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A Model of Business Intelligence Systems Use in Chinese Organizations

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Abstract

The transferability of many Western-based information system theories to other cultures is under-researched. Business intelligence (BI) has topped CIOs' technology priority list for years and BI is currently the largest IT spend. Chinese BI markets have great potential based on its fast-growth economy. Unlike the West, China adopts a different culture and a different management philosophy. This paper investigates whether Chinese culture changes our understanding of BI systems use. Guanxi and constructs from the unified theory of acceptance and use of technology (UTAUT) are applied in two large Chinese organizations, where UTAUT constructs cannot explain Chinese managerial BI use. A model of Chinese BI use (MCBIU), consisted of a foundation, an alignment, and an outcome layer, is proposed to fill this gap. This model is the major theoretical contribution of this paper. This paper also contributes to practice by improving Chinese managers', BI consultants' and developers' understanding of the topic.

Keywords Business intelligence, decision support, guanxi, Chinese organization, case study.

1 Introduction

Business intelligence (BI) systems ‘encompass a wide array of process and software used to collect, analyze, and disseminate data, all in the interests of better decision making’ (Davenport 2016, p. 106). In Gartner’s annual Chief Information Officers (CIO) survey, BI topped CIO technology priority list for fifth-consecutive year since 2012. The BI market is forecast to reach \$18.3 billion this year and grow to \$22.8 billion in the following four years (Gartner 2017). BI helps people at all levels in an organization to access, interact with, and analyze data to manage the business, improve performance, discover opportunities and operate efficiently (Lönqvist and Pirttimäki 2006; Arnott et al. 2017). These decisions can have significant impacts on organizations. Trieu (2016) revealed BI research opportunities on context/environmental factors, conversion processes, use processes, competitive processes, and latency effects. Relevant to this paper, the opportunities consist of the drivers of effective use of BI systems and how BI affects internal and external factors to create business values. BI is important to IS research.

The International Monetary Fund (IMF) reported that the People’s Republic of China is arguably the largest economy in the world (Bird 2014). Irrespective of economic rankings, the Chinese economy is now overwhelmingly important for world trade. IS research studies are dominated by Western cultural norms. China is an Eastern country whose economic, political, and cultural systems differ radically from the West (Tselichtchev, 2012). Chinese managers and organizations are different to the West and in China, IS use is constantly informed by Chinese business culture (Martinsons and Westwood 1997). Davison and Martinsons (2015) argued that social science theories might be limited by the Western cultural orientation, because scholars who are immersed in Western cultural norms often frame these theories. This means that theories developed in the West cannot be guaranteed to work in a Chinese context. Guanxi is a key Chinese cultural norm and refers to ‘a whole complex of social practices, strategies and ethics of the exchange and reciprocity of gifts, favors and banquets’ (Davis 2005, p. 232). Guanxi has significant involvement in managing business relationships and these relationships are likely to influence business decisions. It is reasonable to assume that guanxi will impact BI use in Chinese organizations, internally as well as externally.

This paper investigates whether the Chinese context changes our understanding of BI systems use. The research question is ‘*What is the nature of managerial BI system use in China?*’ By addressing the research question, this paper contributes to IS theory by providing a model of Chinese BI system use when considering the role of context in theorizing. This paper also contributes to IS practice by providing expectations about managerial BI use and its outcomes for Chinese managers, as well as BI vendors and consultation who working in China.

The remainder of this paper is structured as follows: The Chinese context is introduced. Then, the research method and design section outlines the research stages of this paper. The following section describes the nature of the first empirical study and the development of the preliminary research model. This section is followed by the description of the second empirical study, and the specification of the model of Chinese BI system use. The last section concludes this paper and deliberates the potential contributions of this research.

2 The Chinese Context

China has a fundamentally different culture to the West. A classic cross-cultural study conducted by Hofstede (1980) found significant differences regarding national culture in a number of cultural dimensions. Hofstede’s reasoning is that cultures can differ according to how people think, react and behave. This means that research results may only be applied to other contexts to a limited degree and with caution (Mao and Palvia 2008). This section discusses Chinese culture, Chinese organizations, and Chinese management decision-making. It was found that cultural factors was under-investigated in Chinese IS studies.

Guanxi is a practice that determines how people interact with each other in Confucian societies. Yeung and Tung (1996) argued that guanxi practice was critical in achieving business success in Confucian societies. This paper explores intra-organizational relationships that are mostly dominated by the reciprocal type of guanxi. Reciprocal guanxi often happens between neighbors, fellow Chinese, classmates, colleagues, and other close friends who share similar experiences or have a common background (Zhang and Zhang 2006). This type of guanxi can be strengthened by repeatedly exchanging favors. Reciprocal guanxi may be a burden to the recipients of favors who are obliged to repay favors (Luo 1997). Lin (2011) proposed that guanxi networks have two dimensions: closeness and

pecking order. Closeness indicates the distance of relations between parties, such as relatives, friends, or acquaintances; and pecking order indicates an inferior or superior status between involved parties. The closer the relationship, the more and better favors people should offer and the less that payback will be expected. The more superior one party is, the less superior party will be expected to obey a proper order. One exchange exemption in guanxi is that higher ranked individuals can offer favors without any anticipation of repayment from lower ranked people. These higher ranked individuals want to establish their social reputation and obtain self-satisfaction.

Western countries embrace capitalism whereas modern China was created with a communist philosophy. In China ‘the Communist Party is virtually inseparable from the state’ (Martinsons 2008, p. 335). Chinese organizations are categorized into four different classes according to where their investment originates. The funding category affects the governance structure of Chinese organizations and they either follow Western or Chinese approaches to management. Many Chinese IS studies disguise or do not collect organizational information. This is due to the anonymous nature of surveys and confidentiality agreements between the researchers and participants. This lack of organization details can cause serious difficulties when generalizing the findings from such studies.

Since the late-2000s IS use has become widespread across China. The aim has been for IS to strengthen modern enterprises by offering efficient and effective business processes (Huang et al. 2009). Different types of IS, including BI, have been introduced into Chinese organizations. For example, Tian et al. (2007) studied decision support systems (DSS) development and implementation in Chinese universities. Although the number of published IS research articles in China has increased significantly, the number of empirical studies of organizational IS remains small (Chen 2010). Studies about Chinese management decision-making are even rarer. Only two Chinese BI research papers have been published in the leading IS journals. Li et al. (2013) investigated routine and innovative use of BI systems in a large Chinese telecommunication company. All their research constructs and associations of the motivational BI use model focused on individuals. Arnott et al. (2017) proposed a BI-based decision support framework that explained common patterns of BI systems use in decision support. They analyzed use patterns of eight BI systems from two Australia and two Chinese organizations. Neither papers’ research focus was Chinese cultural influence on BI system use.

3 Research Method and Design

This paper adopted a multiple case study design (Yin 2014). The research addresses an exploratory research question and case study is an effective approach to capture the full spectrum of relevant phenomenon. This paper employed a semi-structured interview technique to collect data. Interview protocols were developed in English, translated into Chinese, and verified by practitioners and academics who are proficient in both languages. Prior to data collection, pilot studies were carried out to test and validate interview procedures and protocols.

Stages	Focus	Main Sources	Outcome
Conceptual study	Identify foundation theories and research gaps	Academic and industrial literature	A set of research concepts and constructs
The First Empirical Study	Explore Chinese BI use, and whether guanxi affects this use	Interview and literature	The Preliminary Research Model
The Second Empirical Study	Further investigate how guanxi affects this use	Interview and literature	Model of Chinese BI Systems Use (MCBIU)

Table 1. Overview of the Research Design

Table 1 shows the stages of this paper: a conceptual study, the first empirical study, and the second empirical study. The conceptual study developed the theoretical foundation of the paper and resulted in a set of ten research concepts and constructs to guide the interview protocol development. The first empirical study explored what factors are important to managerial BI systems use in Chinese organizations and especially whether guanxi affects this use. At the end of this study, a preliminary research model of Chinese BI use was developed which identified new research associations and research constructs while the original set of research concepts and constructs were refined. The second empirical study involved a deeper investigation of the influence of guanxi over BI systems use by revisiting the same case organizations. The outcome of this paper is the model of Chinese business intelligence systems use (MCBIU).

This two-phased empirical study was preferred because of one of the research interests of this paper – guanxi. Guanxi is a sensitive topic and many publications have focused on the negative guanxi practice of corruption. Participants may hesitate to discuss guanxi practice openly with external researchers. By revisiting the case organizations, the researchers and participants become familiar and trust was developed. It was easier to collect data about guanxi in the second empirical study. Interview recordings and notes were transcribed and loaded into NVivo for analysis. Analysis codes were based on the research constructs and the emerging associations.

4 The First Empirical Study

4.1 Theoretical Base

Detailed research concepts and constructs selection for this paper was proposed and defined in Song, Arnott, and Gao (2014). In summary, the unified theory of acceptance and use of technology (UTAUT) from Venkatesh et al. (2003) was used to help develop the first set of interview protocols. Venkatesh et al. (2016) evaluated the original UTAUT and conducted an extensive literature review on UTAUT extensions and proposed new directions of extending UTAUT to include additional precedents, moderators, and dependent variables. More importantly for this paper, UTAUT has been empirically tested in China. Venkatesh and Zhang (2010) collected longitudinal data from a US and a Chinese business unit that conducted business analysis. They reported that social influence was important in explaining the difference between the two countries' technology acceptance and use. The UTAUT research constructs were therefore selected as the theory base for the first empirical study.

One change to UTAUT for this paper was replacing social influence with guanxi. Guanxi has been successfully used in empirical research (e.g. Ou et al. 2014 and Nie and Lämsä 2015). Michael et al. (2015) argued that most UTAUT research is limited to a single subject (e.g. organization, department, person, age group, or task). This single focus may limit the potential of generalizability of research findings. Collaborative (paired) decision-making is commonly found in Chinese management practice. Single focused research construct cannot effectively explain it. As a research construct guanxi may explain Chinese technology use more effectively than social influence.

Another change to UTAUT was to use perceived usefulness (PU) and perceived ease of use (PEOU) from the technology acceptance model (TAM). Dwivedi et al. (2010) conducted a bibliometric and citation analysis of research papers which adopted TAM and UTAUT. They concluded that though researchers have shifted focus from TAM to UTAUT over time, researchers had not identified substantial differences between these two models. Chinese managers may be more familiar with TAM constructs because TAM has been frequently empirically tested in Chinese IS research. Therefore, using core TAM constructs to replace relevant UTAUT constructs can facilitate quality data collection in this paper.

4.2 Case Organizations and its Participants

The name of one case organization is disguised at the request of the organization. This organization, Chinese Insurance Company (CIC), is a large insurance company that operates in mainland China. CIC offers insurance products including pensions, accident, health, education, asset management insurance and services. In October 2014, CIC tested a new BI system that was expected to replace all former systems. The second case organization is Alibaba Group Holding Ltd. (AG). AG is the largest Internet company in China and is representative of a group of new Internet companies in China. In September 2014, AG floated on the New York Stock Exchange (NYSE) in the largest initial public offering (IPO). AG operates from major campuses in Hangzhou and Beijing. Both organizations are large in scale and both have domestic business operations across many provinces in China. CIC operates under a more traditional Chinese management style while AG is more modern. It becomes obvious to the researchers that AG has more experience and is more open to domestic and international researchers.

Role	CIC	AG	Gender	CIC	AG			
Developer	5	5	Male	10	17			
Manager & senior professional	11	16	Female	6	4			
Generation	CIC	AG	Education	CIC	AG	Management Level	CIC	AG
Post 60s			Secondary	1		Executive	2	1
Post 70s	4	3	Diploma	2		Senior Manager	4	7
Post 80s	12	17	Bachelor	12	10	Manager	2	8
Post 90s		1	Postgraduate	1	11	Senior Professional	8	5

Table 2. Participants' Demographics in the First Empirical Study

The participants were selected based on the following three criteria: participants should have worked in the case organization for minimum three months; participants should hold either a manager or developer positions; and, participants should have used the BI systems. Table 2 describes the demographics of the participants in the first empirical study. In total, 16 CIC employees and 21 AG employees participated in the first empirical study.

4.3 The Preliminary Research Model

In the cases, senior management made the BI system use decision. Managers and senior professionals reported compulsory use of BI systems to support business decisions which were collaborative not individual. Gender, voluntariness of use, perceived facilitating conditions, and behavioral intention were dropped from further exploration because of a lack of relevance to managerial BI use. PEOU and use behavior (UB) were retained as participants believed that these two constructs explain their system use frequency and length. PU was altered to “decision task BI system alignment” (TSA). Experience, generation (age), closeness (guanxi), and trust (guanxi) emerged as a complex construct: tentatively titled factor X (FX). FX had some influence to TSA and PEOU as well as some complex internal interaction. Lastly, managers and senior professional believed that the nature of decision task (NT) and the nature of BI systems (NS) had a great influence on their BI use. Figure 1 shows the preliminary research model of Chinese BI systems use.

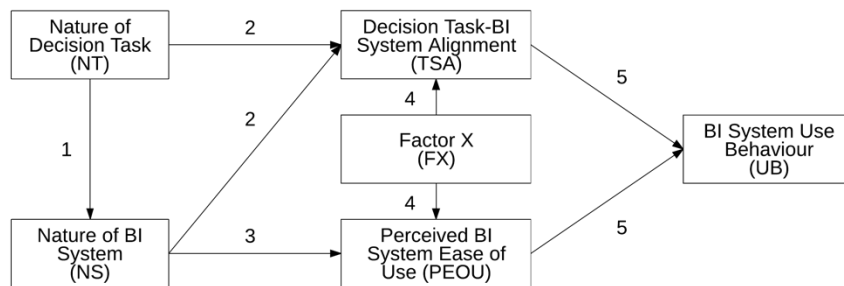


Figure 1: Preliminary Research Model of Chinese BI Systems Use

In Figure 1, Association 1 connects two important emerging constructs from the data analysis. No unstructured or strategic decisions were reported. Semi-structured-tactical decision tasks were the most commonly BI supported decisions in both CIC and AG. In both organizations BI systems were developed for one fundamental reason - supporting decision tasks. A senior developer exemplified with the motivations behind developing a new BI system at CIC. This new BI system aimed to support regulatory reporting to China Insurance Regulatory Commission (CIRC), and to support analysis and decisions on insurance sales. This means NT determines NS.

Association 2 involved the replacement of PU - the core construct in utilization-focused models. Participants focused on comparing, managing, reporting, and analyzing business data. For external users, BI systems were used to report on industrial standards, respond to data requests by government officials, and to assist business partners. Both CIC and AG confirmed that internal use outweighed external use. Many participants believed that it was less important to consider how useful BI systems were, but rather whether BI systems could support task completion. This is consistent with the task-technology fit model (TTF) (Goodhue and Thompson 1995). Decision task-BI system alignment (TSA) refers to the degree to which systems assist individuals in performing their portfolio of decision tasks. Therefore, replacing PU with TSA offers a more comprehensive way to explore, explain, and predict UB in Chinese organizations. TSA is a superior research construct than PU in explaining Chinese BI systems use.

Association 3 and Association 5 are consistent with Davis et al. (1989). Here PEOU refers to the degree to which an actual user experiences the BI system to be free of effort during the process of learning, training, understanding, and communicating. Managers often require extra assistance to use BI systems. There were fewer assisted users than direct users of BI systems at both organizations. When TSA or PEOU is low, it was evident that managers were likely to delegate their BI use to analysts and assistants. The level of usage differed according to how much decisions were supported by BI systems, and the ease of use of such systems.

Association 4 partly involved guanxi that was best conceived as a multi-attribute construct. The decision tasks in the cases often required a minimum of two users to work in a collaborative manner. This is not a common pattern in Western firms. Experience, generation, closeness, and trust have a significant impact on both TSA and PEOU. They also have a complex interaction among themselves. In this paper, experience consists of education and work experience and both dimensions are influential for TSA and PEOU, and therefore UB. Factor X, a composite of trust, closeness, experience, and generations, affects TSA and PEOU.

5 The Second Empirical Study

The second empirical study explored the emergent research constructs and associations, especially those around FX. The first aspect of this study was to confirm and improve the constructs and associations of the Preliminary Research Model. The second aspect of this study was to capture any new emergent construct and association, especially to clarify how closeness and trust (guanxi) can explain Chinese managerial BI use. Prior to revisiting the case organizations CIC implemented the new BI system but had not replaced all former systems. No significant system changes reported by AG participants.

Role	CIC	AG	Gender	CIC	AG				
Developer	4		Male	10	5				
Manager & senior professional	9	11	Female	3	6				
Generation	CIC	AG	Education	CIC	AG	Management Level	CIC	AG	
Post 60s	1		Secondary			Executive	2		
Post 70s	6	3	Diploma			Senior Manager	4	5	
Post 80s	6	8	Bachelor	11	3	Manager	2	5	
Post 90s			Postgraduate	2	8	Senior Professional	5	1	

Table 3. Participants' Demographics in the Second Empirical Study

During the second empirical study, nine repeat and four new participants were interviewed at CIC, while four repeat and seven new participants were interviewed at AG. Participants from the first empirical study withdrew from the second empirical study because business trips, rotation of positions, being on holidays, on maternity leave, or leaving the company. In total, 13 employees from CIC and 11 employees from AG participated in the second empirical study. Tables 3 shows the participants' demographics of the study.

6 The Model of Chinese BI System Use (MCBIU)

The model of Chinese BI systems use (MCBIU) was developed from the analysis of the second empirical study. The research context was compulsory use, collaborative decision-making and in-house systems development. This section specifies MCBIU, which is the major research output of this paper. The MCBIU is shown in Figure 2. The MCBIU consists of a foundation, an alignment, and an outcome layer. The definitions of the six research constructs are presented in Table 4.

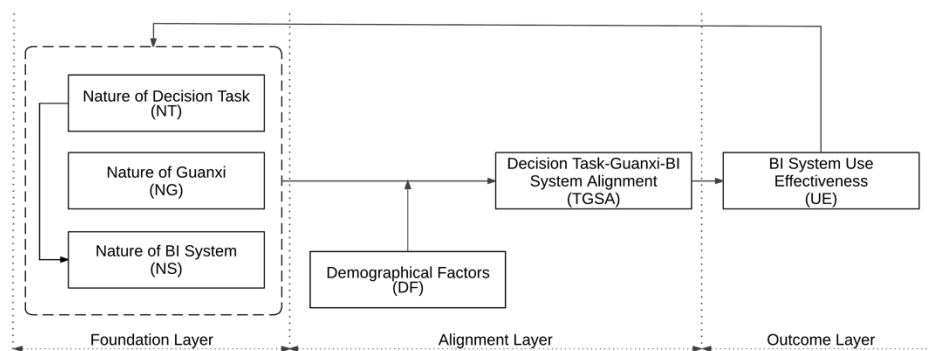


Figure 2: The Model of Chinese Business Intelligence System Use (MCBIU)

Construct	Definition
Nature of decision task (NT)	Refers to the structuredness and orientation of a decision task, which focuses on constructing a solution that best satisfies multiple and potentially conflicting constraints.
Nature of guanxi (NG)	Refers to the closeness and trustworthiness of a progressive dyad where two individuals perceive the quality of their guanxi connection.
Nature of BI systems (NS)	Refers to the quality and the capability of a BI system that managers use to support their decision tasks.
Task-guanxi-system alignment (TGSA)	Refers to an alignment profile composed of the nature of the decision task, nature of guanxi, and nature of the BI system.
Demographical factors (DF)	Refers to the demographical factors of generation and experience.
Use effectiveness (UE)	Refers to a profile of the quality of decision outcomes, the efficiency of the decision-making process, and the managers' satisfaction with BI system use.

Table 4. Definitions of the Research Constructs in MCBIU

The foundation layer depicts important factors for managers to consider in BI use. When they make business decisions, the relevant collaborative guanxi dyads and supportive BI systems are involved. An improvement over the preliminary model involves the split of FX into the nature of guanxi (NG) and demographical factors (DF). Guanxi is a dyad between two individuals. The nature of guanxi is larger than closeness and trust, but only these two factors were frequently cited in the case data. Closeness is an important measure of Chinese guanxi (Lin 2011). Although different, trust is related to closeness. Trust has two major aspects: general trust and specific trust. General trust refers to a person's belief of goodwill in another person, while specific trust refers to a person's expectation of a particular person in a certain situation (Chang et al. 2014). Specific trust is more relevant to work contexts than general trust. Shared experience creates a closer guanxi connection and this closer connection may increase the level of trust.

The alignment layer presents how the three foundation factors lead to a level of alignment moderated by demographical factors. The major model improvements are the merger of TSA and PEOU and the split-up of FX. This paper developed a key construct to explain Chinese BI use: decision task-guanxi-BI system alignment (TGSA). TGSA considers the cultural influences of guanxi in a BI use context. This guanxi influenced construct has not been considered in past BI research. TGSA comprises to profiles or combinations of NT, NG, and NS. To achieve a higher alignment and in turn higher BI system use effectiveness, the effective combination of decision task, guanxi dyad, and BI system is critical. For example, an effective TGSA profile can be structured-operational decision task, trustworthy-intimate guanxi dyad, and good quality-good capability BI system. The greater the degree of adherence to an effective profile, the better the alignment of the decision task, the guanxi dyad, and the BI system. This alignment construct also describes and explains the interaction among these constructs and explains how this interaction can lead to the effective use of BI systems in Chinese organizations.

Participants tended to discuss closeness and trust separately from experience and generation and as a result DF was separated from NG. This separation was quite natural in participants' minds. Different experiences shaped how people thought and behaved, while different age groups had been exposed to different opportunities during their life. For example, younger generations had more opportunities for overseas education and had an early exposure to technology. This set of demographical factors could affect managerial decision-making approaches and technology use proficiencies. DF moderates the association between NT, NG, NS, and TGSA from the following two directions: (i) when two users come from a similar generation or have similar work or education experience, it offers a solid base for collaboration and therefore a higher degree of alignment; (ii) when two users come from different generations or have different work or education experience, it potentially creates obstacles and difficulties in understanding each other, and therefore leads to a lower degree of alignment. Often the moderation effects of DF may not be strong enough to significantly modify the level of the alignment. This moderation effect can be both positive and negative.

The outcome layer describes what managers perceive as the use effectiveness of the BI system. The major improvements from the Preliminary Research Model are the behavioral-focused rather than usage-focused outcome construct, and the emergence of the feedback loop. The higher the alignment in TGSA, the higher the BI use effectiveness. A high UE does not mean high scores in all three criteria of UE. The quality of decision outcome was the most important indication for many managers but some key decision outcomes may not be revealed until years after systems use. Many managers experienced time pressure for making business decisions and efficiency was their second most important contributor to UE. Since BI systems use is compulsory in Chinese organizations, managers' satisfaction was the least important contributor to UE in the MCBIU.

Keen (1980) proposed an adaptive design framework for DSS development and use. User, builder, and system are the three key elements of a DSS and the interactions or loops between each pair of elements explains the adaptive nature of DSS. Keen's model is supportive of two paths of the MCBIU. Path 1: TGSA is the alignment between NT and NS until collaborators came into place where a decision task cannot be completed or system cannot be used without the guanxi dyad between collaborators. These collaborators can be developers, analysts, and managers. TGSA determines the effective use of BI systems from a user perspective. This path focuses on TGSA and integrated its antecedents (NT and NS) and subsequent construct (UE). One limitation of the adaptive design framework for Chinese BI system use is that it does not consider the impact of NG. Path 2: The level of UE is an outcome for the manager when making one business decision that is supported by one BI system, and one specific guanxi connection. The result of UE modifies the decision task, the guanxi dyad, and the BI system. For example, a low UE may trigger the manager to improve the understanding of the decision, find an alternative guanxi dyad, or further develop the BI system. Therefore, the feedback is so important for understanding the managerial Chinese BI systems use.

Arnott (2004) proposed a framework for DSS evolution that explained the patterns and causes of DSS evolution. The framework has three key DSS evolution constructs: tempo, lineage, and etiology. This framework explains how UE offers feedback to NS. System evolution could be understood in two forms, where evolution happens within an application or between applications. In this paper, within application evolution was commonly seen in CIC and AG when analysts spent significant time fixing reports or data analyses. These analysts requested enhancements to the functionality of BI systems. Between application evolution was also observed at CIC, when its current systems reached capacity, an upgrade was not economic, and a new BI system was developed for supporting decision tasks. The DSS evolution framework provides strong support for the UE to NS association that is expressed as a feedback loop.

Further insight was gained into why and how UE influences NG. If the outcome of collaboration was positive, it enhances the level of trust and promotes closeness. AG had different BI systems at different business units which might support similar decisions and have similar functionalities. These AG BI systems are governed by product managers. Some participants mentioned that they could not find out what systems were available to them unless they knew the nominated product manager or people who had used the systems before. A high level of BI system use effectiveness may influence the completion of the next decision task because the manager will use the existing quality guanxi dyad to find BI resources. As a result, the same or even higher quality of guanxi exists. On the other hand, if the use effectiveness of a previous decision is low, the pre-existing guanxi dyad quality may be reduced.

6.1 Possible Alignment Profiles that Lead to BI Systems Use Effectiveness

Figure 3 visualizes alignment profiles from the case data where shapes represent NT, fill-patterns represent NG, shape sizes represent NS, and the number indicates the empirical cases supported. The results are clustered by low, medium, and high TGSA and UE. Overall, the more structured and operational oriented the decision task, the more trustworthy and more intimate guanxi, the better quality and better capability of the BI system results in higher TGSA and in turn higher UE.

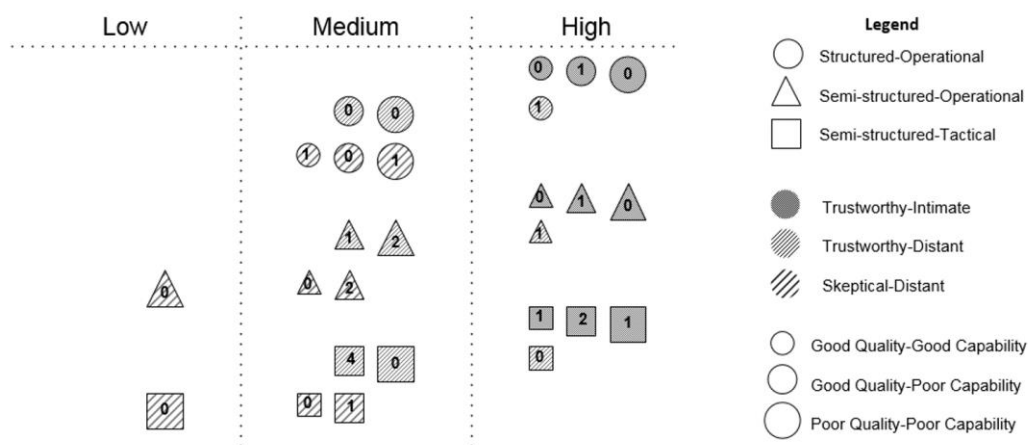


Figure 3: Possible Alignment Profiles of Chinese BI System Use

Structured-operational tasks with various levels of guanxi and types of BI system yield medium to high TGSA and UE. This type of decision task is the simplest in the research data. Semi-structured-operational and semi-structured-tactical decisions share very similar patterns spread over low, medium and high clusters of TGSA and UE. These two types of decision tasks have a lower TGSA and UE compared to structured-operational tasks. In terms of a trustworthy-intimate guanxi dyad, all three types of decision task and all three types of BI systems can have high TGSA and high UE. A similar pattern was found for a trustworthy-distant guanxi dyad, but trustworthy-distant guanxi dyad dominates medium TGSA and UE. A good quality-good capability BI system supports any type of decision task and these types of BI system are often reported with medium or high TGSA and UE. A good quality-poor capacity BI system has similar patterns with good quality-good capability BI systems. However, the good quality-poor capability BI system dominates medium TGSA and UE more than high TGSA and UE. These two types of BI system will not lead to a low TGSA and UE. A poor quality-poor capacity BI system may produce low to high TGSA and UE depending on the level of NT and NG.

6.2 MCBIU and Existing Technology Acceptance and Use Models

The MCBIU is different from existing IS use models including TAM, UTAUT, TTF, and the motivational BI use model. Both TAM and UTAUT are utilization-focused models. However, neither TAM nor UTAUT were able to cover the compulsory use by Chinese managers; the nature of decision tasks requiring different BI systems for support; and the situation where increasing system usage does not mean better decision-making for managers. The MCBIU is an alignment-focused model that explains BI system use in the unique Chinese managerial context.

Goodhue and Thompson (1995) argued that the interaction between task, technology, and individual are the antecedents of TTF. Burton-Jones and Straub (2006) argued that task, user, and system together are rich measures of system usage. Their arguments apply to this paper because the MCBIU investigates the alignment of task, technology, and individual in specific tasks (decisions), technology (BI), and individual (guanxi) contexts. The MCBIU outperformed TTF in explaining Chinese BI use. TTF considers an individual context while the MCBIU accounts for collaborative decision-making environment. The process perspective of the technology-to-performance chain (TPC) has been often lost during empirical examinations as evidenced in Burton-Jones and Straub (2006). The MCBIU model explicitly integrated a variance perspective and a process perspective to formulate a more effective explanatory theory for Chinese BI use by managers.

Only two Chinese BI use papers have been published to date. Li et al. (2013) investigated motivational difference in the post-acceptance BI systems use behavior in a large Chinese organization. They reported that PU had a stronger influence over routine use than any intrinsic motivation, while intrinsic motivation to know and intrinsic motivation to experience stimulation had stronger influence over the innovative use. These research constructs and associations of the motivational BI use model focused on individuals. Arnott et al. (2017) proposed a BI-based decision support framework that explained common patterns of BI systems use in decision support. Data was collected from two Australia and two Chinese organizations. Their unit of analysis was a BI system not decision task-guanxi-BI system. In both Chinese BI studies, culture was not the focus of their investigation. This paper found that Chinese managers make business decisions collaboratively instead of independently. Individual focus cannot explain the factors affect Chinese BI system use, especially a guanxi dyad that involves two individuals. The benefits of this single decision task, single guanxi dyad, and single BI system focus in MCBIU helped to consolidate the profile of the decision task-guanxi-BI system alignment (TGSA). Each profile will assist managers to understand and predict the level of BI system use effectiveness (UE) in specific situations. This focus enables the MCBIU to be used across organization boundaries when the guanxi dyad permitted.

7 Conclusion

This paper addressed the research question ‘*What is the nature of managerial BI system use in Chinese organizations?*’ In total, 61 semi-structured interviews were conducted at two large Chinese organizations during two empirical case studies. By addressing the research question this paper contributes to IS theory by identifying that Western-based technology adoption and use theory does not work in a Chinese context. The major contribution of the paper is the model of Chinese BI systems use (MCBIU). The model is an interesting hybrid of process and factor model and it based soundly on rigorous case study research. This paper also contributes to IS practice by articulating the importance of BI system use effectiveness to Chinese managers and providing managers guidance about the likely

outcome of different profiles of decision task, guanxi dyad, and BI system. The MCBIU may also help Western vendors and consultants understand why their BI technology is likely to have a rocky adoption experience in Chinese organizations.

There are two limitations to our research. Firstly, BI systems do not stop evolving as reported in the literature as well as in the first and second empirical studies in this paper. It may be less appropriate to capture BI data from one point or period in the evolution process. To mitigate this limitation, the second empirical study repeated interviews with some participants from both organizations one year after the first empirical study. This helped to capture BI evolution in both organizations more effectively. Secondly, the research findings of this paper have limited theoretical application power. This can be considered as a limitation of most qualitative research (Gregor, 2014). However, this paper analyzed a number of BI systems based on 61 interviews over 21-month between 2014 and 2016. This represents a strong growth in research scale over other published BI case studies to improve theoretical generalization.

The first stage of future research will be an applicability check (Rosemann and Vessey 2008), which is expected to establish the practical relevance of the MCBIU to Chinese organizations. The second future research stage will be the quantitative evaluation of the model using a survey approach.

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