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Routines, Reconfiguration and the Contribution of Business Analytics to Organisational Performance

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Abstract

Availability of large volumes of data in the firms has given a rise in interest in the potential use of business analytics applications. Research has investigated the potential of business analytics to deliver improved performance and competitive advantage at the firm level. However, a theoretical framework identifying the organisational factors which enables the firms to realise those performance gains and competitive advantage has not been clearly articulated. This paper proposes a theoretical framework identifying the organisational factors involved in realising performance gains and competitive advantage from business analytics. This paper draws on the foundational works of dynamic capabilities, routines and effective use to develop a research model. The data collected to test the research model is described along with the analytical strategies to test the model. Implications for research and practice are discussed.

Keywords

Business Analytics, Business Performance, Competitive Advantage, Strategic Value, Routines.

INTRODUCTION

Previous research has highlighted the role of business analytics tools in enhancing firm capabilities, improving firm performance and in generating sustained competitive advantage (Davenport 2006; Negash 2004; Seufert et al. 2005). Business analytics applications are sometimes referred to as "killer applications" on account of their perceived capability to alter competitive dynamics. A key reason for this expectation is that these applications are capable of assimilating and processing large volume of data from isolated information systems (IS) within and across firms to generate proprietary knowledge that can be exploited to generate competitive advantage.

However, how firms actually achieve success from business analytics is much more complex. Sharma et al. (2010) argue that performance gains from business analytics are often incremental, emerge only after a period of sustained use and that there is significant uncertainty about the magnitude of performance gains. More importantly, they argue that the role of human agency and the context within which human actions to improve performance are undertaken has not yet been clearly articulated in the theoretical literature (Sharma et al. 2010; Sharma et al. 2011).

This paper presents a theoretical framework to understand how business analytics may contribute to improved organisational performance. We draw on the emerging literature on dynamic capabilities (Helfat et al. 2007), routines (Feldman et al. 2003; Liu et al. 2011) and effective use (Burton-Jones et al. 2012) to develop our theoretical framework. In the following section, we describe the use of business analytics to capture organisational performance, followed by a review of the literature, the research model and the hypotheses. We

then describe the data we have collected on which the model will be tested and the analytic approach we will employ to test the model. We conclude with a discussion of the theoretical contribution of this work and implications for practice and future research.

BUSINESS ANALYTICS AND FIRM PERFORMANCE

The term business analytics is often employed to refer to the collection, storage, analysis and interpretation of data in order to make better decisions and improve organisational performance (Davenport 2006). It has also been employed to refer to the processes that transforms raw data into valuable information about capabilities, market positions, activities, and goals that organisations could pursue in order to stay competitive (Seufert et al. 2005). These two perspectives underscore two critical issues involved in creating value from business analytics, the role of the technology and the role of human actions.

The functionalities that underpin business analytics technologies include online analytical processing (OLAP), querying, reporting, data mining, visualisation, and statistical and quantitative analysis to analyse business data. The data typically reside in integrated databases and data warehouses that permit easy retrieval for analysis (Seufert et al. 2005). Integration of isolated IS in the recent years has enhanced the scope of business analytics and provided rich, intelligent and real time information to managers. This intelligent information is employed by managers to make informed decisions and investments to improve performance.

For example, drawing upon a case study of United Parcel Service (UPS) Kohli (2007) highlights the critical role of the technical infrastructure, organisational capabilities and processes in identifying and exploiting value creating opportunities. Sustained IT investments provided the firm with highly integrated IS, which enabled UPS's managers to identify opportunities. For instance, UPS's managers employed the technology and organisational capabilities to estimate the costs and profitability of individual routes, which then became the basis for subsequent actions to improve performance. Managers in the firm played a critical role in creating the required changes to create value for the firm. Drawing on Kohli (2007), Sharma et al. (2010) provide a number of key insights into how performance gains and competitive advantage are achieved from the use of business analytics. They argue that even though the business analytics applications are supported by an integrated and centralised architecture, the use of the technology involves multiple users across different functional areas in the firms. Success with business analytics requires exploitation across multiple users and the reconfiguration of existing routines through managerial interventions. Sharma et al. (2010) also argue that performance gains from individual interventions are expected to be incremental and improvements in organisational performance can be expected only through sustained use over a long period of time.

Extending Sharma et al. (2010), we argue that firms capture performance gains from business analytics only through reconfiguring their resources and routines. The reconfigurations of resources and routines rely on the organisational capabilities and managerial cognitions. This conclusion is consistent with descriptions of several other applications of business analytics described in prior research (Davenport 2006; Kohavi et al. 2002; Sharma et al. 2010). However, most prior research has examined the potential of business analytics applications through case studies. A theoretically grounded framework that explicates the mechanisms of how business analytics lead to firm performance is important to further our understanding of the phenomena.

ROUTINES AND AGENCY

Above, we have argued that interventions in organisational routines are important for generating performance gains from business analytics. Routines refer to the "repetitive, recognisable pattern of interdependent actions, involving multiple actors" (Feldman et al. 2003). Earlier treatments of the concept of routines considered routines to be rigid, inflexible and unresponsive to environmental dynamism. As a consequence, it was assumed that routines force organisations into locking themselves into a loop of unchanging patters of actions. While this provides a compelling foundation to explain stability in the organisations, it is argued that it fails to explain change in routines in dynamic environments (Feldman et al. 2003). More importantly, the static notion of routines did not accounting for the role of human agency in the performance and endurance of routines (Feldman et al. 2003).

Feldman and Pentland (2003) extend the static notion of routines and argue that routines have an inherent capability to generate change simply through their ongoing performance. While routines do involve the recurrent pattern of action, the specific actions may be different for different instances of the routines. For example, though organisations may have a routine to update their IS, the specific actions followed to update a financial IS may be different to those followed to update an inventory IS. Feldman and Pentland (2003) argue that even in cases of variations in routines, it is possible to recognise a basic pattern of actions or activities within a routine. Organisational routines are not just individual routines that are performed in the context of an organisation, but involve coordination of multiple participants. The introduction of multiple participants inherently brings

diversity in the information, interpretive schemes and goals of the participants. In an organisation, not everyone can know everything. Individual participants in routines do not have access to the same information and even if they do, each participant's understanding of the information is likely to vary. The actions of every participant are dependent on the actions of other participants. Since the actions are interdependent, routines involve collective performance. Therefore, routines are interwoven into complex interdependencies, and not limited to the immediate actions of the participants. For example, the activities present within the hiring routines in an organisation may vary depending on other routines, such as those within planning and financial allocation routines (Feldman et al. 2003). This perspective considers routines to be a subjective stimulus of human agency. It accounts for the influences of multiple participants on the routines, and for how individual choices of actions and reflexive, self-monitoring, self-aware behaviour influence the evolution of organisational routines (Feldman et al. 2003).

Liu and Pentland (2011) show that routines are dynamic in nature and continuously evolve through the concept of variation and selective retention (VSR). They argue that actions that have occurred in the past exhibit a series of variations, and account for the performance associated with the chosen variations. The present gets incorporated with the past through selective retention. The realised action sequences that meet a certain performance threshold are retained. They also argue, that variation and retention are offsetting in nature when compared to the simple life cycle view. In the simple life cycle, the organisational routine is theorised into three stages: preformation, formation and lock-in, where a selected set of routines become stable in one path. However, due to the offsetting effects, it is argued that routines tend to increase or decrease in complexity over time. Their results showed that when retention dominates the evolution of the routines, the complexity of the routines is decreased and moves towards lock-in. When variation dominates the evolution, the complexity of the routines is increased, where the routines moves away from the lock-in.

DYNAMIC CAPABILITIES AND DYNAMIC BUSINESS ANALYTICS CAPABILITIES

We have argued that routines have the inherent capability to generate change. These changes take place as a consequence of inherent dynamic evolutionary traits, and are not necessarily a response to external influences. This extends the conceptualisation of routines in dynamic capability perspective that investigated the change of routines through external influences (Feldman et al. 2003; Teece et al. 1997).

Dynamic capabilities refer to "the capacity of an organisation to purposefully create, extend, or modify its resource base" (Helfat et al. 2007). Dynamic capabilities perspective highlights the role of agency and organisational routines extending previous theories focused on organisational characteristics and resource properties as drivers of organisational performance (Sharma et al. 2011). The literature in this stream of research has primarily stressed on the actions performed by the managers in creating co-specialised value assets within the firm.

Search and selection processes, and asset orchestration processes undermine the creation of dynamic capabilities in the organisations. Search and selection processes often involve identification of a need or opportunity and formulating actions and resource allocations. It can also involve designing new business models, selecting configurations of co-specialised assets, investments and courses of actions to invest in, and selecting organisational governance and incentive structures (Helfat et al. 2007). Asset orchestration involves combining unique resources and configuring them to co-specialised assets towards creating innovation and new market opportunity. Asset orchestration is underpinned by informed decision making and entrepreneurial capabilities (Helfat et al. 2007).

We argue that business analytics capability enables managers in their search and selection processes. Business analytics consolidate information from various IS and provides fine-grained information with deeper insights, thus facilitating managers to recognise actions to be performed and allocate specialised resources in order to improve firm performance. Since search incurs cognitive and analytical costs, business analytics applications limit managers' overall search and selection costs. On the other hand, asset orchestration involves managerial processes to undertake changes. Based on the insights delivered from the business analytics, managers undertake changes in the form of new products, new services, and new decision making routines. Further, in order for the changes to be effective, coordination, support and alliances are required across the firms. Accordingly, we argue that the ability of the firm to create value by utilising business analytics involves the interventions of human agency to create value from the use of business analytics. We define dynamic business analytics capability (DBAC) as dynamic capability of the firm which assists decision makers' with the availability of rich, intelligent and high quality data accumulated from one or more IS within/across firms to implement value creating performance. This definition aims to extend the definition provide by Sharma et al. (2010) by specifically

accounting for the role of human behaviours and cognitions between the relationship of business analytics and organisational performance.

Earlier discussions suggest the role of agency and interdependency are implicit in organisational routines. Dynamic capabilities are underpinned by routines for identifying competitive actions, allocating resources for competitive actions and implementing competitive actions (Eisenhardt et al. 2000; Sharma et al. 2010). The dynamic interplay between actions and roles of memory within the organisational routines is examined by Miller et al. (2012). They link organisational routine to three different types of memory: procedural, declarative and transactive, and investigate the unique significance played by each memory in the formation and changing of organisational routines. They theorise that the individuals' performances and their ostensive understandings are iterative. Individuals' experiential learning gained through previously performed actions is believed to shape the ostensive aspects of the routine, as individuals draw from their memories to perform the routines. Business analytics application enables individuals with fine-grained information. However, we argue that the ability to draw valuable insights from the information can vary across each individual. When determining the solution, different set of individuals brings different set of skills and past knowledge. Depending on the ability, an individual can contribute towards creating a solution by inheriting responsibilities among themselves and join others' sequential contribution towards finding the appropriate solution. Hence, we assert the importance of agency is critical for business analytics applications to be effective.

The division of labour is influenced by individuals' procedural, declarative and transactive memories. Procedural memory stores the capacity of individual skilful actions, including implicit components of such knowledge. The influences of procedural memory are seen during the performance of tasks. Individuals need not be consciously aware of the procedural knowledge as they act nor fully articulate this knowledge. This is referred to as the "know-how" knowledge. Declarative memory contains individuals' beliefs and images of all sorts, including description, stories and propositions. Individuals access this knowledge by simply thinking. Individuals' rely on this knowledge to assess and interpret situations and draw appropriate responses to respond to those situations. This is the 'know-what' knowledge, which shows individuals' awareness of required tasks. Transactive memory involves when individuals' rely on external knowledge (other individuals' memories) to solve problems that cannot be solved alone. This is similar to accessing memories on demand. Individuals search for assistance by reaching to other individuals and remember them for similar future situations. This enables them to learn who knows what ('know-who') for conducting coordinated activities. Building a transactive memory is considered to be difficult and time consuming. Communications, face to face interactions and prior work experiences on practical problems influences towards building transactive memory (Hollingshead et al. 2003; Miller et al. 2012). It is considered that all the three kinds of memories are essential towards ostensive side of organisational routines. Off all the three memories, transactive memory had large and favourable effects on the efficiency of the routines by reduced time-consuming search or efforts to acquire procedural knowledge (Miller et al. 2012).

Based on the above discussion, we argue that the relationship between the dynamic capabilities and performance gains of the firms involves more than organisational characteristics and resource characteristics. We argue that effects of dynamic capabilities on firm performance are indirect and mediated by other factors. In Figure 1, we propose a framework that relates the effects the effective usage and routines, and how the interventions of training influence the effects between dynamic business analytics capabilities and firm performance. Formally,

H1: Dynamic business analytics capabilities have a significant positive effect on value creating actions.

H2: Value creating actions have a significant positive effect on firm performance.

H3: Dynamic business analytic capability has a significant positive effect on routines reconfigurations.

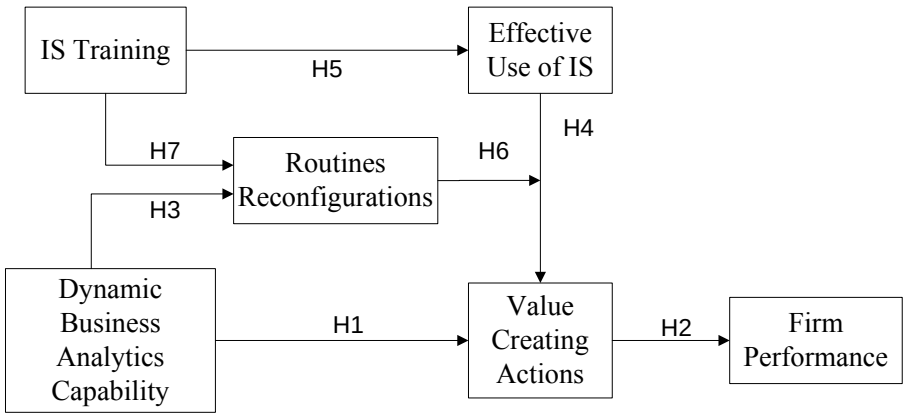

Figure 1: Theoretical Framework

EFFECTIVE USE OF IS AND IS TRAINING

Dynamic capabilities researchers have generally investigated the relationship between IT capabilities and firm performance. Few studies have investigated the drivers or antecedents of dynamic capabilities (Pavlou et al. 2006). Orlikowski (2000) highlights that "technology per se can't increase or decrease the productivity of the workers' performance, only use of it can". Other researchers also underpin this notion (Bharadwaj 2000; Bhatt et al. 2005). While dynamic capabilities enable us to understand the relation between IT resources and IT capabilities, exploring their drivers may give us a better understanding of the phenomenon. More specifically, given that one of the drivers of capabilities and firm performance is the actual use, or usage, of IT resources (Devaraj and Kohli, 2003), we need to explore the antecedents of IS use.

Effective Use in Different Contexts

Burton-Jones and Straub (2006) describe (information) system use in terms of user (who uses the IS), system (the object being used) and task (function being performed) which is a goal oriented activity. Subsequent research refined this definition to emphasise system use to perform a goal oriented activity (Burton-Jones et al. 2012). Recently Burton-Jones and Grange (2012) reaffirmed effective use as "using a system in a way that helps attain the goals for using the system". Such research on effective use in the IS community is emerging and there are calls for developing domain specific theories and models (Burton-Jones et al. 2012; LeRouge et al. 2007). Pavlou and El Sawy (2006) investigated the relationship between effective use of IT functionalities (IT leveraging competence) and process level improvements on effectiveness and efficiency in a new product development (NPD) context. They define effective usage as "the ability of NPD work units to effectively use IT functionalities to support the unit's IT enabled NPD activities". They assert that influence of the effective use of IT functionalities depends on the ability of the work units' awareness and understanding to utilise IT resources and functionalities effectively and take advantage from the same. It is also argued that the strategic effects of IT functionalities are more pronounced in the turbulent environments and it is mediated through the change in routines. Significant emphasis is given to examine the effects of IT beyond the direct effects and investigate how IT functionalities are utilised to leverage the reconfigurations of business routines. This was further extended by investigating the applications of collaborative IT tools in the work group environments (Pavlou et al. 2008). LeRouge et al. (2007) examined the attributes of the use quality on the basis of DeLone and McLean IS success model. They conceptualise the use quality construct in the context of mission critical system development i.e. the use of medical video conferencing for patient exams. The development of this construct was to address the effectiveness of actual usage, i.e. how telemedicine systems are used in socio technical decision making process while treating patients. They define use quality as "intelligent efforts by direct users (medical staff) during the medical video conferencing encounter, with the effect that the effort facilitates desired outcomes". The intelligent effort refers to the extent the medical staff use their medical and technical knowledge towards treating and interacting with patients and other providers. Their study identifies the critical success factors for effective use quality. The first factors highlights that training all the providers with relevant knowledge is essential for effective adoption with new telemedicine settings. The second factor identified interdependency in the firm, the need of medical staffs with clear communication ability for effective adaptability while using the new systems. The last factor highlights individual cognitive capabilities, the providers' attentions while orchestration of the telemedicine encounter.

Dimension and Drivers of Effective Use

The research on effective use has either mainly devoted in understanding the notion surrounding the effective use or has examined the nature and antecedents in a specific context. With the exception of Burton-Jones and Grange (2012) we found no studies that have investigated generalisable drivers of effective use of IS. Based on the foundations on representation theory, they propose the dimensions of the effective use that influence performance efficiency and effectiveness as: transparent interaction, representation fidelity and informed action. Transparent interaction refers to the ability to which users can interact with the representations of a domain without any influences and hindrance from the surface and physical structure on an IS. They argue that transparent interactions within the representations saves user's time leading to efficiency, and this enables the users to focus and perform the tasks effectively. Representation fidelity refers to an extent the IS faithfully imitate its domain's representations. Representation fidelity enables users to better understand the complexities involved in a domain and reduces suspicions, thus enabling effective task closure. Further, it also saves user's time in verifying faithfulness of the representations, increasing performance efficiency. Informed action relates to the extent the users take actions to improve from their current state to a higher state through their interactions with the representations. This enables users to take educated decisions improving performance effectiveness as ill-informed actions can reduce effectiveness. Informed actions is also argued to influence performance efficiency by saving user's time that might have used on recuperating from errors conducted from ill-informed actions (Burton-Jones et al. 2012).

Representation theory informs that users take continuous actions to improve their current state to higher state. Based on this analysis, Burton-Jones and Grange (2012) propose two actions: adaptation and learning as the antecedents for the effective use. Adaptation actions involve user's action to enhance a system's representations of a domain or enhancing the user's interactions through improving surface and physical structures of the IS. Learning actions involve user's efforts to study the IS, the domain it imitates and to what extent it faithfully imitates and leveraging the obtained representations from the IS. The authors argue that adaptation and learning complement each other as any adaptation actions taken by the users will be effective if the users have learned what actions to take (Burton-Jones et al. 2012). The linkage between the antecedents and dimensions of effective usage is as follows. Transparent interactions are improved by either considering the systems as is and learning its representations through its surface and physical structures or by adapting the surface and physical structure in an educated manner, in other words, informed by learning these structures. Similarly, representation fidelity is enhanced by understanding the system through learning what to access and how to access the representations. However, it is argued that users should have learned the systems representations in prior to know what to access. Since transparent interactions is concerned with how the users accesses the representations, coupling the transparent interactions with representational fidelity ensures that users understand what to look for and how to access it (Burton-Jones et al. 2012). Another way is to consider the system as is and adapt to the representations. This inherently involves that users understand the extent the systems faithfully represent their domains. Since representation theory informs that users consider to take actions, these actions will act as informed actions based on the extent the users leverage their knowledge on faithfulness of the systems representations. If the fidelity is not known and has not been understood, ill-informed actions are resulted. Formally,

H4: Effective use of IS has a significant positive effect on value creating actions.

Burton-Jones and Grange (2012) conclude that adaption and learning actions complement each other. In order for the users to take adaption actions, they state that the users should have learnt what adaption actions to take. These actions enhance the effective use of the systems. In the organisations, users often gain the knowledge of an IS provided through training programs. Prior research has shown end-user training plays a crucial role in the successful implementation of IS (Compeau et al. 1995a; Sharma et al. 2007), as well as in the development of an individual knowledge in relation to the use of the technology (Kang et al. 2003). The studies on IS training have investigated in developing individual cognitions and skills in the trainees particularly in examining the extent to which the trainees understand the knowledge and materials imparted during the training sessions (Olfman et al. 2000). Compeau and Higgins (1995b) have further extended towards examining the effects of different methods of training. Drawing from the social cognitive theory, they conclude that behavioural-modelling are more effective than traditional lecture based trainings. Yi and Davis (2003) has examined the role of training on individual knowledge and individual task performance. They argue that effect of training on outcomes is mediated through observational learning process. They assert that effects of training is not only observable at the individual level learning through enhanced declarative knowledge and self-efficacy, but also that the training outcomes contribute directly to immediate and long-term individual task performance. Training, as an organisationally sanctioned activity serves to legitimise the behaviours that are the focus of the training program and increases the likelihood that those behaviours will be enacted in practice by the trained end-users (Jones et al. 2008; Kohli et al. 2004). Similarly, training legitimises the goals and outcomes that the training program stresses (Jones et al. 2008; Kohli et al. 2004). Goals serve to focus attention, energy and effort on the value creating actions, leading to higher levels of performance (Locke et al. 1990). Formally,

H5: IS Training has a significant positive effect on effective use of IS.

Higher levels of use of IS resources alone do not contribute to improvements in performance. Use must be backed by learning of directed and effective use to enhance performance-related routines. When technology is employed merely to automate existing business processes or routines (Hammer 1990), its impact on performance will be limited. Even if training were effective and lead to higher levels of effective use, firm performance is not likely to improve in cases where existing routines have not been improved to leverage the capabilities of the technology (Kohli et al. 2008). Such effective use, therefore, results from the training of managers because such training enables managers to draw a link between the IS functionality and the capabilities required to improve performance. Training enables managers to match IS prowess with improvement in specific routines that managers perform, rather than general efficiency. Examples of how IS use with changes in routines, for example, through reconfigurations of routines, and improved performance have been previously cited (Grover et al. 1995; Scott Morton 1991). Formally,

H6: The effect of effective use of IS on value creating actions is moderated by routines reconfigurations.

TRANSACTIVE MEMORY SYSTEMS AND IS TRAINING

While prior research has demonstrated the effect of training on individual-level outcomes, extending those findings to an effect of training on organisational-level outcomes is not straightforward. An implicit assumption underpinning the above stream of research is that usage is voluntary. For instance, Compeau and Higgins examined the effect of training in the context of spreadsheet and word processing packages while Yi and Davis studied the use of a spreadsheet package among a group of students. However, organisational applications often involve contexts where use is not volitional (Wu and Lederer 2009). In particular, usage is not likely to be volitional for IS applications involving interdependent use (Sharma and Yetton 2003; Sharma and Yetton 2007). Consequently, the mechanisms through which training contributes to firm performance are likely to be different in this context.

Recent literature has expanded from the focus of examining the effect of IS training in developing individual cognitions to examining the role of training towards developing inter-individual cognitions (Kang et al. 2003; Sharma et al. 2007). Transactive memory theory has been the primary foundation for the IS literature that has examined the inter-individual cognitions. The theory is based on the foundation that individuals can act as external memory aids. According to the theory, individuals in a group or teams are expected to benefit from each other's knowledge, skills and expertise provided that the individuals have developed a productive and shared understanding of who knows what (Sharma et al. 2007; Wegner et al. 1985).

A transactive memory is built on two components: internal and external memories. It is argued that individuals frequently learn new knowledge which is stored in their own memory i.e. internally. Individuals more often rely and utilise knowledge encoded outside their internal memories. These external memories can be documents, records, books or even other individual's memory. Thus, individuals' indexes their knowledge which is outside the internal memory along with its location but not the complete knowledge which is present in the external memory (Wegner 1987; Wegner et al. 1985). Thus, the key element of the theory lies on the individuals who play the roles of external memories for other individuals in the groups/teams, who successively encode meta-memories (memories about the memories of others). Meta-memories consists of two components: information contained in the memories of individual group members, and knowledge relevant communication processes among the group members (Sharma et al. 2007; Wegner et al. 1985).

Research has indicated that transactive memory clearly serves as a medium for enhancing group performance, where individuals in the group are aware of the "who knows what" than the groups whose members are not aware of other member's knowledge (Argote et al. 2003; Hollingshead et al. 2003). Training develops a shared understanding of the task among interdependent users, leading to higher levels of business-procedural knowledge among users and more effective transactive memory systems (Kang et al. 2003; Lewis 2004; Sharma et al. 2007). In addition to developing individual capabilities, training also contributes to developing organisational capabilities. Though individual skills provide one of the foundations for organisational capabilities, organisational capabilities are more proximally related to organisational performance than individual skills (Willcocks et al. 2007). The development of an effective transactive memory system has been associated with higher levels of group performance (Brandon et al. 2004; Hollingshead et al. 2003; Liang et al. 1995). Training a larger number of users leads to the development of an effective transactive memory system, an organisational-level capability. In contrast, training only a few lead users is likely to lead only to the development of isolated pockets of individual skills. While transactive memory aids in better utilisation of knowledge by enabling the individuals to access extra relevant external knowledge, training is shown to provide a platform for the development for transactive memory (Argote 2005; Liang et al. 1995). We argue here that while well-developed transactive memory systems among end-users can contribute to task performance in small groups of end users, substantial contributions to organisational performance are more likely when managers develop more effective transactive memory systems. The ability of managers to impact organisational performance is much higher than front line end users. Further, providing IS training to a large number of managers leads to the development of a more effective transactive memory system at the organisational level because managers can better leverage training goals by reaching out to other trained colleagues, for example by sharing best practices and by seeking solutions to residual issues. In contrast, training one or a few managers is likely to lead only to the development of isolated pockets of individual skills. Consequently, training a larger number of managers leads to the development of a more effective transactive memory system for the firm and higher levels of organisational performance. Formally,

H7: IS Training leads to higher levels of routines reconfigurations.

RESEARCH METHODOLOGY

In order to test our proposed theoretical framework, archival data for IS training and IS use from a multi-organisational health system has been collected. The data comprise the use of Decision Support System (DSS)

by managers over a period of 10 years. The DSS is used by department managers and administrators for making decisions on resource utilisation, reconfiguration of routines, cost management and contract performance. All the users in the organisations were trained for the base DSS functions. The dataset includes date of training and the type of training. A second training session pertains to specialised modules depending upon the users' department and responsibilities. Dataset from the second training session include the name of the trainee, their function, organisation, department, and IS module.

Our data also contains hospital process performance, extent of reconfigured routines, and IS use. Organisational level performance metrics contain financial, quality, and patient outcomes such as return of assets (ROA), revenue, and patients' length of stay (LOS). These variables are also reported to accreditation and governmental agencies. Our data spanning 10 years allows us to examine lags between IS training and performance.

Previous research has examined how use influences performance (Devaraj et al. 2003). Utilising our proposed model, we will test our hypotheses that training influences IS use. We will conduct multiple regression analysis to examine the impact of training upon IS use. In addition, we will conduct mediation tests to explicate how value creating capabilities and reconfiguration of routines influence organisational level performance (Baron et al. 1986; Preacher et al. 2004; Sobel 1982).

DISCUSSION AND CONCLUSION

Current literature has examined the role of business analytics in attaining competitive advantage. Research has also asserted business analytics as potential tool for the firms in strategy creation and distinguishing themselves from its competitors. Indeed, studies from Davenport (2006) indicated firms that exploited the business analytic applications were aggressive and clear leaders in their domain. While much is known from prior research on the potential business value of business analytics and the role of the technology, research on the role of human agency and their interaction with business analytics is still at the embryonic stage. In response to the calls for a more comprehensive theoretical framework, this paper has attempted to explicitly emphasise on the role of the human agency as the imperative organisational capability firms should possess in order to maximize the business analytics capabilities.

This paper has developed a theoretical framework modelling the relationship between the dynamic capabilities, routines, transactive memory systems, IS training and effective use of IS. The key contribution of this paper is the framework which identifies the organisational factors necessary for the firm performance from the use of business analytics. This paper makes a theoretical contribution by extending the routines literature. We have argued that performance gains of any particular routines depend on the individuals' learning and cognitions developed over time. Prior research shows that organisational routines involved interdependencies among multiple participants. Linking theories from transactive memory systems provides deeper understands of the influences of interdependencies on organisational routines.

In addition, this paper also extends the notion on effective use of IS to include a critical antecedent – IS training. Burton-Jones and Grange (2012) framework identify learning and adaptation as antecedents of effective use and provide insights into the relationship between learning and adaptation. Learning and adaptation complement each other because adaptation actions is believed to be more effective if the users has learned what actions to be performed. In this paper, based on the foundation of transactive memory systems, we argue that training provides the platform for the users in the firms towards learning and adaptation. Training enables developing users' cognitions and skills, thus imparting the knowledge provided in the training sessions. A review of other literature (Compeau et al. 1995b; Yi et al. 2003) also confirm the same. Our framework offers an insight that training is the mechanism that facilitates the learning that leads to adaptation on the part of managers. In other words, use of IS leads to performance through learning and adaption, both of which are mediated by training.

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