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Realising Synergy in Business Analytics Enabled Systems

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Realising Synergy in Business Analytics Enabled Systems

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Abstract

The synergy of IT resources with other organisational resources is important in achieving operational and strategic benefits. The synergistic interaction between IT resources and other organisational resources leads to the emergence of new IT-enabled organisational resources, which are capable of generating significant organisational value. The aim of this paper is to understand how this synergy is realised between IT resources and other organisational resources. Based on a synthesis of relevant literature, we propose six enablers and mechanisms which lead to synergy. To assess the content validity of these enablers and mechanisms, we conducted ten one-hour interviews with Business Analytics (BA) experts. The results assisted us in refining and contextualising the enablers and mechanisms for BA systems and led to a clear and comprehensive definition of synergy. The paper concludes with suggestions for empirical research to further refine our definition of synergy.

Keywords

Synergy, Systems theory, Business Analytics Systems, Emergence

INTRODUCTION

The synergy of Information Technology (IT) resources with other organisational resources is one of the fundamental concepts in achieving organisational value from IS resources (Nevo and Wade 2010). Synergy refers to the combined effects of resources in accomplishing organisational tasks. Synergy ensures that resources reinforce and complement each other and create outcomes greater than the additive effects of each resource in isolation (Tanriverdi 2006). Synergy provides a strong explanation for the business value created by IT resources and how they can impact the competitive position of an organisation (Nevo and Wade 2010, 2011). Early Information Systems (IS) research was unable to demonstrate that investments in IT provided business value, with some arguing that IT was a commodity and not associated with strategic value (Brynjolfsson 1993; Carr 2003; Lucas 1999). Since then researchers have conceptualised the business value of IT using the construct IT resources, comprising IT assets and capabilities (Aral and Weill 2007). IT assets include hardware, software and data, and capabilities include competencies (skills and knowledge) and practices (routines and processes) (Aral and Weill 2007). Researchers have measured the impact of IT resources on firm performance and competitive advantage, and found that IT resources positively and indirectly influence firm performance (Elbashir et al. 2008; Mithas et al. 2011; Pavlou and El Sawy 2006). This indirect relationship implies that IT resources augment other organisational resources. Together, they may be conceptualised as higher-order IT-enabled organisational resources, which influence firm performance (Bharadwaj 2000). Hence, IT resources are not able to create organisational value in isolation. They generate organisational value by complementing other organisational resources (Tanriverdi 2005; Wade and Hulland 2004). The complementary relationships can result in *synergies* between resources (Grover and Kohli 2012; Melville et al. 2004; Nevo and Wade 2010, 2011; Tanriverdi 2006). When IT and other organisational resources are *synergistically* related they mutually reinforce each other, leading to outcomes greater than the additive effect of the individual resources. However, little extant IS research has focused on synergy as the main phenomenon. In particular, how synergy between IT resources and other organisational resources should be conceptualised. Thus, this paper addresses the following research question:

What is synergy between IT and other organisational resources and how can it be conceptualised?

To answer this question, we explore the enablers and mechanisms that lead to synergy between Business Analytics (BA) resources, an important subset of IT resources, and other organisational resources. BA systems use analytical tools and techniques to transform the raw data of an organisation into meaningful information. Insights from BA systems enable organisational decision makers to take competitive actions that differentiate

them from their rivals (Davenport and Harris 2007). Industry reports and case studies have highlighted the significance of these systems in achieving organisational value and competitive advantage (Davenport 2007; Sharma et al. 2010). Recently, business intelligence (BI) applications were ranked the first technical priority for CEOs (Gartner 2012) and BA was identified as one of the four major technology trends in 2010 (IBM 2011).

The paper is structured as follows. The next section defines synergy and discusses the enablers and mechanisms associated with synergy and how synergy is realised. Following that we discuss systems theory and why it is important in conceptualising synergy. Then we present our research model, which conceptualises the synergy of BA systems and other organisational systems, leading to the emergence of BA-enabled organisational systems. We particularly focus on defining the enablers and mechanisms for synergy. Following that we present an empirical study, involving interviews with ten BA experts, which refines and contextualises the concept synergy. We then discuss the implications of our work for researchers and practitioners and finally conclude the paper.

BACKGROUND

The term synergy comes from the Greek word '*synergos*', meaning 'working together'. In this paper, the concept synergy refers to the combined effort of resources to generate outcomes greater than the additive impact of the individual resources (Tanriverdi 2006). This outcome is the result of interactions, in which resources enhance the effectiveness of each other in accomplishing organisational goals. Hence, synergy is associated with positive outcomes (Nevo and Wade 2010; Roberts et al. 2012; Tanriverdi 2006). Figure 1 presents a framework to analyse the concept synergy (Someh and Shanks 2013). The framework shows that certain enablers and mechanisms of synergy will lead to the realisation of synergistic outcomes. Each of these concepts and their components are discussed in the following section.
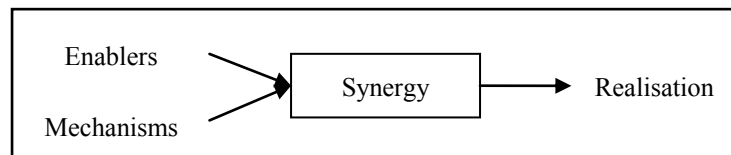

Figure 1: A Framework for Analysing Synergy

Synergy enablers

The enablers of synergy are the factors that facilitate synergistic interactions and influence the success of synergy (Someh and Shanks 2013). *Compatibility* and *integration effort* are two factors to enable synergy among IT resources and other organisational resources (Nevo and Wade 2010). *Compatibility* refers to the degree to which systems fit with each other and are in alignment. Compatibility is achieved when systems are able to seamlessly work with each other. *Integration effort* refers to the effort of management to bring the resources together and guide their interaction congruent with organisational goals (Nevo and Wade 2010).

Synergy mechanisms

Synergy mechanisms are the processes and activities that take place to achieve a synergistic interaction. We distinguish between two types of mechanisms: *complementarity mechanisms* and *boundary spanning* mechanisms. These two mechanisms and their components are described below.

Complementarity mechanisms refer to the practices by which resources are combined to enhance and complement each other's functionalities. The economic theory of complementarities argues that a set of resources is complementary when the returns from any one resource vary in relation to the levels of returns from the other resources (Milgrom and Roberts 1995). Complementarity mechanisms for realising synergy include *reinforcement*, *flanking*, and *compensation*. *Reinforcement mechanisms* occur when resources consistently work with each other, make crucial contributions to each other and enhance each other's organisational impact (Ferratt et al. 2012). *Flanking mechanisms* occur when one resource creates conditions that enable another resource to improve its effectiveness (Ferratt et al. 2012). In the case of *compensation mechanisms*, one resource blocks or diminishes the negative effects of another resource with respect to organisational goals (Ferratt et al. 2012).

Boundary spanning mechanisms refer to the practices that help resources to bridge the knowledge gap between domains. These mechanisms assist complementary resources to achieve a shared language for collaboration and mutual understanding. *Embeddedness*, *learning* and *influence* are the three components of boundary spanning mechanisms. *Embeddedness* occurs when social ties are created between groups of people based on familiarity, trust and commitment (Granovetter 1985). These social ties connect resources from different contexts to collaborate, share knowledge and develop social capital (Evans 1996). *Learning* mechanisms help the resources to sense their environment and exploit the opportunities offered to them (Chellappa et al. 2010; Venkatesh and Bala 2012). They can also help them to better understand each other's values and norms (Venkatesh and Bala

2012). *Influence* mechanisms constrain organisations and individuals to conform to norms, traditions and social expectations (Venkatesh and Bala 2012). Furthermore, resources can influence each other and develop a shared mental model through their interactions, becoming aware of each other's plans and reactions.

Synergy realisation

Synergy is associated with outcomes that are greater than the sum of the value of their individual parts. When synergy is realised, it will give rise to the emergence of new properties which cannot be reduced to individual resources (Nevo and Wade 2010, 2011). Emergent properties may include improved firm performance. Positive emergent properties drive synergistic outcomes and synergistic outcomes provide additional leverage beyond the independent effects of each resource in isolation.

SYSTEMS THEORY

Systems theory deals with systems taken as a whole, rather than individual parts (Ackoff 1971). A system is a composite thing comprising a number of subsystems, which interact to accomplish a set of goals (Churchman 1968). The whole system, derived from the synergistic interaction of the parts, equals the sum of the parts plus their interactions (Ackoff 1971). The synergistic interactions lead to positive emergent properties, which contribute to a system's goals (Churchman 1971). An organisation, with respect to systems theory, can be conceptualised as a set of interconnected subsystems (Kast and Rosenzweig 1981). This contrasts with the Resource Based View theory, which views an organisation as a bundle of resources (Barney 1991). However, an organisational system from the systems theory perspective is conceptualised as a resource from the RBV perspective (Nevo and Wade 2010). The use of systems theory helps model the synergy among resources, which is not possible using the RBV.

RESEARCH MODEL

The research model (Figure 2) utilises systems theory to conceptualise a path from the synergy of BA systems and other organisational systems to the emergence of BA-enabled organisational systems. BA and other organisational resources are conceptualised as two organisational subsystems comprising assets, competencies and practices. The synergistic interaction between them leads to the emergence of BA-enabled organisational system. This synergy is realised when certain enablers and mechanisms are present. Definitions of constructs are summarised in Table 1. However, the focus of this research is to identify and provide evidence for the enablers and mechanisms of synergy. Therefore, we will mainly focus on the synergy construct. Details of the other constructs are provided first to better understand the synergy construct.
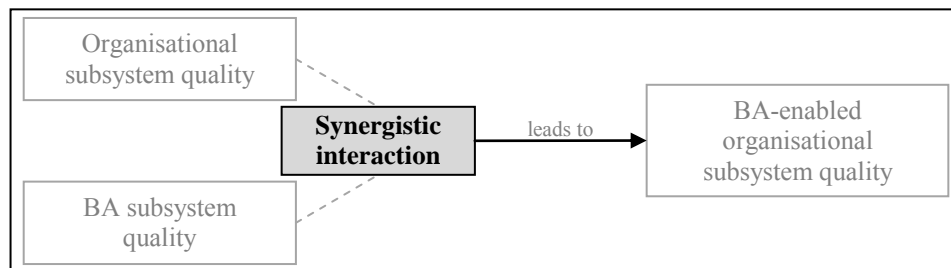

Figure 2: Synergy of BA systems with other organisational systems

1. Organisational subsystem quality

Organisational subsystem quality refers to the quality of the properties that emerge from the synergistic interaction between assets, competencies and practices in a functional area of an organisation. These properties emerge from the complementary relationships that exist between the assets, competencies and practices and therefore the synergies within the boundaries of this construct (Aral and Weill 2007). For example, a CRM subsystem includes CRM software, competencies and processes. CRM subsystem quality refers to the degree to which a CRM subsystem is able to successfully manage relationships with customers through marketing, sales and service provision.

2. BA subsystem quality

BA subsystem quality refers to the degree to which the BA subsystem is successful in storing, analysing, reporting and interpreting high quality data. The BA subsystem is composed of assets, competencies and practices. However, the BA subsystem is only effective when these components are synergistically combined. Hence, the BA subsystem quality construct can be conceptualised as a second-order construct with data storage quality, data analysis quality, reporting quality and interpreting quality as its reflective indicators.

Data storage quality refers to the degree to which the BA subsystem is successful in capturing high quality data from different sources such as legacy systems using extract-transform-load (ETL) techniques to store the data in data marts and data warehouses (Davenport and Harris 2007).

Data analysis quality refers to the degree to which the BA subsystem is successful in utilising statistical techniques and data mining tools to predict the future (Davenport and Harris 2007).

Reporting quality refers to the degree to which the BA subsystem is successful in utilising dash-boarding, online analytical processing (OLAP) and visualisation to describe the past (Davenport and Harris 2007).

Interpreting quality refers to the degree to which the BA subsystem is successful in gaining insight from the data using BA (Davenport and Harris 2007).

3. Synergistic interaction

The *synergistic interaction* between the BA subsystem and the other subsystem refers to the joint effort of these subsystems in accomplishing organisational tasks and generating greater value than the sum of the individual value achieved by the BA subsystem and the other organisational subsystem in isolation. A synergistic interaction is only realised when the BA subsystem complements and reinforces the other organisational subsystem by providing it with new or modified capabilities (Nevo & Wade 2010). This synergistic interaction is realised when certain enablers and mechanisms are in place. The enablers of synergy are compatibility and integration effort (Nevo and Wade 2010) and mechanisms are reinforcement, embeddedness, learning and influence are the four mechanisms that lead to synergistic outcomes (Ferratt et al. 2012; Venkatesh and Bala 2012).

Compatibility between the BA subsystem and other organisational subsystem refers to the degree to which the functionality of the BA subsystem fits with the functionality of the other organisational subsystem. It is achieved when the BA subsystem and the other organisational subsystem are able to seamlessly work with each other (Nevo and Wade 2011). Compatibility ensures that the other organisational subsystem is capable of utilising the analytical tools and functionalities provided by BA resources in their processes and routines. Conversely, the BA tools and functionalities provided should match the decision needs of the other organisational resources, as different organisational resources may need different analytical functionalities (Isik et al. 2011).

Integration effort refers to the effort of management to bring the BA subsystem and the other organisational subsystem together and encourage and direct their interaction to achieve organisational goals (Nevo and Wade 2010, 2011). The integration effort of management acts as a catalyst in initiating, supporting and guiding the interaction between BA resources and other organisational resources. Without this effort, the organisational resources may not change from their traditional processes to fact-based analytical processes. The management activities may include providing training to users and changing the organisational structure and culture to properly accommodate BA resources in relationship to other organisational resources.

Reinforcement mechanisms occur when two subsystems consistently work with each other, add crucial contributions to each other and enhance each other's organisational impact (Ferratt et al. 2012; Wade and Hulland 2004). For example, the BA subsystem provides solutions for the other organisational subsystem and together they generate more organisational value.

Embeddedness mechanisms enable boundary spanners from the BA subsystem to make social ties with their counterparts in the other organisational subsystem (Venkatesh and Bala 2012). These social ties can be exploited to develop social capital, and exchange and disseminate knowledge. BA embeddedness can change the core values, behaviour and processes so they are based on BA and spread an evidence-based decision making culture within the organisation (Shanks and Bekmamedova 2012).

Learning mechanisms of the BA subsystem help to sense and exploit new opportunities to implement BA initiatives and then evaluate the effectiveness of these initiatives after implementation and learn from their experiences (Shanks and Bekmamedova 2012).

Influence mechanisms enable the BA subsystem to change the core values and norms of its counterparts to be based more on analytics and therefore encourage the adoption and use of BA in their processes and routines (Venkatesh and Bala 2012).

4. BA-enabled organisational system quality

BA-enabled organisational system quality refers to the quality of the emergent properties arising from synergy between the BA subsystem and the other organisational subsystem. This system possesses emergent properties, arising from the complementary synergies between BA subsystems and other organisational subsystems. The emergent properties cannot be reduced to any individual BA subsystem or other organisational subsystem.

Table 1: Definitions of constructs in the research model

Constructs	Definition
Organisational subsystems quality	The degree to which an organisational subsystem is successful in accomplishing its organisational goals.
BA subsystem quality	The degree to which the BA subsystem is successful in storing, analysing, reporting high quality data.
Synergistic interaction	A complementary relationship between a BA subsystem and an organisational subsystem, in which the outcomes generated are greater than the sum of the individual effects of the BA subsystem and the organisational subsystem in isolation.
BA-enabled organisational system quality	The quality of the emergent properties arising from synergistic interaction between a BA subsystem and an organisational subsystem.

EMPIRICAL RESEARCH DESIGN

In order to refine and contextualise the enablers and mechanisms of synergy proposed in the previous section, we conducted an empirical study involving interviews with 10 BA experts. Each interview was of approximately one hour duration, and conducted in Australia in June 2013. The BA experts included five highly respected BA academics and five highly experienced BA professionals. Each interview was recorded and later transcribed. Notes were also taken during the interviews. Qualitative data was analysed in relation to the six enablers and mechanisms of synergy: compatibility, integration, reinforcement, embeddedness, learning and influence.

RESULTS

Detailed discussion of each of the six enablers and mechanisms of synergy, together with evidence from the interviews, is provided below.

Compatibility

All of the interviewees identified compatibility between the BA subsystem and other organisational subsystem as a necessary condition for synergistic interaction. Compatibility between the two subsystems ensures that they are able to seamlessly work with each other in terms of data, technologies and human skills and knowledge. To support this, an information manager argued that the technological gap between different subsystems is a barrier for achieving a synergistic outcome:

"I will be very conscious about the balance between business units. The basic assumption is that both BA and the other business unit are at the same peer level. Generally, in organisations you will find business units like finance, which were on excel spread sheets and they moved to Hyperion and now they are using tools like OBIEE [Oracle Business Intelligence Enterprise Edition] and then end up building smart data marts and then do analytics and they become absolute thought centres for all things analytics. This doesn't mean the guys in the supply chain and manufacturing business unit are nearly there. They can still be on Excel spreadsheets using legacy systems aged over 30 years old and so when you are looking for that synergy, here is your centre for excellence. Your centre for excellence is, on a scale from 1 to 5, a 5 and the rest of the business is 0.5. You can't get synergy with that much disconnect."

He also added that the 'balance' between two organisational subsystems also requires a shared business language across the subsystems. This enables the people from different knowledge domains to communicate with each other. This can be achieved when the subsystems have a mutual understanding of their functionality.

"I will be very conscious about the balance between business units. It is the initial challenge. That is the starting point and that is why change management is important. If you cannot take people to a common level you cannot move forward. And you need to move both forward at the same time. They have to get there together. If one is sprinting and the other crawling, that doesn't suit the organisation."

The head of BA from another company added that data definitions and data standards should be compatible so that the software systems talk to each other and exchange data.

"If you cannot agree to the terms that you call something, if your definition of a customer is different to my understanding of a customer, you can't move forward. It just gets down to the very basic level and then processes and behaviours and working as a team comes long after that. But the very basic level is about the data and if it is not understood, you are not getting over it. Because if you are looking at the master data, you need to get consensus and if you are looking at discrepancies in data and you need someone to look at data and what is the right data: you need consensus. Technology will agree to standards based on input

masks. If you ask a room of ten people to define margin, you might get five different answers. So that is big challenge."

"Through understanding their business, I can understand the source system that provides data. So they may [other organisational subsystems] work with 5 or 6 systems that have their 3 or 4 definitions of customers and products. I need to be able to understand that and rationalise that and ask them how they work."

The BA subsystem needs high-quality business data to be able to work with the other organisational subsystem and generate insights. This means that the other organisational subsystem should be compatible with the BA subsystem, and should record high-quality data in their operational databases or other source systems. A BI analyst from a financial company argued that:

"Data format not so much an issue. Data quality is a huge issue, one of those big risks. In terms of a challenge to a project, I don't care if it is Excel, Access or Oracle, but if data is not consistent and trustworthy, then it is a bigger problem."

Integration effort

Management is responsible for supporting the interaction of the BA subsystem with the other organisational subsystem and to decide how this interaction will help the organisation in achieving its goals. When management supports the BA initiatives, BA initiatives can get sufficient financial and organisational support to be implemented. The following argument provides evidence that management support is a critical factor in initiating the BA initiatives.

"There are lot of vehicles in making that happen [establishing analytical capability]. There are things that companies like Gartner talk about, BICC [Business Intelligence Competency Centre], data governance group or centre of excellence. There are vehicles to make that happen. Without those you don't get that cross-pollination of ideas or the cross- organisational buy-in, unless you have someone to coordinate that, it does not happen organically. You need a project or high-level stakeholder to buy into it and agree that creation of that group is a priority. A contribution to that group is the KPI [key performance indicator] thing against your individual performance. So this is kind of fundamental to integrate those things."

An important aspect of management's integration effort is managing the change from a traditional way of performing processes to collecting high-quality data from different sources and acting on the data. The BA subsystem and the other organisational subsystem may not be compatible when they start their interaction. Effective change management is important to ensure that the two subsystems and their components are aligned and are able to seamlessly work with each other. This was supported by an information manager:

"When management senses that there is going to be measurable business value, from the manager's perspective, it is change management. From his perspective, he needs to recruit these people, close down that unit or reopen another one or re-educate people."

"You equip people like me that have got twenty years of experience in information management and we come to say that the earth is not flat and is actually round and you have to take people on a bit of journey. To get to the point that we get the synergistic interaction, you have to get everyone aligned and to a common level of maturity. Otherwise you can't move forward together. It is very advanced to get any kind of synergy between information systems and any application systems. A lot of companies see BA as a magic bullet that turns the business around. The thing that is changing your business around is change management."

The head of BA at another organisation noted that managing the change mainly includes recruiting people with new required skills, changing the culture, educating people and changing the processes to collect high-quality data and act on that data:

"The people that work with the information have a specific mindset. I would like to think that most people that I have got have equal creativity and equal analytical capability. If you have got both, you tend to have more motivation than when you have got one. You cannot bring in change without bringing in different people. Quite often the people are not there. So recruitment is one of the key things that helps. You really need to build a mix. So if you have got so many passive people (bunch of followers), then you deliberately go to market and recruit some leaders. They can have exactly the same technical skills. From my perspective, both can deliver. But in terms of team dynamics, it is going to make much better team."

"The change is predominantly cultural change: business culture change and also educating them. Education is different from training. I send ten people to technical training course and they know how to use a BI tool. I can teach people from my experience how to resolve analytical problems. That means going to the business and understanding the business and what to do next, understanding how to build a process to resolve problems. I don't care if they don't know how to use a tool. They can sit and learn how to use it. This is BI tool, if you don't know to use it 10 different way, you are going to use it one way."

Reinforcement

The reinforcement mechanism suggests that the BA subsystem should consistently work with the other organisational subsystem and enhance its effectiveness and efficiency. The BA subsystem provides the other organisational subsystem with meaningful information and insight. This enables the other organisational resource to act based on facts instead of intuition and create more value. On the other hand, the other subsystem should fully engage in BA initiatives, try to enhance the understanding of BA people about what works in their business unit and define challenging business problems that will lead to more learning for BA people. This continuous engagement of the two subsystems will result in a mutually reinforcing behaviour, in which higher organisational impact is created. The head of BI at one company noted:

"If you put too much on the value add in a project, they don't see it. If they ask for x and y and you give them x, y, z and more, they don't necessarily appreciate what you have given them. So you wait for that return and re-engagement. They are getting there. We built a solution that is covering 50% of requirements. Definitely iteration happens but it doesn't begin to add value until the business unit starts to get some mature questions to ask in the first place."

Learning

Learning is a mechanism, which BA people can learn about their counterpart subsystem and also learn from their experiences after implementing BA initiatives. BA subsystems need to understand the business of their interacting partner. For example when BA starts to interact with CRM systems, BA people should learn about the processes, functionalities and business terms of the CRM subsystem and minimise the knowledge gap between the two subsystems. The head of BI at one organisation supported this:

"You can't even begin to do any good data analysis or apply any intelligence to data unless you understand the context that is being used. That is learning their business."

With this mechanism, the BA subsystem should get to the point where they completely understand their counterpart subsystem. This will assist BA people in analysing the business and providing solutions:

If we are going to deliver value to business, we are going to know the business better than they know it. Because we have to know their data, processes, structures better than they do to be able to give them insight. They may talk to us about their processes but we actually do understand what is going on under the covers to make it work. So they may ask us to give them analytics in one specific area, maybe 25% of their business, and we cannot design a solution just looking at 25% of the data. We have to look at the whole landscape. So when they come back for another iteration or enhancement of more information, we already have got it.

On the other hand, a lot of learning comes from implementing BA initiatives and understanding what works and what does not work. Learning from experiences helps the BA subsystem in getting more competent in providing solutions and the other subsystem in acting on data and embedding analytics in their practices.

They should do [learn from experience]. Whether they do or not, depends on the individuals quite often. You get people that are really good at thinking but not good at doing. In terms of whether they learn from the project, it is actually quite funny, you expect it to be the other way around. People that are normally good at thinking are more static. The doers tend to be quite adaptive. The thinkers tend to think that they have got a number of concepts they are familiar with and to shake them away from that, to help them with their personal development can be quite tricky.

Influence

The influence mechanism provides the BA subsystem with the ability to change the mindset, behaviour and culture of their managers and interacting subsystem to believe in analytics and spread the concept of fact-based decision-making. One BI analyst noted that influence occurs when BA initiatives are successful:

Each time that we implement one of those initiatives, our goal is to influence the business and people to think in those terms and change the way they feel and think about business and the only way is to show them that it works. I would classify something as a success, if it is implemented in a business and everyone knows about it and knows what level you are at. If everyone in the business speaks the same language that we have developed, that is a success. Success provides a proof of concept and then everyone wants it.

Furthermore, creative BA people can directly influence the business. But most of the time, influence happens indirectly through managers.

Getting the feed-back loop with business and beginning to influence the business requires a different kind of person from the BA norm. I think when an organisation wants to introduce any kind of analytical tools, they can create an analytical dashboard for the CEO, CFO and CIO. Once they have got very specific analytics that addresses their needs, then they start to evangelise it. If that does not work, you cannot go to those

people. If you go to them with direct reports, provide them tools that C-level people can look at, they will say how did you get that piece of information? Then they will kind of get an offer for you that day. You have to work in this business unit and I will talk to this guy from another business unit to spread the word. So they kind of do it for you. It is more bottom-up than top-down. So it can be a challenge. I believe in BA but in naive or immature organisations you have to push up, push a bit higher to push it down."

Embeddedness

The embeddedness of BA in the fabric of the organisation was recognised as an important factor in driving synergy. Analytics embedded in the other organisational subsystem means that BA becomes a component of the other organisational subsystem in terms of people skills, behaviours, culture and processes. This can be achieved in mature organisations. One BI analyst supported this:

"We built a propensity model to identify the likelihood of someone purchasing a product. We did a test. We had sample customers and then we proved that calling these people will get positive presentation rates with these characteristics (demographic or psychographic). So we tested against data that we have got in an outbound telemarketing list. We grab a sample of data, we provide them we stats and tell them this H group are more likely to purchase or this H group more likely to buy other products. We have embedded this propensity model in the agents' processes to provide the right information in the right time. Utilising this model generates value for the business. Then, we keep testing regularly to sharpen our propensity model."

Embedded analytics provides input to decision making within the other subsystem. With this mechanism, the decisions are based on evidence and data are available for the decision maker at the right time. One academic supported embeddedness with the following argument:

"For a successful data warehousing project, integration for getting BA embedded is important. When you read the case studies, Continental airline or UPS, they explain what they did and they say that this is now part of the process. So it is all embedded in the organisational processes. e.g in the UPS case, when they identified bad addresses, the process of doing that is updated. They are getting the analytics system to tell their logistic system what to do and this drives the success."

Summary

Refined definitions of the six enablers and mechanisms for synergy are presented below in Table 2.

Table 2: Enablers and Mechanisms for Synergy

Enablers/mechanisms	Refined definition
Compatibility	The degree to which the BA subsystem fits the business and decision needs of the other organisational subsystem. The people and software systems from both subsystems are able to communicate with each other.
Integration effort	The degree to which management supports and guides the BA subsystem to solve business problems. Change management is crucial and includes hiring the right people, educating current employees, influencing the culture, and changing the organisational structure to properly accommodate BA resources in relationship to other organisational resources.
Reinforcement	The degree to which BA is utilised in the other organisational subsystems' processes and routines to enhance its effectiveness. The other organisational subsystem can enhance BA by providing high-quality data, business knowledge and business problems.
Learning	The degree to which the BA subsystem is capable of learning from the business environment and from their initiatives and experiences. This mechanism helps BA to be more dynamic and get more competent over time.
Influence	The degree to which BA subsystem is capable of changing the mindset, attitudes and culture of the other organisational subsystem to utilise analytics.
Embeddedness	The degree to which BA is entrenched in the mindset and behaviour of people and is frequently used in the processes and routines of the other organisational subsystem.

CONCLUSION AND DISCUSSION

Recognising the important role of synergy between IT resources and other organisational resources in realising benefits from IT, in this paper we explored how synergy is realised between BA systems and other organisational

systems. We specifically explored the enablers, mechanisms of synergistic interactions between BA systems and other organisational systems. To assess the validity of the enablers and mechanisms in the context of BA systems, we conducted ten one-hour interviews with expert BA academics and practitioners. We then developed refined and contextualised definitions for six enablers and mechanisms of synergy.

These enablers and mechanisms of synergy are an important contribution to the BA literature, and are based on synergy between resources. This extends previous work, which focuses mainly on synergy of IT assets and other organisational resources. For example, previous work on *integration effort* was limited to the relationship between IT assets and other organisational resources (e.g. human resources). In this study, we explored integration effort between BA resources and other organisational resources, where resources are conceptualised as combinations of assets, competencies and practices.

This research is important for both practitioners and academics. For IS practitioners, it will help to understand how to synergistically combine BA resources with other organisational resources to maximise benefits. In particular, this research will help BA practitioners to develop synergistic interactions between BA subsystems and other organisational subsystems and increase their organisational effectiveness and efficiency. For academics, this research will provide evidence for specific enablers and mechanisms for achieving synergistic interactions between BA subsystems and other organisational subsystems. It will also advance our understanding of how synergy can be conceptualised and measured in IS research. Further empirical research is required to validate and refine our definition of synergy.

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