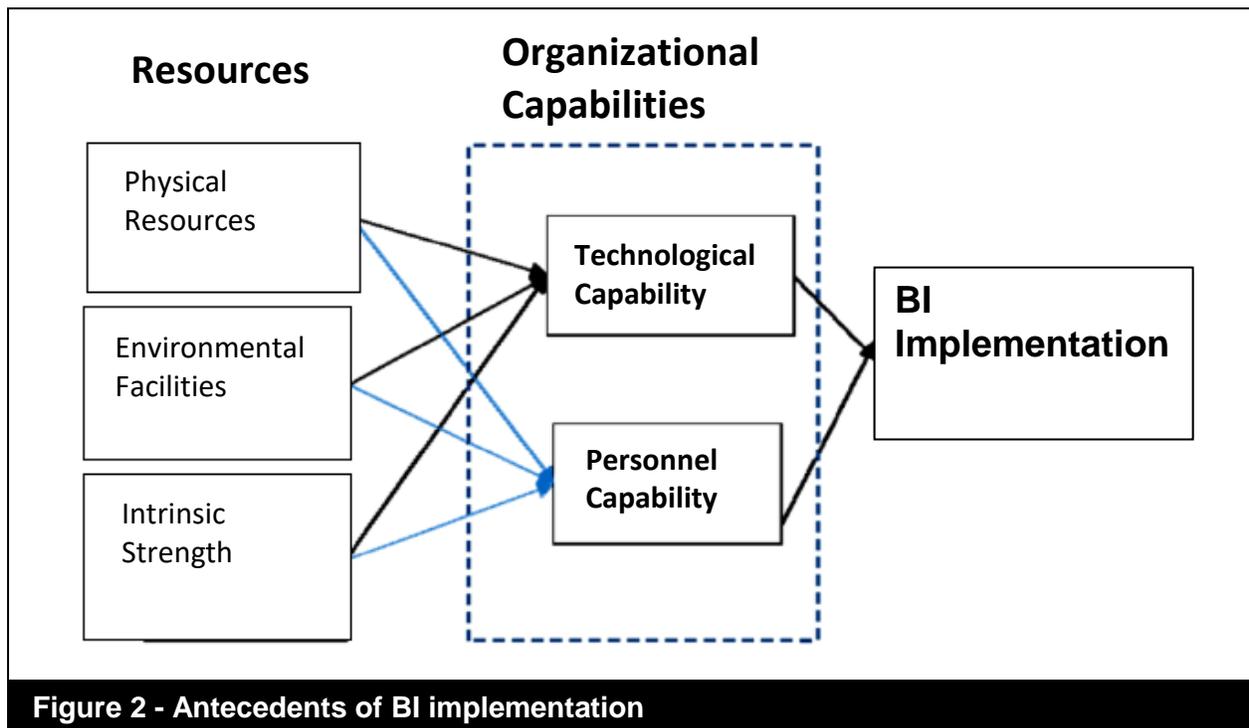


Figure 2 represents all suggested antecedents of BI implementation as it has been recognized for achieving organizational agility in small business.

Although technological and personnel capabilities are proposed as the vital antecedents of BI implementation, organizational capability integrates both

marked by bracket. Organizational capability has logically been recognized as the key antecedent of BI implementation in small business. It is noted that technology and skilled personnel can affect each other, which strengthen organization's inner capability. As physical resources, environmental facilities, and intrinsic strength are defined as factors of considering organizational capability, these factors have significant influences on BI implementation. Although studies on factors of BI implementation were identified in previous IS research (e.g. Yeoh & Koronios, 2010; Ramakrishnan et al., 2012; Bijker & Hart, 2013; Yeoh & Popovič, 2016), the aspect of organizational agility in small business was not covered in those studies. Finally, physical resources, environmental facilities, and firm's intrinsic strength as variables for leading to organizational capability, which has been recognized as a key antecedent of BI implementation to address organizational agility particularly in small business become a new contribution into IS research area.

## **Discussion and Conclusions**

The aim of this study was to identify antecedents of BI Implementation following through the resource-based theory so that business organisation can achieve their agility. The need of agility was evolved from the issue of business environmental changes, which may affect business performance. Ongoing changes and new emergent situations may cause an array of changes (due to customer's interest, market demands, competitive pressures, instability in pricing, and supply chain integrations). These emergent changing situations hold opportunities and threats for businesses. Taking those opportunities and encountering threats become business imperative in terms of sustainable business operations. In this regard, comprehending the impact of changes and taking proactive decision to adapt those changes is

important. From this point of view, organizational agility should be characterised with flexibility and adaptability, as we identified the link using existing literature. Information management creates flexibility and the decision-making provides adaptability, were identified antecedents for small business to achieve organizational agility.

The literature reviewed from the aspect of organizational agility highlighted the need of adequate backing of IS. BI implementation, as a significant part of IS, has been proposed to enhance the agility in businesses. Subsequently, "BI implementation to achieve such agility" becomes the key issue of searching more literature. Although BI becomes one of the useful solution to adapt environmental changes, what factor can make BI implementation was not much known in previous studies. Our study attempted to find all possible factors of BI implementation in achieving organizational agility in businesses.

In summary, BI has logically been acknowledged as an enabler of achieving organizational agility in small business through the identified antecedents. For BI implementation, organizational capability appears the dominant factor as it leads to information management capability (technological capability and skilled personnel capability). As small businesses are organizationally weaker to lead to the information management capability, enhancing technological and personnel capabilities is proposed led by enhancing organizational capability of businesses. Finally, these three proposed interrelated capabilities have been identified as antecedents of BI implementation in achieving organizational agility in small businesses. Although organizational capability becomes the source of technological and personnel capabilities, organizational capability comprised with three elements (resources, intrinsic strengths and environmental facilities) are identified from previous studies. The

findings provide valuable insights for further research on BI implementation especially to address organizational agility in small businesses.

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