How to get the most from a business intelligence application during the post implementation phase? Deep structure transformation at a UK retail bank[1]

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Abstract

This paper focuses on the process of maximizing the benefits from a business intelligence (BI) application during the post implementation phase. A theoretical framework is formulated based on previous research into organizational deep structure and inertia within a punctuated equilibrium model of organizational change. It indicates that the organization's ability to extract strategic BI benefits is influenced by the organization's deep structure (core beliefs, organizational structures, control systems and distribution of power) and also processes that embed the BI into an organization as a whole. As the deep structure generates inertia, these processes should be designed by carefully considering and aiming to overcome factors that cause inertia in respect to information from BI applications. Ensuring dynamic interaction between the BI and the deep structure, with appropriate feedback mechanisms, enables organizations to actively manage these inertia factors and supports the extraction of long-term BI benefits. Our framework is applied to a case study of a UK retail bank which used an existing customer profitability BI application to transform its marketing strategy. Generally applicable insights into enhancing the delivery of informative long-term BI decision support for organizations operating in moderate to fast changing environments are presented.

Key words: business intelligence, BI benefits, organizational transformation, organizational inertia, case study in retail banking

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Introduction

The role of business intelligence (BI) applications has become of strategic importance for many businesses as executives use these technologies to address business priorities; this has led to a growing demand for BI applications (Gartner Research, 2012, and Negash, 2004). The BI support includes the meaningful integration and aggregation of vast amounts of organizational (and in some cases external) data originating from various sources and the multidimensional analysis of these data (Olszak and Ziemba, 2007). The BI output represents actionable information which is delivered in an easy-to-use form to the right location and at the right time to inform managerial decisions at various organizational levels (Negash, 2004). The BI usually include or are linked to specialized data bases (e.g., data warehouses) and use specialized IT infrastructure such as data query, analytical and reporting tools (Elbashir et al., 2008). Key organizational benefits of BI, which are the main focus of this study, include but are not limited to better management decisions, improvement of business processes and support for the accomplishment of strategic business objectives (Watson, 2009).

Despite the growing importance of BI for the business community, factors that determine BI benefits have received limited attention (Jourdan et al., 2008). Existing BI studies focus mainly on implementation success (e.g., Arnott, 2008, and Yeoh and Koronios, 2009). Factors that contribute to the realized monetary value are examined in Williams and Williams (2003) and Williams and Williams (2004). Studies of monetary BI value however may not be able to capture many key organizational benefits such as support for the accomplishment of strategic business objectives and also better management decision-making which can be of strategic importance to the organization's long-term success (Lönnqvist and Pirttimäki, 2006, Schieder and Glushowski, 2011, and Watson, 2009). Elbashir et al. (2008), Lönnqvist and Pirttimäki (2006) and Gibson et al. (2004) among others focus on the measurement of BI benefits. Elbashir et al. (2008), for example, rectifies the shortcomings of the monetary value based methods by proposing a comprehensive measure of the realized BI benefits within a process-oriented framework. There has been little or no work however that directly investigates factors determining the long-term BI benefits.

It is important to specifically consider the long-term BI exploitation as the strategic decision making that BI supports is long-term in nature and its benefits may not be fully realized over a short-term post-implementation period. More importantly, short-term BI benefits are assessed under current business conditions which are unlikely to have changed greatly since the BI implementation. In contrast, the BI benefits in the long run are influenced by uncertainty and a changing business environment (Moreton, 1995). The BI benefits therefore are likely to be determined by the organization and BI's joint ability to adapt to an evolving environment (e.g., Sabherwal et al., 2001),

which in turn critically depends on the organization's ability to overcome inertia (e.g., Romanelli and Tushman, 1994, and Rumelt, 1995).

The conditional nature of the BI benefits is further pointed out by Lönnqvist and Pirttimäki (2006). These benefits can only be realized when the BI generated information is integrated into management decisions and the outcome of this process is conditional not only on the technical aspects but also on an appropriate integration of the BI into an organization as a whole. While the technical aspects of BI implementation have received great attention, the inter-dependence of BI benefits and broader organizational factors has not been well understood (Alter, 2004, and Silva and Hirschheim, 2007). This very limited understanding has been also evidenced in the inability of many banks and other organizations to exploit BI and other decision support applications to their full potential (e.g., Ćurko et al., 2007, and Finlay and Forghani, 1998).

The very limited understanding of (a) the links between the organization as a whole and the BI benefits and (b) the organizational factors that support the sustainable delivery of BI benefits motivates the need for theorizing in these areas that will improve our understanding and motivate further research. Our study makes an initial step towards addressing this gap. We use the constructs of the organization's deep structure and organizational inertia within the punctuated equilibrium model of organizational change to formulate a theoretical framework that emphasizes the mechanisms that support the organization's ability to maximize BI benefits during the long-term BI use. Our study integrates the literature from the organizational change, alignment and BI success areas and offers some new insights into the effects of organizational inertia and also processes that enable an appropriate alignment for extracting long-term strategic BI benefits. The relevant theoretical concepts are introduced in our theoretical framework section.

We propose that the organization deep structure (core beliefs, organizational structures, control systems and distribution of power) and also the processes that embed the BI into an organization as a whole are both important for the organization's ability to extract the expected BI benefits during the long-term BI exploitation. Even if the BI is successfully implemented, multidimensional organizational inertia that the deep structure generates, if not appropriately managed, may prevent the BI from delivering its expected benefits in a long run. Hence, in addition to recognizing the important role of the deep structure, organizations should design processes that link the BI and the deep structure by carefully considering the effects of multidimensional organizational inertia and aiming to manage inertia sources in respect to information from the BI. From a practical process development perspective, these processes should support a dynamic interaction, with the appropriate feedback mechanisms, (as opposed to a static link) between the BI and the organizations' deep structure. Such

interaction enables an inbuilt BI-based capability to detect and respond to the change in the business environment and helps to achieve timely external and internal (re-) alignment. This is because these processes support not only the appropriate BI adjustment to the evolving deep structure but also that the deep structure evolves in response to the BI generated signals of change either in the internal or external environment. Our framework is primarily developed for organizations that operate in moderate to fast changing business environments such as financial services and high-tech sectors. It is of particular interest to organizations that possess a good quality adaptive BI application which permits the extraction of better information and the delivery of more effective decision support.

We apply our framework to a case study involving a BI implementation at National Australia Group Europe (NAGE), a retail financial services organization trading in the UK as Clydesdale Bank and Yorkshire Bank (CYB). Despite the important new capabilities that this BI application introduced and its overall perceived implementation success, after two years in operation CYB managers felt that this application was not fully meeting their expectations. In this case study we use our theoretical framework to investigate this failure and confirm that it is the interaction of the organization's deep structure with the BI (and not the BI factors or technical factors alone) that determines long-term BI success. We find that even when the BI is aligned with the organization at implementation and receives senior management support (e.g., Finlay and Forghani (1998), Poon and Wagner (2001) and Sabherwal et al., 2001), various dimensions of organizational inertia can prevent a robust BI application from meeting key management expectations. Similarly to Silva and Hirschheim (2007) we find that the links of the BI with the organization's deep structure play an important role. Also, processes supporting a dynamic interaction between the BI and the overall organizational deep structure help in overcoming organizational inertia and in maintaining an organizational alignment with the environment. Based on our analysis we offer a number of practically applicable insights that are generalizable to other BI applications and other organizations.

The remainder of the paper is set out as follows. The next section outlines the relevant academic literature from the areas of BI success, the organizational deep structure and inertia and introduces our formal theoretical framework. The background and the motivation for our case study are presented next, followed by the details of our research methodology, discussion of the customer profitability BI application and formulation of the problem. The analysis section which includes the discussion of insights and generalizations of our case study follows. Finally, our conclusions are offered.

Theoretical framework

This section begins by summarizing the previous studies of BI success factors and the insights they provide. The interdependencies between the BI and its organizational context are established next

using the constructs of the deep structure and organizational inertia within the punctuated equilibrium model of organizational change. Finally, we analyze the interrelations between the deep structure and the BI and also the effects of organizational inertia and develop a number of theoretical propositions in relation to organizational ability to extract BI benefits during post-implementation use.

BI success literature

Few studies directly examine the factors determining the success or failure of BI applications. We therefore also draw on studies of predecessors of modern BI applications such as personal decision support systems, executive information systems and, to some extent, data warehousing. Many common success factors are supported across a number of studies which mainly focus on implementation (as opposed to long-term) success. The importance of the *system quality* and *data quality* factors that form the basis of the DeLone and McLean IS success model (DeLone and McLean, 1992 and 2003, and Petter et al., 2008) is evidenced in Finlay and Forghani (1998), Wixom and Watson (2001) and Yeoh and Koronios (2010) among others. The contribution to the implementation success of *(senior) management support* and *highly-skilled users* is also widely acknowledged (e.g., Poon and Wagner, 2001, and Sanders and Courtney, 1985). Furthermore, the *alignment of the IS development with the business objectives* is widely accepted as a key success factor (e.g., Finlay and Forghani, 1998, and Weir et al., 2003). Wixom and Watson (2001) also find that the *implementation success* and *user involvement* contribute to the perceived post-implementation success. Arnott (2008) highlights that the *adaptive*, *evolutionary development* of the BI project towards the effective application set is essential and this is supported by studies of other decision support applications (e.g., Poon and Wagner, 2001, and Salmeron and Herrero, 2005). The system *adaptability* and *decision making benefits* are among the factors that ensure *the organizational commitment* to the IS (Finlay and Forghani, 1998). Schieder and Gluchowski (2011) also emphasize the importance of *organizational maturity* which primarily deals with the development level of organizational structures and processes in the BI context that enables the BI integration into a wider organizational context and also contributes to organization's *capability to strategically apply the BI* to address its business priorities (Watson and Wixom, 2010).

A number of lessons can be drawn from the prior research with many of these factors remaining relevant during the post-implementation period. The expected benefits from the BI can only be achieved, for example, if the top and middle management remain committed to its use and also deploy the BI-generated information strategically. As the business environment and the business needs change over time (Boeker, 1997, and Ghemawat, 1991), the quantity and quality of the analytical data produced by the BI needs to be re-aligned with changing business objectives and the organization as a

whole to be able to deliver decision-making benefits (Sabherwal et al., 2001). The BI re-alignment will be influenced by the organizational maturity and it will require the BI application to remain adaptive. An organization will also need to possess an adequate set of skills to implement the BI adjustment and to exploit the evolved BI application. Similarly to the situation during BI implementation, the appropriate user involvement is also likely to be important during the BI re-alignment (Berg, 2001, and Wixom and Watson, 2001).

Deep structure and organizational inertia

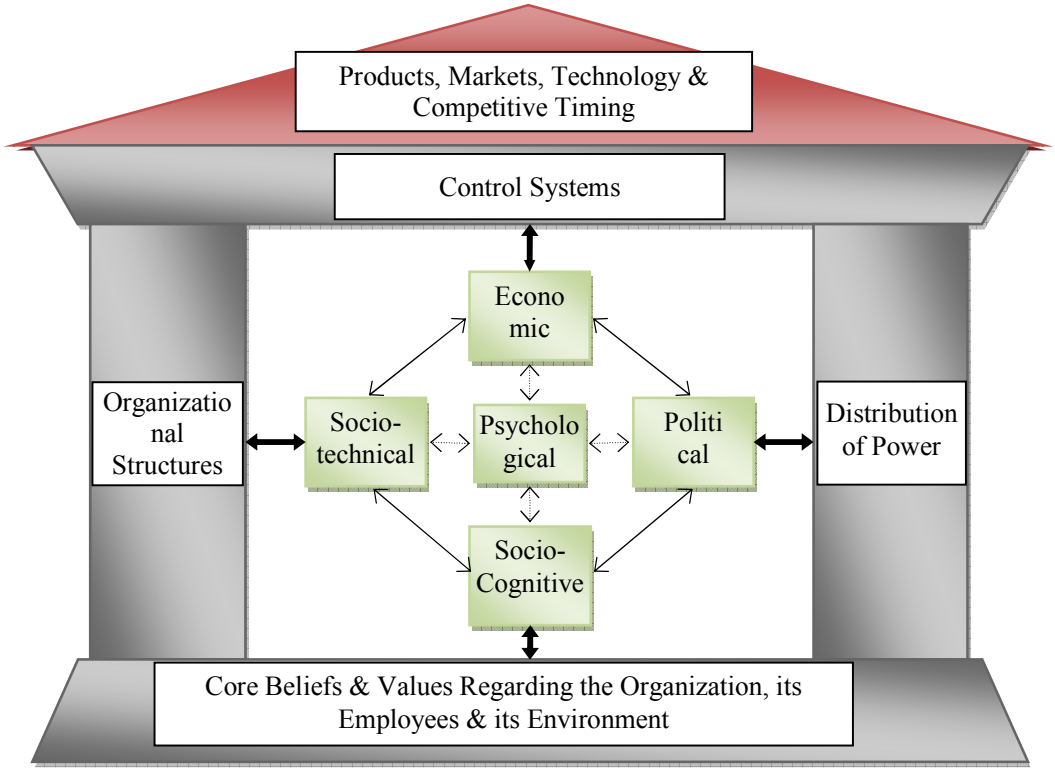
Focusing on the BI success factors alone might be necessary but not sufficient to ensure that the organization obtains the expected benefits from a BI application in the long-run; a broader contextual set of factors and its interaction with the BI also should be taken into account (e.g., Alter, 2004, and Silva and Hirschheim, 2007).

Punctuated equilibrium and deep structure For our theoretical development we need an appropriate model of organizational change. A punctuated equilibrium model of organizational transformation (e.g., Gersick, 1991, and Tushman and Romanelli, 1985) provides a valuable perspective on the links between decision support type applications and the organization's overall deep structure (Besson and Rowe, 2012, Sabherwal et al., 2001, and Silva and Hirschheim, 2007). In this model, an organization evolves via pro-longed periods of relative stability (convergence) which are "punctured" by short-term "revolutionary" organizational transformations (upheavals). As the BI post-implementation exploitation can be associated with either small evolutionary changes or a radical BI-enabled organizational transformation, a punctuated equilibrium model is better suited for the purposes of our study than alternative, e.g., Darwinian models of gradual evolution (e.g., Hannan and Freeman, 1984 and Plowman et al., 2007). Change can be either slow and incremental during periods of relative stability when the deep structure remains largely unchanged or fast and radical during "revolutionary" transformations which lead to breaks and fundamental changes in the deep structure (Gersick, 1991, Tushman et al., 1986, and Tushman and Romanelli, 1985). Furthermore, in this model an organization is considered as a "sociopolitical arena" (Silva and Hirschheim, 2007, p.332). The related concept of deep structure therefore potentially provides a very useful conceptual construct for studying the links between the innovative IS developments and the organization's social dynamics (Sabherwal et al., 2001, and Silva and Hirschheim, 2007). Building on the work of Gerswick (1991), Romanelli and Tushman (1994, p.1144) describe the organization's deep structure as "a system of interrelated organizational parts that is maintained by mutual dependencies among the parts" through regular organizational activity patterns. This concept consists of five facets: (1) *core beliefs and values* regarding the organization, its employees and its environment, (2) *products, markets, technology and*

competitive timing, (3) *the distribution of power*, (4) the organisation's *structure* and (5) the organisation's *control systems* (Tushman and Romanelli, 1985, p.176).

Organizational inertia As the facets of the deep structure originate from a set of fundamental choices made by an organization, together they form a highly stable structure. This stability is reinforced by the mutually dependent choices that the system supports and also by the ability of this system to reinforce itself as a whole through multiple shared feedback mechanisms (Gersick, 1991). The consequential organizational inertia, which arises as a natural derivative from routinizing organizational processes that become rigid once the organization becomes established (Besson and Rowe, 2012), does not permit any alternatives to be generated outside of the existing deep structure and the related processes (Gersick, 1991).

Figure 1 The deep structure and organizational inertia; inertia dimensions are in light green.* The deep structure representation is adopted from Silva and Hirschheim (2007, p.332)



* Links between the organizational inertia and the facets of the deep structure are indicated with thick arrows. Thin (broken) arrows link the interrelated inertia dimensions at the group and organizational (individual) levels.

The organizational transformation literature regards organizational inertia as a complex process that consists of five interrelated inertia dimensions: *psychological, socio-cognitive, socio-technical, economic* and *political* (e.g., Besson and Rowe, 2012, Hannan et al., 2002, and Tushman et al., 1986). While the first dimension tend to be an individual attribute, the latter four relate to inertia, or

"stickiness", at the group and organizational levels; Besson and Rowe (2012) give comprehensive summaries of these dimensions. The importance of inertia is concisely encapsulated in a quote by Moore, 2004, p.91: "For most executive teams, battling the inertia demon is the biggest challenge they face. Sad to say, the demon usually wins". We illustrate the role of inertia by building on the Silva and Hirschheim (2007) metaphorical representation of the deep structure as a classical house. We incorporate a multidimensional inertia construct into this representation in a form of a soft medium that supports the facets of the deep structure and enforces the stability of the entire structure (Figure 1). As in Silva and Hirschheim (2007), *core beliefs and values* form a foundation for the formal *organizational structure* and *distribution of power* which both in turn support the *control systems*. These four facets form a basis for *products, markets, technology and competitive timing*. Besson and Rowe (2012) emphasize the importance of examining the joint impact of all inertia dimensions which are interrelated in nature, this is evidenced in case studies of Abraham and Junglas (2011), Berg (2001) and Sarker and Lee (1999).

Organizational deep structure, inertia and BI success

This section investigates the links between the deep structure and the BI success factors and the effects of various dimensions of organizational inertia. We focus on the *core beliefs and values, distribution of power, organizational structure, and control systems* facets of the deep structure. The fifth facet, *products, markets, technology and competitive timing*, builds on the first four facets (Figure 1) so that changes in this facet need to be supported by modifications in the remaining four facets (Silva and Hirschheim, 2007).

Core beliefs and values The entrepreneurial attitudes towards technology of the top management, employees' general attitudes toward technology and the organization's capability to learn from competitors, which are all linked to a set of *core beliefs and values* of an organization, determine the organization's *capability to apply BI strategically* (Silva and Hirschheim, 2007, Mata et al., 1995, and Benjamin et al., 1984). A very extensive organizational transformation literature also underlines the central role of the organizational culture and ensuing socio-cognitive inertia (Besson and Rowe, 2012) which is formed around the *core beliefs and values* of an organization (e.g., Philip and McKeown, 2004, and Peters and Waterman, 1982). Moreover, a fundamental change in the organizational culture is often a pre-requisite of a successful organizational transformation (Philip and McKeown, 2004).

In addition, *socio-cognitive* and other sources of organizational inertia such as *negative psychology, political inertia, socio-technical inertia* that are all linked to the organization's core beliefs and values can jointly impair the delivery of expected BI benefits. For example, skepticism towards IS-driven organizational change, conservatism and distance from top management created major obstacles for

the strategic systems implementation project in Silva and Hirschheim (2007). In the same study, the failure of the IS-driven change was associated with resistance by long-term employees (despite the top management support) due to their perception that the new project team would be favored over them. The IS enabled organizational transformation can also be impeded by technocentric and monopolistic organizational cultures and also cultures that encourage "finger-pointing" and discourage co-operation among employees (Sarker and Lee, 1999). Abraham and Junglas (2011) and Mangan and Kelly (2009) further establish that IS driven development projects can be considerably delayed, incur large over-spending and eventually brought to a halt if the key stakeholders have inconsistencies and clashes in cultural norms and ideology; these sources of inertia are often hidden behind the technical issues and can be dangerously overlooked.

Distribution of power The extent of *the top and middle management' support* and their level of *commitment* both can be affected by their vested interests and political agenda. Hidden political agenda of the top management can have a particularly destructive effect on both the BI implementation and the BI-driven organizational development during the post-implementation phase due to the high time, financial and emotional costs of un-coordinated and ill-supported development efforts (e.g., Sarker and Lee, 1999). The vested values and interests of informal as opposed to formal leadership networks (e.g., Rumelt, 1994), can also cause deadlocks as these networks can influence both the top management decisions and the implementation of these decisions in practice. Some users, for example, may have a political agenda embedded in the new development: e.g., access to another department's information resources or detailed knowledge of their working patterns which may lead to conflicts and threaten the application use (e.g., Berg, 2001, and Bowers, 1995). As the BI has the ability to introduce radical changes to the organizational alignment, and hence, to the distribution of both resources and power (Sharma et al., 2008, and Zmud and Cox, 1979), its introduction may be perceived as a threat and met with resistance by some managers. Even if the BI project receives wide-spread support at the implementation stage, open or hidden opponents may emerge as sources of *political inertia* at a later stage if specific BI-driven strategic developments threaten their position of power (Rumelt, 1994).

Political inertia rooted in vested values and interests may lead to *economic inertia* as it often causes costly political deadlocks associated with wasted time, human and financial resources (Sarker and Lee, 1999, and Rumelt, 1994). These deadlocks may also cause insufficient resource allocation to either the BI exploitation or to the BI-driven developments if these developments meet opposition among some senior managers.

Organizational structures An adequate level of development in the organizational structures and processes, or *organizational maturity*, is a pre-requisite for the integration of BI outputs into management decision making and also for enabling an organization *to use the BI strategically to address its business priorities* (Schieder and Gluchowski, 2011, and Watson and Wixom, 2010). Also, failure to adjust outdated organizational structures to define the role of key highly skilled staff or to make provisions for their competitive compensation packages affects the *ability to hire and retain highly skilled staff* (Silva and Hirschheim, 2007).

Furthermore, the *alignment* with the organization requires an appropriate alignment not only between the business and IS objectives but also between the business and IS structures and processes (Sabherwal et al., 2001, and Cooper et al., 2000). This alignment is dynamic because strategic IS developments introduce the need for radical changes in the organizational structure, for example, by removing informational barriers between different divisions and encouraging a change in the focus of the structural configuration from the division of labor to the division of knowledge (Berg, 2001, Teo et al., 1997, and Lucas and Baroudi, 1994). Such developments also introduce a process of mutual transformation of both the organization and technology. This transformation cannot be planned or pre-specified and should be carefully managed, building on the existing techno-social fit (Berg, 2001). Cross-fertilization inputs from different stakeholders during the IT use add an impetus to continuous organizational learning and related adjustments in both the IT and business processes (Abraham and Junglas, 2011). Also, BI evolves in response to on-going improvements in business processes (e.g., the introduction of performance measures for business strategy) and changes in business needs (Watson, 2010). A failure to understand and appropriately manage the alignment between the organizational and IT structures and processes is often rooted in strong *socio-technical inertia* that along with other interrelated sources of organizational inertia impair both IT development and IT-driven organizational change (e.g., Berg, 2001, Lorenzi and Riley, 1995, and Sauer, 1993). The IT-enabled organizational transformation literature (Besson and Rowe, 2012) provides many examples of transformation failures that are linked to *socio-technical inertia* and other related inertia sources (e.g., Sarker and Lee, 1999).

Control systems are key to both successful BI project implementation and also the subsequent management of BI-driven organizational development projects as the project management skills are required to manage frictions and tensions between different stakeholders (Charalambos, 1999, and Silva and Hirschheim, 2007). This is important as conflicting views of the key stakeholders due to their political agendas or genuine differing beliefs about the nature of the problem or its possible solutions if not appropriately managed, may lead to costly political deadlocks (e.g., Rumelt, 1994, and

Mangan and Kelly, 2009). Furthermore, it is essential for an organization to be able to meaningfully interpret, analyze and integrate the BI information into decision making; this is supported by *control systems* that allow the organization to *hire, retain and train highly skilled staff* (e.g., Sanders and Courtney, 1985, and Wixom and Watson, 2001). The organization's IT skills are also important for supporting the BI evolvement over time and its recurrent alignment with changing business processes and business needs (Watson, 2009) whereas the organization's inability to procure these skills impairs both *IT functionality* and *usability* (Sarker and Lee, 1999). Organizational knowledge and *capability to apply IT strategically* are required to address the organization's business priorities using the BI (Schieder and Gluchowski, 2011, and Wixom and Watson, 2010). *Adequate user involvement* in the BI development contributes to the future system usability and also its match with organizational processes. (Berg, 2001, and Wixom and Watson, 2001). Furthermore, the BI-implementation or BI-enabled organizational change at a later stage, in turn, may introduce changes to the organizational control processes and coordination (e.g., Sharma et al., 2008).

The interrelation between the BI and the deep structure

This section concludes our theoretical analysis that leads to the development of our propositions.

The influence of the deep structure The strategic role of BI applications in improving management decision making and enabling an organization to address its business priorities implies close interrelations between the BI and the organization's deep structure. The BI implementation may lead to a radical change to the deep structure. First, for many organizations the BI is specifically introduced to enable an organizational transformation, for example, from a product or service oriented to a customer focused business model, as in cases of Harrah's Entertainment (Watson and Volonino, 2002) and Continental Airlines (Watson, 2009). The decision support type applications that enable either strategic or operational decision making both affect the deep structure as they often bring about changes in the work tasks and processes, the re-distribution of the resource allocation and introduce higher task interdependence between different organizational functions (Sharma and Yetton, 2003, and Silva and Hirschheim, 2007). The BI, in turn, evolves during the implementation process to achieve an appropriate alignment with the organization as a whole, including its specific business objectives, structures and processes (Sabherwal et al., 2001, and Moreton, 1995). The implementation success of a strategic type of IT application is also affected by the characteristics of the deep structure such as the organization's core values, distribution of power and control mechanisms (Silva and Hirschheim, 2007).

Given that many strategic decision making benefits from the BI can only be realized over a long-term horizon, the impact of the deep structure remains important during the BI post-implementation

use. As our previous analysis illustrates, relevant long-term BI success factors are directly influenced by the deep structure: core beliefs and values, structures, distribution of power and control systems.

Proposition 1 The organization's deep structure (its core beliefs and values, structures, distribution of power and control structures) influences the BI ability to deliver its expected long-term benefits.

Organizational processes The development and maintenance of the appropriate processes that incorporate the BI into an organization as a whole remain critically important during the long-term post-implementation BI use due to uncertainty and the changing business environment that an organization faces and to which it needs to adapt. As an increasing number of organizations operate in moderate to fast changing environments (due to frequent marketplace changes, shorter product cycle lives, more highly tailored products and services, changing social values and demographic patterns and evolving methods of business management), it is important for such organizations to develop an in-built capability to detect and respond to changing business environment (Moreton, 1995). The vast organizational transformation literature evidences that organizational inertia represents a key challenge in this process. Such BI-based capability faces the issue of overcoming organizational inertia that stems from the established organizational deep structure and it is enforced by the routine processes that embed the BI into the organization. Close organizational alignment with the BI, in particular, which is widely recognized as an important short-term success factor, leads to complacency and inertia over a longer term exploitation horizon as it narrows the organizational outlook and hampers the ability to detect and act on new opportunities (Sabherwal et al., 2001). This is because such alignment restricts the information discovery capability of the BI and in particular, its ability to capture information that does not conform to the current business model or falls outside of the established reporting structures. New developments in the environment and related changes in the internal data therefore can be easily overlooked, leading to inferior BI decision support.

Also, even if signals of internal or external misalignment are detected by the BI, a high degree of inertia in the deep structure may prevent such signals from being heard or acted upon and lead to adverse consequences that may even threaten the survival of the organization (Greenwood and Hinings, 1996). The task of overcoming organizational inertia is particularly challenging when an organization faces a revolutionary transformation and needs to re-configure its deep structure facets. (Tushman and Romanelli, 1985). Such transformations are fraught with difficulties and often result in failures that are linked to a joint impact of multiple sources of organizational inertia (e.g., Sarker and Lee, 1999, and Silva and Hirschheim, 2007). It is therefore essential to account for multidimensional organizational inertia when the links between the BI and the deep structure are developed.

Proposition 2 The development of organizational processes that embed the BI into the organization as a whole require a careful consideration of the effects of multiple sources of organizational inertia that the deep structure generates and aim at overcoming inertia in respect to information from the BI.

Practical process development From a practical process development perspective, processes that enable an appropriate dynamic interaction (as opposed to a static link) between the BI and the organization's deep structure can be used to manage the effects of organizational inertia in respect to information from the BI and support a dynamic (re-) alignment, both internal and external. First, this interaction process supports the dynamic alignment between the BI and the organization which is often a lengthy process and can be viewed as a "moving target" at which companies shoot with varying success (Thompson, 1967, p.234). This is because either the level of alignment is high and can only be achieved in multiple stages or the organization does not initially perceive low alignment as an issue (Sabherwal et al., 2001). Even if an adequate alignment has been achieved, the evolving nature of the environment implies that the BI will need to adjust over time in response to changing business model and business needs, and consequently related changes in the deep structure. Furthermore, a gradual and continuous BI-driven optimization in organizational processes and structures may be required over a long-term horizon as the organization's learning and capabilities build over time, driven by better understanding of information interdependencies and communication among different types of BI stakeholders; the BI implementation can be regarded as just a starting point in this process (Abraham and Junglas, 2011). Seddon et al. (2010), for example, establish that the on-going improvement in organizational processes contributes to long-term (but not short-term) organizational benefits from enterprise systems, which as BI have strategic objectives.

Second, as BI plays a key role in information discovery regarding changes in the environment, the establishment of an appropriate link which includes a feedback mechanism between the BI and the deep structure is important for (a) monitoring the robustness of assumptions (e.g., about customer behavior and customer expectations) underlying the organization's business model and its alignment with the environment and (b) timely signaling when these assumptions no longer reflect the reality. The BI capability to integrate and analyze vast amounts of organizational and in some cases external data enables such "reality checks". This process supports an organization's ability to "recognize and respond to the need for change" (Miller, 1996, p.510) and leads to the adjustments in the alignment over time. A company may be pushed to re-formulate its business strategy and re-align its deep structure if, for example, significant changes in customer behavior or customer expectations are detected (e.g., Tushman et al., 1986).

Proposition 3 A process of dynamic interaction between the BI and the organization's deep structure, with an appropriate feedback mechanism, (as opposed to a static link) supports a BI-based capability to detect and respond to the change in the business environment and a dynamic (re-) alignment, both external and internal.

Our propositions are deduced logically from prior research largely drawn from different domains of IT and organizational studies so it is appropriate to seek to verify it with data drawn directly from the situation with we are dealing (in this we are following the approach advocated by Whetten, 1989). Given the multiple forms of organizational inertia it is very challenging to empirically check every possible subset of these. Thus we initially use a single case study to illustrate that the proposed relationships can definitely be observed.

Methodology

Our theoretical framework which builds on the punctuated equilibrium model of organizational change is applied to the CYB case study to enable a systematic interpretation. CYB was chosen as it motivated our research and also provided access to rich data about both its profitability BI and its organizational environment that would not be accessible otherwise. This allowed the research questions to be comprehensively studied within the natural complex environment of a business organization where many significant factors and links can be observed and fully accounted for (Avison, 1993, p. 496). Our case study approach is therefore revelatory in nature. This approach is particularly well suited for the study of the BI links with the entire organizational deep structure as its methodology allows capturing the interaction between innovative IS developments such as BI and the organizational context (Darke et al., 1998, and Franz and Robey, 1984).

Background to the Case Study

CYB Background Clydesdale Bank and Yorkshire Bank are well-established regional retail banks which were founded in the 19th century in Glasgow, Scotland, and Halifax in the English county of Yorkshire, respectively. Both banks joined the National Australia Bank Group: Clydesdale Bank in 1987 and Yorkshire Bank in 1990. Since 2001, the two UK-based banks' head quarters and operations have been merged and the Yorkshire Bank has become a part of the Clydesdale Bank, although it has continued trading under its own name. Operations of the merged bank include personal banking, private banking and business banking. At September 2011, CYB had £44.9 billion in total assets, £23.3 billion in retail deposits and £33.0 billion in gross loans and acceptances, figures which are characteristic of a medium-size regional bank (National Australia Bank Group, 2011). In the same financial year, the bank reported an increase in underlying annual profits of 4% to £533 million which was viewed as a healthy result under the prevailing weak economic conditions.

Customer Base Business Strategy From the early years of the new millennium, one of the strategic business objectives of CYB was to maximize the value of its customer base. As the first stage of the strategy implementation, CYB initiated a successful customer base expansion campaign which attracted a large number of private (wealthy) customers. As the next stage, the CYB management were looking for new promising customer groups within their retail sector who were already highly profitable to the CYB or had a high propensity of becoming highly profitable in the future to serve as a strategic target for customer management and acquisition. This was expected to enhance the CYB customer base by retaining and acquiring customers with high customer value. To assist in achieving this business objective, in 2005 CYB launched a new customer profitability BI application which was expected to provide intelligence allowing the differentiation of CYB retail customers by their profitability to the bank, the identification of valuable customer groups and the provision of customer management leads. In this development, CYB adopted an approach similar to that of First American Corporation (FAC) and other companies that have moved from a traditional banking model to a customer relationship-oriented approach (Cooper et al., 2000). In contrast to the Cooper et al. (2000) study of FAC's organizational transformation, which was enabled by a new data warehouse, CYB developed its customer profitability BI using existing data warehousing provisions which were implemented as part of the merger of the two NAGE-owned UK banks' operations.

The motivation behind the case study Despite the widely accepted overall success of the new profitability BI application in delivering important new capabilities which are detailed in the next section, the CYB managers who owned the application felt that it was falling short of meeting some of their expectations. After over two years in full operation, the new valuable customer groups had not been identified so that the quest for the promising customer segments remained unsatisfied.

In 2008, one of the authors worked with CYB as a Knowledge Transfer Partnership (KTP) associate on developing a forecasting BI application which was expected to produce forward-looking measures of customer profitability, including customer life-time value metrics, and was complimentary to the existing customer profitability application. As part of a broader contribution of the KTP project, she was asked to investigate the existing customer profitability BI application with the aim of establishing if this application captured and revealed all the important trends in customer profitability which were present in the available data. The specific task was to interrogate the output profitability data along with the primary input data to identify valuable customer groups which were potentially not adequately captured in the existing BI outputs. At this point in time, the customer profitability BI application had been in full operation for over two years.

A thorough data interrogation exercise, based on the BI application, was performed largely outside of the existing customer segmentation system. The exercise allowed the data to lead the analysis. A large volume of business analytics was produced at both summary and more detailed levels and presented to the CYB management. Experienced CYB managers, the head of Customer Knowledge and the Customer Insight manager, immediately spotted unusual (in the light of their perception and understanding at the time) features in the behavioral characteristics of some key customer groups. This motivated the next step, which we refer to as the KTP initiative, which involved a more focused investigation into these customer groups. The results of this investigation revealed that both the routine BI reporting and also ad-hoc intelligence which was produced on demand by the CYB analysts failed to uncover (a) some highly valuable customer groups and also (b) recent unfavorable changes in their behavior. This failure motivated our research project and also informed our research questions.

Data collection

The first source of data for this study includes a series of semi-structured interviews that were conducted over a 6-months period in 2008, shortly after the participating author had begun her KTP Associate role with CYB. Sixteen CYB staff were interviewed and included both managers and specialists in all key stakeholder units, including the BI analysts within Customer Insight that owned the BI application, a larger Customer Knowledge team of which Customer Insight was a part and also product, marketing and communications teams that were either regular or on-demand users of the BI reporting and the database manager. The interviews lasted an hour, on average, and detailed notes were produced. The quotations cited in this paper therefore have been paraphrased from our notes. The questions of all interviews focused on the specifics of the BI use, BI benefits and also associated issues. In addition to the interview data, the participating author had access to internal BI-related documentation, including the BI project and technical documentation, internal memorandums with development propositions, memos of relevant meetings and BI based reporting and also attended regular internal meetings where various aspects of both day-to-day BI operation and related strategic developments were discussed, including one meeting with the representatives of the parent company. The relevant documentation, minutes and personal notes of these meetings and also of other organizational events and communications were collected throughout the duration of the KTP partnership in 2008 and 2009. Some documentation was classed as “confidential” and could not be stored; in such cases only brief personal notes that could provide relevant evidence but excluded confidential information were kept.

The findings of the preliminary stage of this research (the KTP initiative) were extensively discussed with the Customer Insight manager and the head of Customer Knowledge and subsequently

presented to the heads of Retail Marketing and Marketing and Communications and also the business partner overlooking this business area who provided the senior management level view. This study was conducted outside of the main KTP project which had a distinctive purpose and was a complimentary development to the existing customer profitability BI application. The work on the new application however facilitated the in-depth understanding of the data sources, information systems and the organizational environment which all provided background information for this study. Another important advantage of being part of the organization during the data collection and preliminary data analysis stages is that this gave practically unlimited access to the application itself and also to the key stakeholders, from Bank analysts operating the application to middle-level and senior managers who used the output intelligence in both the operational and management decision making processes. This allowed verifying our understanding and interpretation of the data during the preliminary data analysis stage.

The direct involvement of the first author with CYB points to her dual role as a practitioner and a researcher during her time at CYB which could potentially lead to undue influences on the research outcomes relating to the organizational politics and other factors leading to one-sided or biased views (Coghlan and Brannick, 2001, and Heiskanen et al., 2008). Her primary role, however, was that of a researcher and this corresponded with how she was perceived by the CYB staff due to the following factors which also limited the potential for undue influences on the research. First, she was contracted as a facilitator of academic knowledge transfer between an independent academic institution, the University of Leeds, and CYB and formally employed by the University partner. Second, the KTP partnership was fixed-term (2 years) in duration which limited both the possibility and benefits of involvement in organizational politics. Third, during the initial data collection stages, including the interview stage, the first author was new to the organization so her perception was free from organizational influences. Also, her "newcomer" role gave her the benefit of being able to spot some organizational phenomena that potentially were invisible to the long-term CYB employees (Heiskanen et al., 2008). Finally, while at CYB, the first author remained in regular contact with the second author who continuously questioned her interpretations of the data throughout this stage. The second author also devoted considerable time validating the data sources and interpretations of the first author.

Data analysis

Our data analysis was conducted in several stages during 2008-2013. Our preliminary analysis was broadly focused on the organizational factors that contributed to the post-implementation success (or otherwise) of the profitability BI. The case data was carefully systemized and analyzed, particular attention was given to determining a comprehensive set of organizational factors that could be

potentially linked to the failure of the BI application to deliver the expected benefits in a strategically important area. These factors were rigorously analyzed independently by each author and then discussed by both authors to critically review our understanding. A detailed case study was written to facilitate both authors' in-depth familiarity with the data. To ensure the correctness of our interpretation, the case study was sent to the Customer Insight manager who mostly agreed with our initial interpretations and suggested a few minor corrections that were implemented.

At the next stage, the case data was revised and carefully analyzed using the lens of the organization's deep structure and organizational inertia within the punctuated equilibrium model. This analysis focused on the links between each facet of the deep structure and BI success and the effects of organizational inertia. Table 1 gives an excerpt from our data analysis for the *core beliefs* facet of the deep structure and the success factors related to the company's *capability to apply BI to accomplish its strategic objectives* in which relevant data is mapped to potential sources of

Table 1 Data analysis excerpt: *Core beliefs* and the *capability to apply BI to accomplish strategic objectives*. The last column indicates a potential presence of various inertia sources

Data source	Data type[†]	Explanatory Notes	Commentary	Inertia sources[‡]
LMC meeting 2	MM	CK manager: the brand is being re-examined with the objective of improving the articulation of brand values (both internally and externally).	The top management recognizes that the company values require better articulation and potentially stronger enforcement.	SC
Marketing team event 'Away day'	N	Core values (ownership, personal accountability, entrepreneurial attitude, full co-operation among different teams and elimination of internal competition) are discussed in the senior managers' talks directed to the team and illustrated through various team play activities. Reaction: mostly positive as these values are seen to strengthen the company although some (long-term) staff express skepticism.	The company is potentially not doing enough or not supporting these values sufficiently in everyday business activities.	NP (?) SC ST (?) E (?)
Marketing team event 'Dragon Mission'	N	Internal competition. The main focus is on improving internal processes and reducing costs. High participation rate.	The event encourages the development of ownership, entrepreneurial attitudes and innovation among employees and it is generally well received.	
Retirees paper, draft 1	M	Key findings: a new highly profitable customer group is identified; this group shows high attrition. This cannot be seen from the existing BI reporting; the customer segmentation does not capture this group.	The adoption of culture with questioning and entrepreneurial attitudes needs to be supported by changes in business processes.	SC ST (?) E (?)

[†] MM, M and N stand for meeting minutes, memorandum and personal notes respectively

[‡] NP, SC, ST and E stand for negative psychology, socio-cognitive, socio-technical and economic inertia respectively. A question mark indicates cases where further evidence was sought to verify a potential effect.

organizational inertia. In this analysis, our explanation of the relevant concepts and their interrelations was guided by the theoretical interpretations of the deep structure and the role of organizational inertia within the punctuated equilibrium literature (following predominantly Tushman and Romanelli, 1985, and Gersick, 1991) that were contextualized and linked (either explicitly as in Silva and Hirshheim, 2007, and Besson and Rowe, 2012) or implicitly (as in, e.g., Abraham and Junglas, 2011, and Sarker and Lee, 1999) to strategic IS developments within the organizational transformation literature. We adopted core notions of organizational inertia dimensions and used as guidance the related interpretations of conceptions of agent within the context of IS enabled organizational transformation from Besson and Rowe (2012) who draw on an extensive body of prior research in IS, strategy and organizational studies. This work helped to finalize our research questions and also served as an inspiration for developing our theoretical framework which focuses on the process of interaction between the BI and the organizational deep structure that supports the delivery of BI benefits during its post-implementation use. Subsequently, our theoretical framework was applied to the case data to enable our interpretation. To ensure that we did not miss any important information, our data was searched manually for all references to relevant constructs from the literature which related to the organizational deep structure, organizational inertia, BI-enabled organizational transformation (change), alignment between the BI and the organization as a whole, including the business strategy, structures and processes, and also BI success factors and BI benefits. This search was supplemented by an automated search using relevant key words from these areas. The selected phrases were tabulated under each of the potentially relevant headings and next revised and carefully analyzed by both authors, this analysis was guided by our theoretical framework. At the final stage, our conclusions were validated using the entire case study data.

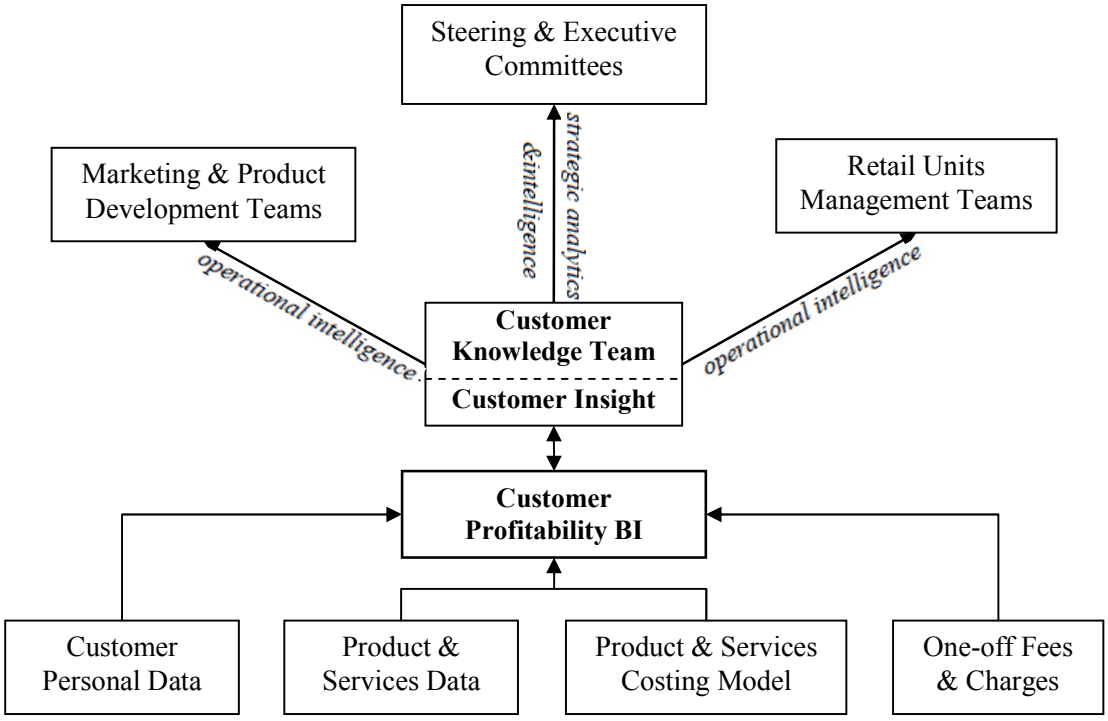
Customer Profitability BI

Description of the customer profitability BI The development of the customer profitability BI application was initiated and overseen by the managers of the Customer Insight and Customer Knowledge teams. The relevant development work was outsourced to an external consultant and was conducted with the close involvement of the Customer Insight team. Input was also invited from other CYB stakeholders at key development stages. At the implementation stage, both the application and also the programming code for it were handed over to CYB so that the bank could easily tailor the application outputs to their current business needs. The analysts of the Customer Insight team also possessed adequate technical skills and were able to implement such changes. The Customer Insight team in effect was acting as the BI competency centre that was facilitating the use of BI within the

organization and also was able to adapt the BI outputs to their evolving needs. Customer Insight reported to the head of Customer Knowledge who oversaw the high-level strategic BI use.

The application integrated a regular feed of information from different sources across a number of business functions and databases which served as an input into the customer profitability models. The model inputs were sourced from the customer personal (profiling) database, product and service databases containing information for each of the main product groups, the product and services costing model and the database containing records of customers' one-off fees and charges. Relevant data from all sources were aggregated and integrated using the embedded profitability models which produced up-to-date measures of profitability of each of the CYB customers. The application used these measures in the estimation of profitability of internal customer segments and other important customer groups and in the analysis of trends in customer behavior.

Figure 2 Customer Profitability BI Application: the Input Structure and the Output Users of Business Intelligence. The business unit names reflect the nature of their business and may differ from the actual names of the corresponding teams



The BI output included profitability dashboards, analytical memorandums and other related intelligence which was produced both on a regular basis and in an ad-hoc manner for a number of different business users (Figure 2). In particular, the retail management units received business indicators reflecting their performance in the past period so that they could monitor and improve their performance on a regular basis. Profitability dashboards for various internal marketing segments were

directed to the marketing teams. Also, the BI could now be used for the accurate assessment of the impact of new product launches on overall customer profitability which was important for the product development teams but previously was not feasible. The current and past profitability measures were also planned to be used as an input into the new profitability forecasting application which CYB was developing when this project took place. Finally, the bank steering and executive committees received intelligence which was tailored to specific current business objectives.

In summary, the BI application was aligned with the business needs of CYB and assisted in the decision-making processes at both the operational and strategic management levels. This BI development led to improvements in organizational efficiency and also gave the business new capabilities that allowed better understanding of their customer base and also the ability to monitor and respond rapidly to the most recent trends in customer behavior.

Implementation success Given the important benefits and new capabilities that the customer profitability application BI introduced to CYB, the application was perceived as a significant overall success among its key stakeholders. We verify the objectivity of this perception using two alternative measures of BI implementation success. The application met all five evaluation criteria of Poon and Wagner (2001) that are drawn from the previous literature and combines the success criteria of Cottrell and Rapley (1991), Rainer and Watson (1995) and Rockart and DeLong (1988). Specifically, first, the BI application was made available so that all intended users could *access* it: The BI analysts accessed the BI application directly whereas other organizational users received their BI information from the BI analysts. Second, the application has been continuously *used* by the intended users (Figure 2) over a considerable period of time, from the implementation in 2005 and for the foreseeable future at the time of writing. Third, all key *users* indicated their *overall satisfaction* with the BI; and, fourth, the application has had a significant *positive impact* in a number of business areas as detailed in the previous section. The final, *diffusion*, criteria was also satisfied as the number of internal users of the customer profitability BI increased over time. The BI also attracted the attention of the parent company which was investigating the possibility of utilizing this application in its other businesses.

While this set of five criteria is indicative of the overall success of BI, it fails to capture the issue that the CYB customer profitability application did not reveal important 'new information' about customer behavior that Customer Knowledge managers were looking to discover. This aspect is better captured by the success measure of Sanders and Courtney (1985) that incorporates two different dimensions of user satisfaction. The first criteria, *the overall satisfaction*, is met in line with the previous discussion involving the Poon and Wagner (2001) criteria set, whereas the second criteria, *decision making satisfaction*, was only partially met in our case. Although most users were satisfied

with the decision making support that this application provided for day-to-day operations at both operational and executive levels, the decision makers who were expecting the BI to discover 'new information' to support CYB's strategic objective of maximizing customer value were not entirely satisfied.

The KTP initiative

Our further data examination exercise, which was part of the KTP initiative, identified a key group of retail customers who, although constituting only about 4% of the retail customer population, contributed about 40% of the total retail profits. Customers aged over 55 constituted almost half of this highly profitable customer group. These highly profitable 55 plus customers also had other favorable characteristics such as low credit risk and historically high loyalty to the CYB which distinguished this group from other profitable customers groups. Even though the CYB management was aware of the high profitability of this 55 plus customer group, they were astounded by its scale and the overall contribution of this customer group to the profits of CYB.

Another major discovery was that the bank's perception of high loyalty among this customer group did not find support in the recent data. One of the most important pre-conceptions in retail banking, a belief that older customers tend to stay loyal to their bank for life, has shaped retail banks' customer acquisition and retention strategies for many years. The almost universally adopted strategy of high-street UK banks has been to focus on attracting and keeping young customers and to largely ignore loyal older customers, assuming that they would stay with the bank no matter what and, hence, required little attention (e.g., Lewis, 1982, and Thwaites and Vere, 1995). The defection rate among the highly-profitable sub-group of customers aged over 55 at CYB was, however, found to be considerably higher than the average for this customer group and was also high relative to other marketing segments. This was an alarming indication that the most profitable and most safe customers were leaving the bank. The results led to a major shift in the bank's marketing strategy involving both customer acquisition and retention strategies. While young people were still considered important, the mature customer segment, that had been historically overlooked, was given a strategically important status. A special steering committee consisting of key stakeholders within the bank was created to move forward this strategic development.

An important question which arose from this exercise was why the valuable information concerned was not already known to the bank? The bank had systems and processes in place to ensure that the bank management had the most up-to date and accurate information. The customer profitability application regularly produced accurate BI with the aims of monitoring the performance of internal customer segments and also identifying new trends in customer behavior.

Analysis

This section gives our interpretation of the CYB case study which is enabled by our theoretical framework that emphasizes the interaction between the deep structure and the BI within the punctuated equilibrium model. Our interpretation is structured around the two way links between the BI success factors and each of the CYB deep structure facets: core beliefs, distribution of power, control systems and organizational structure. Our findings are detailed below and their summary is given in Table 2. Insights which are generalizable to other organizations are also offered.

Core beliefs

Core beliefs to BI link The largely *successful implementation* of the BI profitability application which aimed to enable the CYB strategic move to a customer centered as opposed to a product centered business model demonstrates the *entrepreneurial attitude of the CYB management* towards technology. The perceived implementation success and the new capabilities and efficiencies that the BI introduced also generated a *positive general attitude towards the BI* from both their owners and other stakeholders. This attitude was supported by the bank's efforts to nurture an entrepreneurial mindset and a sense of ownership among the CYB employees. This is reflected in the "Always thinking…" motto which was launched in 2008 and represents the CYB commitment to "always find ways to improve, to add value and do the right thing for our customers, our employees and the environment" (Clydesdale Bank, 2013). A series of internal events were also held in 2008 to promote these values. Despite these efforts, the BI data interrogation exercise revealed that the CYB internal customer marketing segmentation used a number of outdated assumptions about customer behavior (e.g., the high loyalty of mature customers) that were historically developed following industry practice. These outdated preconceptions prevailed at the organizational level and were embedded into the internal customer marketing segmentation which was part of the CYB business model. Accordingly, the BI reporting was also structured around these long-established internal marketing segments and could no longer capture some of the important developments in the customer data. As our BI data interrogation exercise has shown, the outdated assumptions about the customer behavior obstructed the discovery of important new information. To put it simply, the data needed to be "cut" in a different way for this new information to be discovered. This demonstrates how *socio-cognitive inertia* embedded in the organization's *core beliefs* can impair the informative content of the BI outputs for the decision making at the strategic level and as a result, the organization's *capability to apply the BI to accomplish its strategic objectives*.

BI to Core Beliefs Link The fact that the participating author conducting the BI data interrogation exercise only used information and data that was readily accessible to the CYB BI analysts indicates

that despite its availability, this information had not been adequately captured in the BI outputs and hence, not integrated into the decision making process. Furthermore, our analysis established little evidence of systematic processes aiming to verify the validity of the assumptions underlying the internal customer segmentation and serving as a basis for the BI based analysis and reporting structures. The statistical description of marketing segments, for example, included only broad descriptors and lacked informative robustness indicators. As a result, an adequate feedback mechanism from the BI to the *core beliefs* of the deep structure had not been established.

Insights and generalizations As the environment (e.g., customer expectations and customer behavior) changes over time, it is important to ensure that the assumptions underlying the business model and serving as a basis for the BI reporting are regularly verified and updated. The importance of such evidence-based verification extends to most organizations, including regulators. In particular, this need is highlighted in the recent banking literature focused on the 2008-2009 global financial crisis and the on-going financial crisis in a number of EU economies. Crowe (2012), for example, argues that the failure to predict the credit crunch was in part related to the dominance of common (prior) group beliefs over the private idiosyncratic signals amongst financial analysts from different financial organizations. Another issue was the prevalence of "groupthink" in which the desire for harmony or conformity in a group results in incorrect decision-making outcomes (e.g., Janis, 1972, and Bénabou, 2009). The over-reliance on prior beliefs and "groupthink" among central bankers also led to their inability to foresee and prevent the crisis (Cobham, 2012, and Buiter, 2012). The evidence-based questioning and updating of business assumptions is therefore essential for banks and also other organizations to ensure that the BI can continue capturing important developments in the organizational data and to deliver informative and relevant decision support. Furthermore, the CYB case indicates that the related questioning attitudes that were part of the CYB culture are important but not sufficient; they need to be supported by business processes enabling such BI-based questioning and verification.

Organizational structures

Organizational structures to BI link The existence of established processes ensuring the timely delivery of relevant BI information that informed the decision making of both CYB top and middle management in a number of business areas (Figure 2) provides evidence of the BI alignment with the business structures and processes (Sabherwal et al., 2001). The importance of alignment between IS and business processes for extracting the benefits from IS is argued by Moreton (1995). A particular issue related to the BI failure to identify profitable customer groups for the next round of customer acquisition and retention remained unresolved however until the involvement of an external expert

who was contracted for a related but formally independent project. Our data analysis points to a number of related issues in organizational structures. Our BI data interrogation exercise revealed that a focused rigorous BI-based data analysis supported by advanced quantitative data analysis skills was required. The Customer Knowledge manager indicated however that their BI analysts did not possess sufficiently advanced data analysis skills to perform the task. Also, an analyst who operated the BI application expressed frustration that some customer segments appeared exceedingly heterogeneous, however, as she was fully loaded with regular duties, she did not have the time to investigate potential issues. The inability of the BI operating team to resolve this issue internally in a timely manner is therefore at least in part related to the lack of specific (advanced quantitative data analysis) skills. Also, given the volume and complexity of the customer and other BI input data and its dynamic nature, which is associated with changes in data characteristics, regular access to such data analysis skills is essential for the BI operating team. Such skills however were not part of the relevant job specification which can be explained by the historical development of the CYB structures: Customer Knowledge was part of the marketing function that traditionally relied on marketing analysts with predominantly qualitative data analysis skills. Even though the bank had employed and trained staff in the technical (programming) areas of BI, the quantitative data analysis aspect was not given adequate attention.

BI to Organizational Structures link The link from BI to the organizational structure can be classified as limited and static. The BI regular reporting contained an indirect but persistent indication of the issues with the BI reporting structures, for example, low homogeneity of some of the underlying internal marketing segments. This feature was known to the BI analysts as they acknowledged facing difficulties when attempting to produce a meaningful analysis of trends and developments in these segments for the profitability dashboards; a more systematic analysis was required. The bank management also recognized this issue. In fact, CYB was conducting a business research project at the time of the KTP initiative with the aim of updating and refining these segments. Surprisingly, the rich internal BI related data and the BI functionality were not exploited to their full capacity to investigate the issues.

Insights and generalizations Sanders and Courtney (1985) and Wixom and Watson (2001) also recognize highly skilled staff as an important factor and Finlay and Forghani (1998) emphasize the relevance of adequate technical skills. As a novel contribution to this literature, our study highlights that it is important to ensure that the nature of the key user skills is carefully matched to the specific BI application.

Furthermore, our results demonstrate that an excessively close, static link between the BI and the organizational structures lead to strong *socio-technical inertia* which obstructs the BI from discovering new developments in the data. Consequently, this obstructs an organization from developing a BI-based capability to detect the need for change and act on it.

Distribution of power

Distribution of Power to BI link The regular long-term (from the implementation in 2005 and into the foreseeable future) use of the BI information by both middle and senior management to support their decision making in a number of business areas and their overall satisfaction confirms that the BI has been delivering the decision making benefits in these areas. This along with the development of the new forecasting profitability application which built on and complemented the existing BI and was championed by the same business owners indicates *the senior management long-term commitment* to the use of this BI. Also, technically, as Customer Knowledge (Customer Insight) had accessed, integrated and analyzed information from across different business units and this team's analytical work was instrumental for the bank's ability to achieve its strategic objectives, this warranted the team managers a special (strategic) position within the bank. As detailed in the previous section, however, despite the BI owners' dissatisfaction with the BI performance in a strategically important area and their commitment to resolving this issue, it remained unresolved until much later. It points indirectly that the Customer Insight (Customer Knowledge) team required a more strategic status within the bank and, importantly, better resources to adequately deliver their roles which indicates the potential presence of *political inertia* and also *economic inertia*.

BI to Distribution of Power link Once the issues that hindered the discovery of strategically important information were identified, both the BI owners and the bank executives acted promptly to move the "retirees initiative" and the related changes to the bank marketing strategy forward. This initiative was championed by the BI owners and supported across other relevant CYB teams.

Implications and generalizations We found only indirect evidence pointing to a potential impact of organizational inertia associated with the *distribution of power* facet of the deep structure. This contrasts with Silva & Hirschheim (2007) whose case study is conducted in a public health services setting and finds the impact of the distribution of power important. As they focus on the strategic IS implementation as opposed to the BI post-implementation use in our study, the differences in findings may reflect different organizational contexts and also the specific organizational and IS (BI) development stages. Further research is required to obtain conclusive evidence.

Control systems

Control Systems to BI link The structuring of the routine BI reporting around the CYB internal customer segments ensured consistency with the current business model, and this alignment allowed the BI to meet a number of CYB's business needs. Our evidence suggests however that these BI reporting structures were too closely aligned with the existing customer segmentation and hence, the business model. Such over-alignment gave rise to *socio-technical inertia* as it gave little opportunity for any important information that did not conform to the current business model to be revealed. For example, a number of the CYB customer segments were found to have low homogeneity in some important customer characteristics which were not directly used for segmentation (e.g., the customer defection rate). Any changes in such characteristics that did not notably affect the profitability distribution within a segment were very difficult to spot given the established BI reporting. It turned out that the highly profitable 55 plus customer group was distributed across four distinct internal segments and it was problematic to distinguish these sub-groups from the rest of the population in these segments using the regular BI reporting. The marketing managers were also aware of the low homogeneity issue. One manager, for example, noted in relation to high-value customer segments: 'There is a problem with segments… not enough segmentation. The segments include very different customer groups, with different attitudes and cultural differences". The CYB control systems however failed to introduce procedures that could detect the over-alignment with the outdated segmentation system. The lack of these procedures is linked with the *organizational maturity* BI success factor.

BI to Control Systems link The lack of the BI based feedback mechanism, for example, "reality checks", or reliability indicators, that allow detecting if the actual developments in the business data deviated from the assumed scenarios implied that that the BI was not incorporated into the systematic monitoring process of the robustness of the current business model and the related business assumptions about the external environment. Also, regular BI outputs (e.g., analytical information in the marketing dashboards) needed more systematic and in-depth scrutinizing to be able to point to potential issues.

Implications and generalizations As the CYB case demonstrates, any business system can become outdated over time and it needs regular up-dating as it only reflects business knowledge which was available at the time of its creation. By construction, it may not be possible to capture new developments by closely applying pre-determined structures (e.g., customer segments as in our case). Any new segmentation system that the BI application might adopt therefore could only provide a temporary solution unless it was continuously verified and updated. The BI capabilities allow the BI reporting to be constructed so that to include such verification and also provide signals when the current system becomes outdated and trigger the updating of this system. Such two-way dynamic

interaction (as opposed to a static link as in our case) contributes to the BI continuously providing *timely and informative decision support*. For example, an introduction of the BI-based feedback mechanism that incorporates "reality checks" or reliability indicators enables early detection of situations where the actual business data characteristics deviate from the assumed business scenarios. Significant deviations should lead to an in-depth data interrogation to verify and update both the business assumptions and the BI reporting structures. This potential solution is also generalizable to other retail banks and organizations operating in fast changing environments. In contrast, as in the CYB case, a static link which is enforced by an excessively close alignment between the BI reporting structures and the business model leads to reproducing information that is already well known while missing new important developments in the business data, and therefore re-enforcing existing preconceptions without pointing to a problem.

It follows from our analysis that to enable the BI adjustment, BI needs to be adaptive not only during the development stage (e.g., Finlay and Forghani, 1998, and Poon and Wagner, 2001) but also during the post-implementation phase. This adaptability condition was met in our case as the CYB customer profitability BI could be easily adjusted to accommodate the updated customer segmentation and introduce new robustness indicators if needed. The adjustment of the organizational processes may also be required to support the suggested dynamic interaction which is supported in the organizational transformation literature (e.g., Seddon et al., 2010) but has been largely omitted from consideration in the BI success literature.

Discussion of insights and generalizations

Our findings contribute to the organizational transformation and the BI benefits literatures by establishing how the organization's deep structure and also processes that embed the BI into an organization as a whole influence the long-term strategic benefits from the BI such as better management decision making and the organization's ability to use the BI for the accomplishment of its strategic business objectives (Table 2). The adoption of the punctuated equilibrium framework demonstrates that a good quality BI, its alignment with the business strategy and business structures along with other established BI success factors are important but not sufficient for the BI to be able to deliver expected BI benefits in the long run. The ability to extract these benefits is also influenced by the organization's deep structure and, importantly, by the organization's ability to overcome the effects of multidimensional organizational inertia that the deep structure generates. Our case study provides evidence that organizational processes that link the BI to the deep structure can be used to manage the effects of organizational inertia with respect to information from the BI. From the practical process development perspective, these processes should enable a dynamic interaction (as

opposed to a static link) between the BI and the deep structure and include appropriate feedback mechanisms. Such dynamic interaction allows managing the effects of inertia with respect to information from the BI and thus supports better organizational alignment with the BI and also the organization's capability to detect the need for change and respond to it by (re-) aligning both externally and internally. As the CYB case demonstrates, for example, such processes would help to fully institutionalize its important core beliefs and values that encouraged evidence-based questioning

Table 2 Links between the deep structure and the BI success factors at CYB and the effect of organizational inertia; insights and generalizations

Deep structure facet	Links between the deep structure and the BI	Inertia Attributes	BI success factors	Insights and generalizations
a) Core beliefs and values	*Core values to BI:* The bank used outdated, historically developed beliefs about customer behavior for their internal customer marketing segments that were also in-built into the BI analysis and reporting structures. *BI to Core values:* Despite the "always thinking" culture, the verification of the assumptions underlying the internal customer segmentation was lacking from the BI based analysis and reporting structures, so that no systematic feedback mechanism was established.	Socio-cognitive inertia Socio-technical inertia	Capability to apply BI strategically to support the achievement of the business objective of maximizing customer value. Capability to deliver decision making benefits at the strategic level.	A BI based process of verification of the robustness of existing business assumptions enables the BI to signal when the existing business model is no longer aligned with the evolving environment, e.g., changed customer behavior. To become fully institutionalized and support the extraction of BI benefits, the appropriate organizational culture (e.g., questioning and entrepreneurial attitudes) need to be supported by business processes enabling the BI-based "reality checks" of assumptions underlying the current business model and alertness to new developments.
b) Organizational structures	*Organizational Structures – BI* The BI reporting structures were closely (statically) aligned with the organizational structures and the needs of different business users. The job descriptions of BI analysts failed to include a set of important (quantitative data analysis) skills, so that the set of required skills was not appropriately matched with the nature and purpose of the BI. *BI - Organizational Structures:* CYB lacked processes allowing the verification of the robustness of the existing reporting structures	Socio-technical inertia Indirect evidence of economic inertia	Capability to deliver decision making benefits. Ability to hire and retain highly qualified users with the appropriate set of skills. Organizational maturity: adequate process	The BI reporting structures that are only statically linked to the current business model and organizational structures generate inertia that obstructs the discovery of new developments in the environment. Organizational processes that link the BI and organizational structures should incorporate *feedback mechanisms that allow the verification of the robustness of the current reporting structures and signaling of potential issues.* In addition to the previous BI success studies emphasizing the importance of highly skilled users and technical expertise, we find

	and pointing to potential problematic areas.		design.	that *the set of users' skills needs to be carefully matched with a specific BI.*
c) Distribution of power	*Distribution of Power to BI:* Even though the managers who owned the BI were not satisfied with the BI failure to detect new profitable customer segments, the underlying issues were not identified and could not be resolved until the KTP initiative took place and involved external expertise. *Distribution of power – BI:* Once the BI related issues were detected with the help of an external expert, the top management acted promptly to move the "retirees initiative" forward.	Indirect evidence of political inertia and economic inertia	The senior and middle management commitment to the BI. The support of senior management.	Our evidence indirectly indicates that in cases where the BI's purpose is to support strategic decision making, it is important for the manager – owner of the BI to have a strategic status within an organization and, importantly, adequate resources to enable this strategic support function.
d)Control Systems	*Control Systems – BI:* Existing control systems failed to detect an over-alignment of the BI reporting structures with the customer segmentation which was part of the current business model. *BI – Control Systems* The BI capabilities had not been fully exploited as part of control mechanisms to ensure the robustness of both the assumptions underlying the business model and also the BI reporting structures.	Socio-technical inertia Economic inertia	Organizational maturity: established organizational processes ensuring an adequate integration of the BI into organizational control systems. Adaptive BI	Control Systems should support a process of a two-way dynamic interaction between the strategic BI and the organizational deep structure. This process enables the timely adjustment of (a) the business model to changes in the environment and (b) the BI to the changing business model and business needs, thereby limiting the effect of organizational inertia and enabling a dynamic (re-) alignment over time. As a result, this process enables timely and informative long-term strategic decision support. The BI needs to be adaptive to accommodate this dynamic interaction. An adjustment in the organizational processes may also be required.

and entrepreneurial attitudes and better align them with the BI (Table 2, part a). Our results also extend an argument in the organizational transformation literature (Besson and Rowe, 2012) that it is essential to understand the effects of the multidimensional organizational inertia by proposing how these inertia factors can be managed to enable the delivery of long-term BI benefits.

Our findings also emphasize that the dynamic view of the alignment process proposed by Sabherwal et al., 2001) is relevant not only during the implementation process as widely acknowledged in BI studies (e.g., Arnott, 2008, Poon and Wagner, 2001, and Salmeron and Herrero, 2005) but also during the long-term post-implementation use. Even if appropriate alignment is achieved at implementation, changes in the environment necessitate continuous re-alignment. Over-alignment generates strong inertia and leads to failure when business conditions suddenly change (Sabherwal et al., 2001, and Tushman and O'Reilly, 1996) which in turn may necessitate a risky revolutionary transformation (Greenwood and Hinings, 1996). Our findings also extend this literature by highlighting the role of the BI and its links with the organizational deep structure in developing the BI-based organizational capability to detect the need for change and respond to it, thereby ensuring the organization's on-going alignment with the environment.

Our novel contribution to studies of BI benefits is in extending the analysis from a short-term to long-term horizon and identifying a number of factors that are important for extracting long-term BI benefits. These factors include the need for the BI owner to hold a strategic position within the organization and have access to adequate resources; a careful match between the set of users' skills and the needs of a specific BI; and also the need for a BI to remain adaptive during its post-implementation use. Our discussion of the organizational processes that support long-term BI benefits also expands the understanding of the "organizational maturity" success factor.

Conclusions

This paper has aimed to advance our understanding of the important issue of how to maximize the decision making benefits from a business intelligence (BI) application during the post implementation phase. We have formulated a number of theoretical propositions based on previous research into organizational deep structure and organizational inertia within a punctuated equilibrium model of organizational change. We illustrate and provide initial evidence towards verifying our framework by applying it to a case study of a UK retail bank which used an existing customer profitability BI application to transform its marketing strategy. As anticipated in our theoretical framework, the organization's ability to extract long-term BI benefits is influenced by the deep structure (core beliefs, organizational structures, control mechanisms and potentially distribution of power) that generates multidimensional organizational inertia. The organizational processes that embed the BI into the deep structure, if not adequately designed, can enforce the effects of inertia which obstructs the delivery of expected BI benefits. The effects of interrelated inertia dimensions therefore should be carefully considered when such processes are developed, with an aim of overcoming the effects of inertia in respect to information from the BI. From a practical application perspective, considerable emphasis

should be put on ensuring a dynamic interaction (as opposed to a static link) that includes appropriate feedback mechanisms between the BI application and the deep structure. Such interaction enables not only alignment of the BI with the organization as a whole but also the organization's (re-) alignment with the evolving environment by supporting the BI-based capability to detect and respond to the change in the business environment.

Our finding of the importance of the deep structure for the organization's ability to extract strategic BI benefits is in line with Silva and Hirschheim (2007) who also find control systems and core values important for the case of strategic information systems. Their third important facet, distribution of power, is not as apparent in our study where organizational structures seem more crucial. The two sets of findings demonstrate that the context of a study is likely to be important and worthy of further investigation as discussed below. The differences in findings may reflect the specific nature of IT (strategic information systems in Silva and Hirschheim (2007) as opposed to BI in our study), industry (Elbashir et al., 2008), organization-specific timing (Silva and Hirschheim, 2007) and the BI exploitation stage (Seddon et al, 2010 and Purvis et al., 2001).

Case study work necessarily has limitations as well as benefits with potential issues of bias or undue influences on the research, particularly when researchers are based within the organizations being studied. We have, however, gone to considerable lengths to minimize these issues as detailed in our methodology section. Also, the successful and profitable development which followed from the preliminary stage of this research, after the participating author's involvement with the organization has ended, supports the objectivity of our analysis.

Our findings highlight the need for further research into the links between the BI benefits and the deep structure that explicitly accounts for the effect of multiple inertia dimensions. The research with a focus on different organizational contexts and also BI exploitation stages would allow systemizing the evidence for further theoretical development. One would expect that our theoretical framework would be useful in many other areas of the banking, high-tech and other industries that operate in moderately to fast changing environments. Verifying this in practice and developing a greater understanding of organizational factors that enable maximizing the long-term BI benefits represents a valuable direction for future research.

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