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Abstract

Many organizations implemented business analytics and intelligence solutions. Often such initiatives bring little business value after initial hype. An analysis of factors influencing the continued use of those systems is thus called for. We use organizational information processing theory to argue that while IT-enabled business analytics can drastically enhance the information processing capabilities they do not necessarily have the same effect on the information processing needs. Thus a deliberate effort is needed to assure a permanent increase of processing needs in order to assure long-term use of business analytics. We use a case study of a North-American company to analyze how the successful implementation of analytics tools lead to high initial use. However, after decrease in those needs, the use dropped leading eventually to also reduction of processing capabilities.

Keywords: business analytics, decision making, information processing view, longitudinal case study
1 Introduction

Today’s decision makers need to make sense of a tremendous volume and variety of information, leading more enterprises to deploy analytics to help them both to respond to key business issues. Business analytics and business intelligence (‘BAI’) have the potential to transform the way in which organizations makes decisions (Sharma et al., 2010) since timely BAI impacts current business decisions and current business processes (Sahay and Ranjan, 2008). However, the expected benefits do not always follow the investment in business analytics technology (Trkman et al., 2010). Focusing on the development of technological capabilities (hardware, software and databases) solely enables information-driven decisions however it does not necessarily guarantee them.

Currently however the available literature mostly focus on anecdotic case studies (Davenport, 2009), statistical analysis of the impact of BAI (Trkman et al., 2010) and the hype in professional press. This is undoubtedly important, especially in the initial, exploratory phase of the research of BAI impact. However it gives little guidance on the factors that lead to the outcome of BAI implementation – this can be either radical or incremental change in decision making and consequently performance or can come down to just a few fancy charts in a newly acquired program. Even more importantly, an analysis of BAI impact should not focus on the impact at a particular time moment but should be longitudinal to establish how and even more importantly why the BAI use and impact varies in time.

On a more theoretical side in order for BAI research to be more deeply rooted within the IS research a rigorous theory-based grounding and analysis of their impact is needed. Since the rapid evolution of technologies and managerial methods, however, poses a significant challenge to theorists (Lewis, 1998) most of previous research on BAI was atheoretical. Our analysis thus uses organizational information processing theory (Galbraith, 1974) to analyze how new BAI technologies can drastically enhance the information processing capabilities but do not necessarily have the same effect on the information processing needs.

The paper uses a longitudinal case study of a North-American company to show how BAI-induced development of information processing capabilities was firstly matched with an increase of information processing needs. However, the reduction in processing needs caused by the change in management and high turnover of key employees that demanded analytically driven decisions eventually lead to decrease in information processing needs.

The structure of the paper is as follows. Firstly, the role of BAI in changing decision making is discussed. Then the way in which information processing needs can be influenced are discussed. Then the case study is presented and analyzed from the information processing theory perspective. Main findings and further research topics are presented at the end.

2 Business analytics as a changer in decision making

Managing an enterprise requires access to information and efficient data management in order to monitor activities and assess performance of various business processes. It is not easy to understand and assess the information about the processes of an organization (Sahay and Ranjan, 2008). A deeper insight into the ways in which BAI gets adopted and how it changes the way in which organization makes decision is needed– after all better decisions facilitate better performance. Similar to other strategic technologies, BAI will evolve or change depending on organizational needs and maturity. Despite the significance of BAI research, little attention has been given to examining the natural progression of BAI adoption and maturation within organizations (Russell et al., 2010). Most BAI initiatives have focused on the development of a high quality BAI data asset that is used in the replacement of existing reporting systems. Despite some well-publicized case studies of BAI being used to support value-creating actions, Shanks et
al. (2010) found little evidence of this to date. Since the BAI takes up resources while the benefits actually occurring in practice are not always clear (Lönnqvist and Pirttimäki, 2006) this may lead to disappointment after initial hype. More focus is thus needed on how and to what extent do employees use the available tools. Assuming that users will somehow use developed BAI applications (“if you build they will come”) is definitely not appropriate. The focus should be why users adopt BAI and at which levels can they use it. After all BAI are not used by an organization but by individuals working in it. In this paper we argue that individuals seek to establish the fit between the information processing needs and capabilities.

2.1 Influence on information processing capabilities

Some of the technological capabilities needs for the implementation of business analytics are clear. The successful implementation of timely BAI requires a data warehouse. Critical data must be captured from source systems, loaded into a warehouse, and made available. Depending on the business need, data can be hourly, daily, and even weekly or monthly and still be considered timely. Actionable information for applications and users needs to be provided while costs of communicating information should be reduced by improving the quality and speed of information processing (Songpol et al., 2004).

We thus explore the role of BAI within the IP view that posits that IP capabilities and IP needs must be aligned; the greater the task uncertainty the greater amount of information that has to be processed (Galbraith, 1974). An important contributor to task uncertainty is the level of performance that an organisation wants to achieve in executing the task. Higher performance standards entail less availability of slack resources and thus higher processing needs to achieve the goals (Galbraith, 1974). The IP view then sees the linkage between a key organisational resource (information) and its management (i.e., the use of information) as an organisation's most critical performance factor (Fairbank et al., 2006).

Thus a high level of IP capabilities is not necessarily positive; a company may experience subpar results whereby its information capabilities are high but unbalanced (Sleptsov and Anand, 2008). When IP capabilities are less than what is needed to perform a task, performance standards will not be met. Conversely, when an organisation possesses more IP capabilities than is required the task will be accomplished inefficiently. Further, IP needs may change along with organisational development. BAI implementation is thus not a one-off project. If an organisation does not consciously match its information needs and information capabilities, reduced performance standards will automatically lead to configurations of misfit.

BAI therefore involves developing information capabilities that lead to better decision making, which can be referred to as business analytic capabilities (Susarla et al., 2010). How well such activities can be performed depend on the quality of the analytical tools and the quality of data that are used as input (Susarla et al., 2010). However, although many IT techniques have been developed for intelligent information processing, even the most advanced are not yet mature enough to solve complex real-world problems thus they need to be complemented by information processing capabilities of individual employees and/or the groups of employees. An organization must determine which kind of information is necessary and which capabilities need to be in place to allow successful operation. This is very important since developing the “wrong” analytical capabilities may have negative effect. This was confirmed by Sleptsov and Anand (2008) who found that the firm may fail to exercise opportunities effectively not only when it has low levels of information capabilities, but also when its levels are high but unbalanced.

In accordance with information processing theory we thus argue that the most effective organizational design strategies are those that recognize an appropriate fit between an organization's ability to handle information and the required information. Information processing needs are both on the organizational and on the individual level – how much an individual believes he or she needs information processing to make the decision. The BAI services are namely used by organizational actors to help execute tasks. The same decision in the same process can be made either with “the gut feeling”, Excel calculation or
supported by advanced BAI. If performance expectations and measurements are vague or inconsistently applied then the stimulation for the BAI use may be low. If information processing (‘IP’) capabilities in the organization are lower than IP needs of the individual it is likely people will complain; on the other hand if the capabilities are higher than the needs it is possible that they will not be used without this lack of usage being very noticeable. This means that while the buy-in from top management is absolutely necessary for the successful implementation of BAI tools (Hedgebeth, 2007) this is not enough. Something must assure the continuous high level of information processing needs that will lead to higher BAI use. This something can be the management, incentive system, individual heroics, regulative pressure or so called “analytics oriented” culture (see (Davenport et al., 2010)).

3 Case study

A longitudinal case study of Oilcom was chosen to analyze the way in which BAI implementation influence both information processing capabilities and needs. Oilcom is a producer of the synthetic crude oil (name is fictional, all other data is real). Several data collection methods were used to collect, triangulate and validate the data. One of the researchers collaborated on developing the company’s BAI capabilities over three years and made direct observations during this period. Internal documentation was reviewed and the current business processes were analysed. Process maps were constructed and studied and over 50 end-users were interviewed. Several data sets were gathered using existing manual data sources (spreadsheets) and combined in order to understand the current situation and quantify the potential opportunity for a business case. These combined data sets were also used to calculate the current state metrics discussed in this case (i.e. no shows etc.). Interviews with Oilcom managers, outside contractors, lodge managers and individual workers were also conducted during the three-year effort. In addition, an online web-based survey together with on-site interviews were used to gather information about room availability at the 15 lodges. The data collection lasted from August 2008 to late 2011.

Oilcom is a North American producer of synthetic crude oil by mining, extracting and upgrading oil trapped in sand. In late 2007, Oilcom began investing heavily to expand its production. Thousands of skilled construction workers had to be transported from other regions of North America and other countries to remote parts of the world. This means Oilcom must coordinate more than 10,000 temporary workers on site each day in support of 175 simultaneous construction projects and 300 different Construction Contractors, along with lodges, buses and airport transport. They must continually manage the assignment and movement of practitioners to or between projects. Oilcom thus faces the same challenges as many companies from various industries who constantly strive to balance the many objectives of multiple stakeholders in order to minimize idle resources while aiming to improve the quality of practitioners assigned to each project (Chenthamarakshan et al., 2010).

By the summer of 2008, the manual processes for coordinating the transportation and housing of its temporary workforce were collapsing under the enormity of the task. On an annualized basis, Oilcom was losing millions of dollars in overbooked rooms, underutilized transportation, turnover of workers and construction project delays. Information on the process was mostly unavailable or unreliable. Oilcom had engaged external consultants to quickly survey the current operations and recommend changes necessary to “stop the bleeding”. It was clear that trying to manage the work flow of this interactive network of businesses was impossible using emails, faxes and spreadsheets.

A web-based, self service, centralized data repository was created where Oilcom could enter its workforce requirements (forecast demand), contractors could enter accommodation requests for its workers (actual demand), Lodges could enter current accommodations availability (supply) and bus and airline companies could provide updates to scheduled routes and flights (supply). With access to timely demand and supply information, better decisions could be made by every participant at every level within this Extended Enterprise. Single point data entry also would minimize data quality errors rampant in the manual process. With Demand and Operations Planning exercised across the Extended Enterprise, Oilcom and
the hundreds of participating companies could visualize approaching demand and plan prepare as needed for on time delivery.

Within two weeks of the start date, a prototype solution was being evaluated by users and within another two weeks user feedback was incorporated and the system was operational. Quick Reference Guides were built to instruct various levels of users and trained hundreds of contractors and Oilcom personnel how to enter data and monitor their requests for approval. In less than ten weeks the system was developed. The general consensus across the Extended Enterprise was the system was easy to use, information was immediately accessible broadly across the organization and most important: the system produced reliable results.

With the "force" of the Senior Director and the project management directors demanding analytics views and reports, the simultaneous increase in information processing needs happened. This put pressure on the people to use developed BAI tools. It also displayed incentives for the people to use analytics and get rewarded through recognition by the senior director. The performance results were significant. “No Shows”, a key measure for rooms reserved and paid for but no one showed up (rooms were required to be held for 7 days) went from 30% to less than 10% saving $20 million dollars per year. “No Rooms” when workers arrived and rooms were not available went from 15% to less than 2%. Room utilization also increased 30%.

When the senior director left and there was a significant turnover in project management, the behaviour incentives changed dramatically and the analytics behaviour slowly collapsed to just some transactional support. The new leadership was mostly not aware of the analytical capabilities of the system. The on boarding process for new leaders did not include training in the process or system. Many employees who enjoyed the previously increased IP capabilities left the company because their analytical approach did not match the IP needs of the organization. In fact 3 new senior directors changed within a year. Turnover in the core group was equally high. With new leadership, the job requirements changed. Employees were not expected to use the analytical reports and analysis, leading to degradation of job competencies. The initial BAI tools had relatively few business rules built in because of the variable nature of the process (e.g. although the rule is that workers, supervisors and executives should be in different types of rooms sometimes a worker can be placed in supervisor's room). This was initially beneficial but enabled a quicker downgrade of analytical capabilities. A typical example of this downgrade was the MP report, which included information on current demand, supply and forecasts by business unit and lodge. While the core process did not change and its stated goals and key performance indicators remained the same, the view of the importance of this document went from “the most important document available” to “nobody looks at it”.

At the end, the new management (third iteration of the leadership team in two years) felt that even existing processing capabilities available to contractor employees were too high due to some data entry issues (e.g. contractor requestors entering employees in the system without their employee ID numbers). Thus they shut down all self-service requesting and the process reverted back to a typical “Excel by e-mail” process coupled with faxes and telephone calls sent to a centralized data entry group. In addition, contractor requestors were removed as users of the system and they were blocked from accessing information about their current or historical requests. The requirement for forecasts from the project management group was also abandoned as well as key performance indicator reporting by project group, both were original drivers of the development of the system. The system that was originally meant to provide on demand, distributed BAI capabilities both in reporting and prediction thus became only a centralized transactional system providing access to only a small, centrally located group.

4 Discussion & conclusion

In our paper we showed that BAI can enhance IP capabilities if it is properly implemented in the organization. A well-known fact is that the development of BAI capabilities is not solely about
technology but about supporting business processes. This was done properly in the Oilcom case to assure
the increase in the processing capabilities.

However, only a high level of information processing needs (due to e.g. management pressures, culture,
regulatory pressure) will assure BAI are really used. Thus something needs to drive IP needs. In the
Oilcom case an intervention by external companies increased IP capabilities but that lasted only until IP
needs were required by the management. Using BAI can be cumbersome for the users – if they are not
required/stimulated they may not do so. Thus BAI in itself will not guarantee improvement, even if they
are technology and data wise perfect. Just the fact that BAI enable better decision making that does not
mean it will happen since many employees are not necessarily interested in better decision. They are
interested in what is required of them (and rewarded) by their leadership.

In terms of the IP view, our paper has enhanced the understanding of how IP needs form in organisations.
The paper showed how top management can affect the IP needs leading to better acceptance, better
decision-making and consequently better performance. We also showed that greater environmental
uncertainty does not necessarily lead to higher information-processing needs as is often argued (e.g.
(Shockley et al., 2011)). The amount of information required to perform a task (Galbraith, 1974) is thus
not fixed. Put differently, as shown by our case environmental turbulence (e.g. crisis) can serve as a force
stimulating IP needs. However, increasing those needs with other interventions in less turbulent times
may be equally beneficial. Thus if for example the management increase the demand for data-based
decision making this importantly increases the processing needs of individual employees executing those
processes.

Previous studies on leaders’ influence on IT project success have not provided much guidance in terms of
specific managerial behaviours that are associated with implementation success (Neufeld et al., 2007). For
BAI success management support needs not only to provide nominal/verbal support, funding, training
etc., but most importantly it should ensure that employees are required to make BAI-supported decisions.

Obviously our case suffers from usual limitations of case study research; one case may not be sufficient
for a generalization of the findings. The industry in question is more or less focused on service operations
management; information processing capabilities needs and consequently adoption may be different in
more knowledge-intensive, less-structured processes. Further, since this a research-in-progress paper
further interviews are planned to enable a more detailed analysis of how and why information processing
needs degraded in time, leading eventually also to the erosion of information processing capabilities. Such
longitudinal studies can importantly help managers to not only better implement the BAI but to also
improve the likelihood of their longitudinal positive impact on performance.

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