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Business-IT Alignment from Operational Level: Empirical Evidence from the Bank of Qingdao, China

YANG Bin

Doctor of Management

Supervisors:
PhD Elsa Cardoso, Assistant Professor,
ISCTE University Institute of Lisbon

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University of Electronic Science and Technology of China

August, 2020

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Marketing, Operations and General Management Department

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Abstract

Business-IT Alignment (BITA) has long been a significant topic for scholars as well as enterprise managers especially in the Internet era. Although numerous studies have identified the factors influencing the aligning process and relationships between them and organization successes from strategic perspective, few consider the impact of these elements on employees's performances from an operational level. To fill this gap, this thesis first discusses the state-of-art and the challenges of BITA in China's city commercial banks (CCBs) and further develops a theoretical framework to empirically evaluate the BITA in China banking industry. Finally, some recommendations for improving the level of BITA in China's CCBs are provided.

Taking the Bank of Qingdao (BQD) as a sample, this thesis empirically examines BITA maturity model with the results that five factors including communication, IT competency/value measurement, IT governance, partnership, and IT skills are positively related to the BITA while IT scope and architecture are not significant. In addition, the moderating effect of service quality between BITA and employee's working performance is also supported by the survey. This study also develops a new theoretical model namely, business-IT punctuated equilibrium alignment model (BIPEAM), based on life cycle theory and punctuated equilibrium theory to describe the alternately leading roles between business and IT strategies. This model may contribute towards the better understanding of the mechanism of business-IT strategic alignment process from a longitudinal perspective within an enterprise.

Keywords: Business-IT Alignment, city commercial banks of China, operational level, maturity model, Bank of Qingdao

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Resumo

O alinhamento entre o negócio e as Tecnologias de Informação (TI) ou alinhamento business-IT (BITA) tem sido desde há muito um tópico significativo para académicos bem como para gestores de empresas, especialmente na era da Internet. Embora numerosas investigações tenham identificado os fatores que influenciam o processo de alinhamento e as relações entre eles e os sucessos da organização do ponto de vista estratégico, poucas consideram o impacto destes elementos no desempenho dos empregados a partir de um nível operacional. Para preencher esta lacuna, esta tese começa por discutir o estado da arte e os desafios do BITA nos bancos comerciais das cidades da China (CCBs) e desenvolve um quadro teórico para avaliar empiricamente o BITA na indústria bancária Chinesa. Por último, são fornecidas algumas recomendações para melhorar o nível de BITA nos CCBs da China.

Tomando o Banco de Qingdao (BQD) como amostra, esta tese examina empiricamente o modelo de maturidade do BITA com os resultados de que cinco fatores, incluindo comunicação, competência/avaliação de TI, governação de TI, parceria, e competências de TI estão positivamente relacionados com o BITA enquanto que o âmbito e a arquitetura de TI não são significativos. Além disso, o efeito moderador da qualidade do serviço entre a BITA e o desempenho de trabalho do empregado é também apoiado pelo inquérito realizado. Este estudo também desenvolve um novo modelo teórico, nomeadamente o modelo de alinhamento de equilíbrio pontuado de business-IT (BIPEAM) baseado na teoria do ciclo de vida e na teoria do equilíbrio pontuado para descrever os papéis alternadamente de liderança entre as estratégias empresariais e de TI. Este modelo pode contribuir para uma melhor compreensão do mecanismo do processo de alinhamento estratégico entre empresas e as TI, a partir de uma perspetiva longitudinal dentro de uma empresa.

Palavras-chave: Alinhamento business-IT, bancos comerciais das cidades da China, nível operacional, modelo de maturidade, Banco de Qingdao

JEL: M10, M11

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摘 要

随着信息技术的快速发展，业务与信息技术匹配（BITA）已成为学术界和企业关注的重要课题。现有研究主要从战略层面分析了影响匹配的各种因素，以及这种匹配对企业绩效的影响程度，但很少从企业运营层面考虑这些因素对员工绩效的影响。为了填补这个缺失，本文首先探讨了我国城市商业银行实施 BITA 的现状和面临的挑战，然后构建了相应的理论模型来对我国银行业的 BITA 进行实证研究。最后，给出了提升我国城市商业银行业务与信息技术匹配的相关建议。

本研究以青岛银行为样本，实证检验了 BITA 成熟度模型。结果表明，沟通、IT 能力/价值衡量、IT 治理、合作伙伴关系和 IT 技能五个因素与 BITA 正相关，而 IT 规模和架构对 BITA 的影响不显著。此外，IT 服务品质对员工工作绩效的调节作用也得到了支持。此外，基于生命周期理论和间断均衡理论，本研究提出了一个新的理论模型即业务与信息技术匹配的间断均衡模型（BIPEAM），用来描述业务与信息技术战略之间的交替主导作用。该模型有助于从时间演进角度，揭示企业内部业务与信息技术的具体匹配方式，从而更好地的理解企业 BITA 的具体实施过程。

关键词：业务信息技术匹配，中国城市商业银行，运营层面，成熟度模型，青岛银行

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约翰·沃尔夫冈·冯·歌德曾经说过：“我们必须不断改变，不断更新，不断恢复活力，否则就会僵化”。遵循此道，我一直把终身学习付诸实践。然而，在不惑之年攻读博士学位对我来说困难重重。电子科技大学和里斯本大学的合作项目给我提供了向优秀教授学习的宝贵机会。我有机会在近五年系统学习了管理学相关理论，并且最终实现我的梦想——成为一名管理学博士。

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List of Abbreviations

AI	Artificial Intelligence
AGFI	Adjusted Goodness-of-Fit Index
AMOS	Analysis of Moment Structures
AVE	Average Variation Extraction
BDP	Business Data Processing
BIPEAM	Business-IT Punctuated Equilibrium Alignment Model
BITA	Business–IT Alignment
BQD	Bank of Qingdao
BRI	Belt and Road Initiative
CBA	China Banking Association
CBRC	China Banking Regulatory Commission
CCB	City Commercial Bank
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CFO	Chief Financial Officer
CIO	Chief Information Officer
CITIC	China International Trust and Investment Corporation
CMMI	Capability Maturity Model Integration
CNY	China Yuan
COMM	Communication Maturity
COMP	Competency/Value Measurement Maturity
COO	Chief Operation Officer
CRM	Customer Relationship Management
CTO	Chief Technology Officer
EA	Enterprise Architecture
ERP	Enterprise Resource Planning
ESB	Enterprise Service Bus
Fedex	Federal Express
Fintech	Financial Technology
FMCG	Fast Moving Consumer Goods

FSB	Financial Stability Board
GDP	Gross Domestic Product
GFI	Goodness of Fit Index
GOVE	Governance Maturity
HKD	Hong Kong Dollar
ICBC	Industrial and Commercial Bank of China
IFI	Incremental Fit Index
IPO	Initial Public Offering
IS	Information System
ISA	IS Strategic Alignment
ISMS	Information Security Management System
ISO	International Organization for Standardization
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
KPMG	Klynveld Peat Marwick Goerdeler
M&A	Merger and Acquisition
MIS	Management Information System
MPaaS	Mobile Platform as a Service
NBSC	National Bureau of Statistics of China
NFI	Normed Fit Index
NPL	Non-performing Loan
OBM	Original Brand Manufacture
OCRM	Operational Customer Relationship Management
ODM	Original Design and Manufacture
OEM	Original Equipment Manufacture
PART	Partnership Maturity
PBOC	People’s Bank of China
PERF	Performance
PLS	Partial Least Squares
R&D	Research and Development
RBT	Resources-Based Theory
RMB	Renminbi
RMSEA	Root Mean Square Error of Approximation
ROA	Return of Asset

SAM	Strategic Alignment Maturity
SCOP	Scope and Architecture Maturity
SERV	IT Service Capability
SKIL	Skills Maturity
SME	Small and Medium-size Enterprises
SOB	State-Owned Bank
SOE	State-Owned Enterprise
SOA	Service-Oriented Architecture
SPSS	Statistical Product and Service Solutions
TMT	Top Management Team
TSM	Tivoli Storage Manager
TLI	Tucker Lewis Index
UPS	United Parcel Service
VIF	Variable Inflation Factor
WTO	World Trade Organization

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Chapter 1: Introduction

1.1 Background and significance of this study

1.1.1 China's banking industry

The achievement of Chinese economy can attribute to the adoption of market principles and practices. In the past four decades, the Chinese economy has developed rapidly with average Gross Domestic Product (GDP) growth rate of 9.5% (National Bureau of Statistics of China［NBSC］, 2018). The transformation of Chinese economy sustains with the gradual modification and improvement of market economy (NBSC, 2019). Consequently, the rapid development of the economy has positive impact on the development of the country's financial industry.

The banking industry in China has transferred from traditional banks to joint banks that with foreign banks to present day westernized and Information Technology (IT) integrated banking. Today, Chinese banks are acting more like western banks which are different from the banks following Chinese traditional law in the early years. However, in the last twenty years, China's banking system has changed dramatically with IT integrated into banking operations. All banks in China are government controlled though they have gained more autonomy these days. The People's Bank of China (PBOC) plays the role of the Central Bank in China, where the China Banking Regulatory Commission (CBRC) has the right to make monetary policy. The PBOC, founded in 1948, acts as a Treasury monitoring money supply. The CBRC was established in 2003 whose main objective is to reform the State-Owned Bank (SOB) and monitor the China's banking system.

The banking industry in China is made up of large commercial banks, joint-stock commercial banks, city commercial banks (CCBs), rural commercial banks, foreign-funded banks and an emerging stream of private banks, among which commercial banks are the pillar industry and the hub of national economy. According to CBRC, there were total 1606 banks in China at the end of 2018, among which the number of large commercial banks, joint-stock commercial banks, rural commercial banks, foreign banks, and private banks are 6, 12, 134, 1396, 41,17, respectively (CBRC, 2019).

The main objective of commercial banks is to make profits. In 2018, the total assets of

commercial banks reached 209.9 trillion Renminbi (RMB), accounting for 78.27% banking financial institutions, showing that commercial banks hold greatest part of assets and liabilities in the banking enclave (CBRC, 2018). Although large commercial banks occupy the most prestigious position in banking industry, CCBs and rural commercial banks are gradually increasing their market shares. For instance, there was a surge in the number of rural commercial bank established by the end of 2016. Among commercial banks, CCBs and foreign banks have witnessed an increase in market share across certain locations in China. In 2018, the total asset and total liabilities of CCBs account for 12.8% and 12.9% in total commercial banks, respectively (China Banking Association[CBA], 2018).

Large commercial banks refer to the wholly state-owned banks with branches both at home and abroad engaged in comprehensive commercial bank business. They are the principal part of China's financial industry and play an important role in maintaining the national economy and economic security. The big four state commercial banks in China are the Bank of China, the China Construction Bank, the Industrial and Commercial Bank of China (ICBC), and the Agricultural Bank of China. The Bank of China specializes in the field of foreign trade and foreign exchange reserves. The China Construction Bank specializes in the field of infrastructure finances and the ICBC specializes in the industrial sector. The Agricultural Bank of China focuses on the agricultural industry. Besides, there are two banks which play a significant role. The China Development Bank concentrates on distributing foreign capital and the China International Trust and Investment Corporation (CITIC) dedicates in foreign investment funds and businesses related to the Bank of China. In 2018, there were 12 national joint-stock commercial banks, with total assets of 47.02 trillion Yuan, accounting for 17.53% in banks and financial institutions (CBA, 2018).

CCBs were formed based on the City Credit Cooperatives under the special historical conditions of China. They are devoted to serving local economy and small and medium-sized enterprises (SMEs). By contrast, Rural Commercial Banks mainly serve local farmers, agricultural and rural economic development.

Foreign-funded banks are wholly foreign-funded banks in their own countries, which provide loans to domestic enterprises and multinational corporations in other countries. At the end of 2017, there were altogether 41 foreign banks in China (CBA, 2018). Private bank is a form of financial services with private capital holding and market operation. Private banks are conducive for acquiring private capital, reducing government burden, and defusing financial risks. On the basis of traditional commercial banks, they have realized diversification of banking and financial institutions.

1.1.2 CCBs in China

1.1.2.1 History of CCBs

In 1979, with the advancement of economic reform, the predecessor of CCBs, the city credit cooperative, was established. Collective economy and individual business households mainly establish city credit cooperatives. In 1995, the first city cooperative bank in China was set up namely Shenzhen City Cooperative Bank. In March 1998, PBOC and the state government jointly renamed "City Cooperative Bank" as "City Commercial Bank".

The initial form of CCBs is the city credit cooperatives founded in the early 1980s. At the beginning of its establishment, it mainly provided financial services for urban collective enterprises, individual business households and urban residents. With the expansion of opening to the outside world, CCBs were constantly adapting to the needs of economic development and their own development requirements, carrying out reform, development and transformation. Thus, the developing process of CCBs can be summarized into four phases including city credit cooperatives, city cooperative banks, transformation period, and accelerated development period (CBRC, 2018; CBA, 2018）.

Phase 1 (1979-1994): City Credit Cooperative

The Central government issued the "*Decision on Economic System Reform*", which made it clear that the focus of economic reform should be shifted to cities. In 1979, the first City Credit Cooperative was established in Zhumadian, Henan Province, mainly serving collective enterprises and private economy.

Phase 2 (1995-1997): City Cooperative Banks

In May of 1995, the State Council issued the "*Notice on the Establishment of City Cooperative Banks*", which decided that the first batch of organizational work should be carried out in 35 cities. Shenzhen City Cooperative Bank was established in 1995.

Phase 3 (1998-2002): Rename to CCBs

In March of 1998, PBOC issued the "*Notice on the Change of the Name of the City Cooperative Bank*", which made it clear that City Cooperative Bank should be renamed as CCBs. In 1999, Bank of Shanghai took the lead in introducing foreign strategic investors.

Phase 4 (2003-Present): Rapid development of CCBs

In 2003, the CBRC was established. In 2007, three CCBs completed the Initial Public Offering (IPO) and entered the A-share market in China. From 2015, the numbers of CCBs are stable with 134. In 2016, Bank of Jiangsu, Bank of Guiyang, Bank of Hangzhou and Bank of Shanghai landed (IPO) on the A-share market successively. As of February 2019, 11 of 134

CCBs were listed in A-share, 12 in H-share and one in the new third board. There are 45 commercial banks listed on the main board, of which CCBs account for nearly half. It can be seen that CCBs have gradually entered the capital market and their capital capabilities have steadily improved.

1.1.2.2 Role of CCBs in China's economy

Since the establishment of CCBs, they have played an irreplaceable role in promoting and sustaining competition in the banking industry by improving the financial system structure and improving the efficiency of financial market allocation. Recently, CCBs have actively promoted transformation and upgrading, and have developed into the third echelon in China's multi-level financial system.

Because of the close relationship between CCBs and local economy, the development of CCBs depends strongly on the regional economy. The strategic position of CCBs is to serve local economy especially SMEs. According to the current regional distribution of listed CCBs, there are significant differences in the firm size of CCBs in diverse geographical location.

On the one hand, there are many SMEs in the eastern region with strong profitability, abundant government support and high awareness of intellectual property protection, providing sufficient capital and excellent institutional environment for the development of CCBs. However, the inequality of financial resources forces CCBs to form alliances to realize resource sharing and enhance competitiveness. This alliance may provide information system (IS) operation platform, data operation maintenance, business operation platform and information consultation services for all CCBs in their locality, ensuring that all CCBs maintain their operations.

Currently, serving SMEs has gradually become one of their business characteristics. The loan balance of SMEs in CCBs accounts for a rapid growth. By 2018, the loan balance of all CCBs was 6.26 trillion Yuan, accounting for 24.8% of the total loans of SMEs in commercial banks. CCBs have gradually become the new force of in banking financial institutions with the objective to support the development of SMEs.

According to the list of legal persons of banking financial institutions published by the Banking Insurance Regulatory Commission, there are 134 CCBs in China, of which 21 are listed at home and abroad (as of the end of January 2019). As of December 31, 2018, the total assets of CCBs reached 34.35 trillion Yuan, and the total liabilities reached 31.83 trillion RMB, showing a favorable developing trend.

Examining the financial performance of CCBs from an operation perspective can reveal

their current and sustainable development capabilities which is embodied in five indexes: assets, liabilities, profitability, solvency and risk level. The assets and liabilities of CCBs are steadily rising, showing their developing quality is stable. In addition, the market share of CCBs has been further enhanced. The after-tax profit growth rate has rebounded and is up to the average. In particular, the liquidity ratio of CCBs is superior to other commercial banks with the proportion of risk-weighted assets to total assets decreasing gradually. Considering the risk of CCBs is more complex, the risk level of CCBs is under control.

The asset of CCBs has been increasing with huge variation. From 2008 to 2018, the assets of CCBs increased from 4.13 to 34.35 trillion RMB, with annual growth rate of 23.89%. The proportion of assets in banking financial institutions increased from 6.6% to 12.8% (CBRC, 2018). With the deepening of the reform as well as the rapid development of the national economy, the CCBs have been growing steadily and their importance on Chinese economy has also been increasing. Currently, there are six CCBs whose asset is more than trillion RMB, accounting for a quarter of the total assets of CCBs.

As an important type of commercial banks, most of CCBs focus on local markets, showing strong relationship with the development level of regional economy. The initial objective of establishing CCB is to promote SMEs' development. Thus, general speaking, the CCBs and local economy are highly interdependent. According to list of ibrand, isite and ipower, the top ten CCBs in the first half of 2018 are located in the eastern part of China, except for Huizhou Commercial Bank (central part) and Harbin Bank (northern part). In addition, up to the fourth quarter of 2018, the CCBs' loans to service SMEs exceeded 6 trillion RMB, nearly one fourth of the total loans of commercial banks.

1.1.3 IT application in China's banks

IT has brought in a drastic change to human life. Life without IT is crippling in today's digital world. Different from the traditional banks which have to operate manually and employ too many staff with huge costs, the invention of Internet technology and its widespread access to each individual have enabled banks to provide various services easily. Today, the IT infrastructure has become a fundamental indicator for measuring the performance of a bank, showing the importance of IT in the banking industry.

Banks are one of the biggest customers for the IT industry in China. The adoption of technology for their operations has allowed them to grow rapidly and offer various services beyond loans and deposits. In this rapidly changing world, banks depend on IT for their efficient operation and effectiveness of their services to customers. Especially, Internet technology can

largely improve their business processes. Internet technology makes online banking possible, enabling customer's access with 24 hours. Hence technology has become one of the determinants for a bank sustainable development. Own to the self-service of auto machine, the number of employees can be reduced, which largely cut the human resource costs of a bank.

Today, IT, as a critical resource, supports the daily operations of a bank and plays a higher strategic role than before. In practice, IT strategy usually acts as a platform and relies on business strategy to achieve the goal of an organization. Strategic ISs enable the planning, monitoring and execution of the organizational strategy. On the other hand, operational ISs support operations efficiently and effectively through automation, though they do not increase the business's profitability directly. ISs as a set of inter-related processes, exist everywhere.

ISs play an important role in helping companies store data, update and analyze information to detect and identify any drawbacks and fix them on time. Further, IS can integrate various data and thereby help managers to achieve the company's performance and detect any possible threats. Therefore, efficient strategic plans are essential, making it possible for managers to adopt ISs and make decisions that help companies develop.

ISs guide managers in employing and implementing larger number of value-added systems. Thus, IS adoption will help companies to eliminate unnecessary activities and simplify the operations. In addition, IS help banks to remove repetitive tasks, making employees focus on high value-added operations. It is important for businesses to use efficient ISs in their business. Since IT can provide better operation and new services, it helps managers to make decisions more efficiently, IT is also the source of bank's competitive advantage. Executives find IS a very important tool which aids them with better planning and implementation of right strategies and help them with effective monitoring and comparison against established criteria.

1.1.4 Significance of the BITA

The Business-IT Alignment (BITA) refers to the extent of fit or congruence between business and IT strategies (Sabherwal & Chan, 2001; Preston & Karahanna, 2009b). The rapid development of business is bringing great challenges to IT since the level of IT of the China's CCBs seriously lags their development with regards to business due to lack of safety measures and related talents. The BITA has become a big challenge for nearly all banks in China.

Thus, BITA is a major concern not only for many IT executives but also for business managers. The bank industry in China has identified the alignment of IT strategy and business strategy as one of its priorities. However, at present, quantitative research of BITA from

employee operational level in China has not been found yet. As we know, it is the first-line employees who use IT to complete their daily work and provide various services to the customers. Therefore, it is necessary to studies BITA from employee perspective, which may provide valuable suggestions to improve the alignment of business-IT in China.

1.2 Research problem, questions and objectives

1.2.1 Research problem

BITA has emerged as a critical issue for CCBs in China. Moreover, BITA is also an important concern for both IT executives as well as business managers. In this thesis, we will explore not only the current situation of strategic alignment, but also factors affecting BITA in the banking industry. Therefore, the main problem of this study is to explore to what extent and how the IT is aligned with the business strategy from operational level perspective in China's CCBs.

1.2.2 Research questions

Based on the research problem, the following questions will be addressed:

(1) Is there an interactive relationship between IT strategy and business strategy in the China's CCBs?
(2) What is the current state-of-art for the BITA in China's city banks? Is there any misalignment between IT and business strategy in these banks?
(3) How does IT affect business strategic management process including strategy making, implementation, and evaluation in CCBs? And how the strategic management process influences the IT deployment?
(4) What factors influence the BITA in China's CCBs?
(5) How to improve the BITA in China's city banks?

1.2.3 Objectives

Each bank in China strives to be the leader in the financial services sector. There are many obstacles such as ever-increasing customer demands, failing strategies, constant pressures and increased competition which may affect their development. Although BITA can help banks to achieve their competitive advantages, in reality, it is often difficult for IT and business strategies to match each other; leading to business-IT aligning being a critical problem for all banks in China.

BITA has been a hot topic for practitioners and scholars. Despite of its critical impact on organization sustainable development, few enterprises regard themselves in alignment. Meanwhile, the factors influencing BITA and its effect on the performance of China's CCBs have remained understudied.

This thesis enriches the previous researches by empirically investigating antecedents of BITA in employee operational level as well as its impact on organization performance. The study contributes towards better understanding of the process and determinants of BITA, which would enable both business and IT managers to implement and evaluate the match between IT and business. The benefits of IT-business alignment to the banking industry will be highlighted in this research.

The primary objectives of the study are as followed:

(1) To discuss the state-of-art as well as the challenges of BITA in China's city banks.
(2) To develop a theoretical framework to empirically evaluate the BITA in China banking industry.
(3) To provide some recommendations for improving the level of BITA in China's CCBs.

1.3 Thesis structure

This thesis consists of seven chapters, as shown in Figure 1.1.

Chapter 2 reviews the previous literature in this study. We focus on the BITA to mainly review its related concepts, the modelling, the key factors, and the implementation. Based on the previous researches, we analyze the state-of-art and propose the research gap which needs to be studied in the future. Through the literature review, the importance of this study is also highlighted.

Chapter 3 describes the general situation and challenges for the alignment of business and IT in CCBs, especially from a technological perspective. We first introduce the financial technology (Fintech) development in CCBs and then propose the challenges of CCBs in digital era, including turbulent economic environment, regulatory policy, threat from Internet finance, and the mismatch between IT and business strategies.

Chapter 4 conducts an empirical study with hypotheses, question design, data collection and measurement of some variables. In this study, based on the Luftman (2000)'s business-IT strategic maturity model, we establish the theoretical model of this study. Bank of Qingdao (BQD) is selected as a sample to examine the impact of six factors on BITA from employee's level. The chapter also explains how to measure the independent variable and the questionnaire

design process.

Chapter 5 reports on the empirical results. Structure equation modelling (SEM) method is used to examine the proposed hypotheses. We first test the reliability of data and do the validity test through exploratory factor analysis and Confirmatory Factor Analysis (CFA).

Chapter 6 discusses the results of the empirical study. Based on the archive data in BQD, a model namely business-IT punctuated equilibrium alignment model is proposed to describe how business and IT strategies has aligned in the longitudinal process. According to the questionnaires, this study explores the problems of BITA in BQD and furthermore uses the balanced scorecard to evaluate the implementation of the IT strategy in BQD. In particular, using smart Customer Relationship Management (CRM) as an example, this thesis shows how to transfer from business-driven to IT-driven alignment in digital economy era.

Chapter 7 concludes the thesis, presenting a summary of the main results of this study and a discussion of the theoretical and practical contributions. Moreover, we provide some practical suggestions to the BQD, which may also be valuable to other CCBs. Finally, limitations and further research are discussed to guide the future direction.

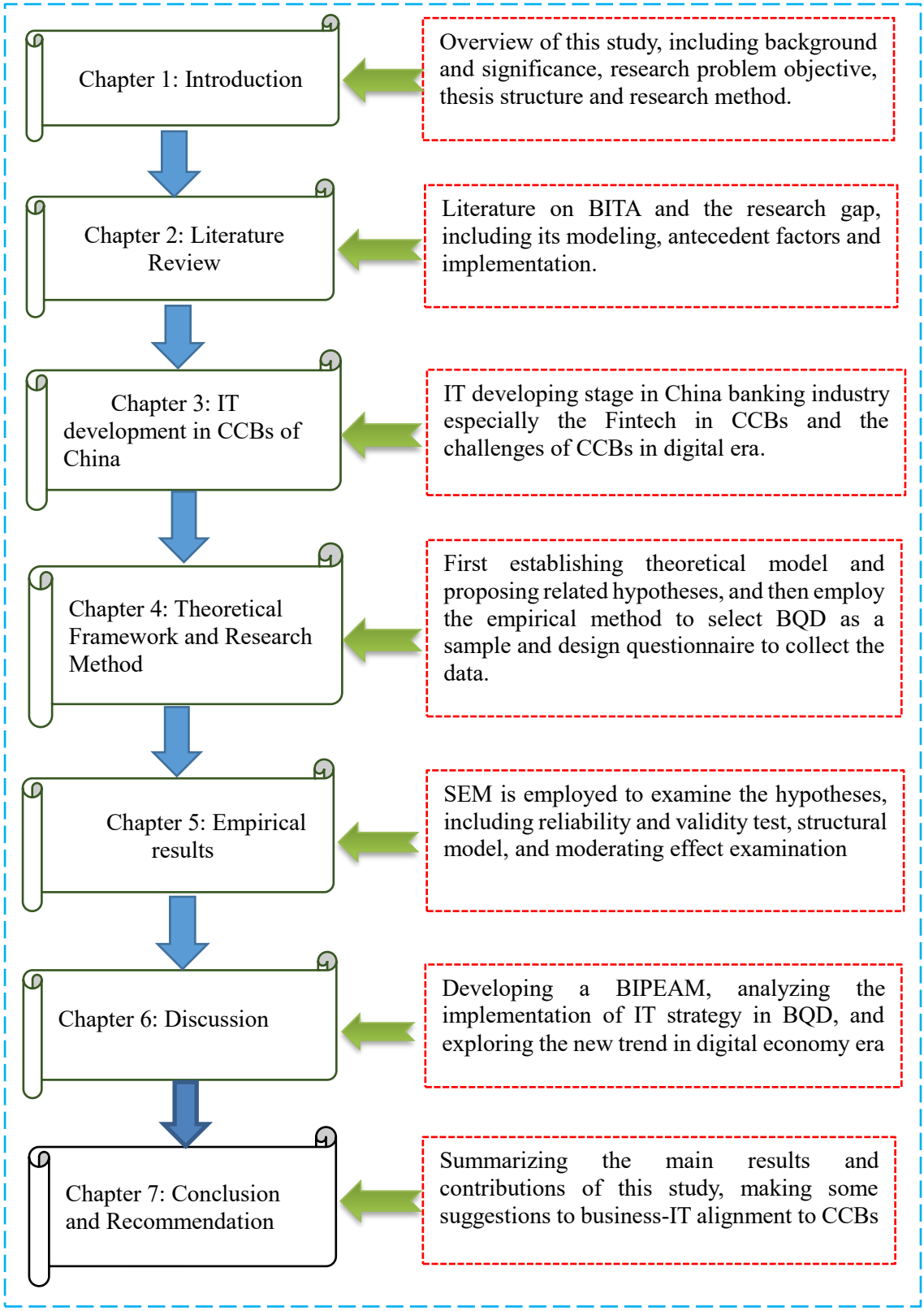

Figure 1.1 Structure of this thesis

1.4 Research method

This study aims to explore how and whether IT and business are aligning in CCBs. To address this problem, qualitative and quantitative methods were employed to analyze the antecedents of BITA and its impact on organization performance.

1.4.1 Quantitative analysis

In this study, an empirical study was used to investigate the factors influencing the BITA in a CCB of China. In Chapter 4, based on the classic business-IT strategic maturity alignment model by Luftman (2000), we first proposed the theoretical framework in this study, in which IT service quality acts as a moderator between BITA and working performance. BQD was selected as a sample to examine the proposed hypothesis. The field survey approaches such as questionnaire and the second-handed data including the annual reports and archive data were used to collect necessary data. In Chapter 5, SEM method was employed to test the theoretical model. All the empirical data were run by statistical product and service solutions (SPSS), as well as the analysis of moment structures (AMOS) software. Through the cross-section empirical analysis, we examine the state-of-art of BITA in BQD, especially from employees's operational level.

1.4.2 Qualitative analysis

In addition to the empirical study, this study also employed qualitative method to further explore the longitudinal matching between business strategy and IT strategy in the last 20 years. The qualitative analysis is mainly in Chapter 6, where the empirical results were discussed.

First, since the data in the empirical study are cross-sectional, showing the current state of business-IT matching in BQD, to explore the longitudinal relationship between business and IT strategies, we developed Business-IT punctuated equilibrium alignment model (BIPEAM) to describe the interactive relation between two strategies. This model can help managers to understand the BITA from a historical perspective.

Secondly, the balanced scorecard analysis proposed by Kaplan and Norton (1992), was used to explore the IT strategy implementation in BQD. The balanced scorecard approach examines performance from four perspectives, including financial performance, customer analysis, internal processes analysis, and learning and growth analysis. The advantages of balanced scorecard analysis are not only to integrate the separate elements in a single report,

but also to help managers to balance the different important aspects.

Thirdly, through analyzing how to use knowledge graph technology to transfer the traditional CRM system to smart CRM, this study shows that in the digital economy era, BITA may exhibit some new trend from business-driven to IT-driven alignment.

Chapter 2: Literature Review

In this chapter, we review the previous literature on BITA, including related concepts, theories, and models. According to the purposes of these researches, this chapter is divided into five sections. The first section presents the related definitions as well as the role of BITA on the development of enterprises. Then evaluation and factors influencing BITA are discussed. After that, we focus on its implementation and practice. Finally, to understand the significance of this study, studies on BITA in the Bank industry are provided at the end of this chapter.

2.1 Related concepts

2.1.1 Business strategy

Business strategy provides the roads, ways, or approaches for an organization to achieve its goal (Ireland, Hoskisson, & Hitt, 2013). It is the outcome of decision that guide an organization to the environment change, organization structure, resource allocation, marketing tacit, and operational processes (Croteau & Bergeron, 2001). Henderson and Venkatraman (1993) point out that strategy especially business strategy tries to explore how a firm can compete the rivalry in the market. Porter (1980) regards business strategy as a unique competitive position in an industry. Luftman (1996) suggests that the business strategy should consist of business scope, distinctive competencies, and business governance, which are related to nearly all critical activities such as market, products, services, customer exploration, and relationships with other stakeholder.

Within these generic definitions, there are various kinds of business strategies such as competitive strategy (Porter, 1980), blue ocean strategy (Kim & Mauborgne, 2005), and strategic maps (Kaplan & Norton, 1996). All types of business strategy have different characteristics. Typically, one strategic typology developed by Miles et al. (1978) includes prospector, analyzer, defender and reactors. This typology is characterized by its integration of organizational structure and strategic implementation process (Croteau & Bergeron, 2001). Later some empirical studies examined the relationship between these four strategies and firm performance, showing the first three strategies (prospector, analyzer, and defender) contribute to organizational performance while there is a negative relationship between reactor strategy and firm performance (Hrebiniak, 1980). Another famous typology was proposed by Porter,

which is defined as cost-leadership, differentiation, and focused strategies (Porter, 1980). These generic strategies are called competitive strategy that aims to provide practical choice for the firms to compete with others in the specific niche market (Ireland, Hoskisson, & Hitt, 2013).

However, Giannoulis, Petit, and Zdravkovic (2011) argue that existing business strategy definitions are not suitable for the model-driven BITA, making it necessary to develop a well-structured definition. They extended the value chain concept by Porter (1985) to value configuration (Stabell & Fjeldstad, 1998) for modeling the business strategy so as to enhance the alignment to IT. Their proposed value configuration meta-model integrates the balanced scorecard and strategic maps to elaborate the business strategy, making it more applicable to the alignment process.

2.1.2 IT strategy and deployment

There are many related terminologies on IT such as IT strategy, IT capital, IT assets and IT capability, IT deployment. Previous researches view IT as an aggregate and uniform asset (Bharadwaj et al., 2013). Among them, IT strategy mainly refers to the strategy to access and utilize the important information and technology (Luftman, 2000); IT assets may consist of four types: i.e., infrastructure, transactional, informational, and strategic assets (Aral & Weill, 2007). In addition, Aral and Weill view IT resources as the combination of IT assets and IT capabilities and empirically test their impacts on firm performance by using 147 firms in U.S. from 1999 to 2002. Moreover, Bhatt and Grover (2005) regard IT capabilities as the combination of IT infrastructure, IT business experience, and relationship infrastructure, in which IT business experience refers to the extent of IT group knowledgeable to business issues like business opportunities and business policies, relating to the alignment of business-IT.

Technological deployment, arising from the five conceptual frameworks, refers to the ways in which firms plan and manage specific IT to achieve its potential and effectiveness (Henderson & Venkatraman, 1993; Bergeron, Raymond, & Rivard, 2001; Das, Roy, & Chakraborti, 2016). Originally, the strategic value of ISs and the portfolio assessment of their current and future applications are emphasized (Oh & Pinsonneault, 2007). Gradually, the technology combines with business strategy, and many other terminologies appears like strategic technology and strategic IS, which shows the importance of IT on business strategy as well as organization performance (Luftman, 2000; Alsolamy, Khan, & Khan, 2014). Following these concepts, further studies have been done to explore the components of technological deployment. Currently, seven components are discussed as follows:

(1) The strategic use of IT that refers to the IT application to help the firm gain competitive advantage or support to other strategic purposes (Bergeron, Raymond, & Rivard, 2004);
(2) The management of IT that looks at the IT department activities and functions (Das, Roy, & Chakraborti, 2016);
(3) The role of the IS department that concerns the extent of IT alignment with organization structure, IT planning, the effective management of communication (Bergeron, Raymond, & Rivard, 2004);
(4) The technological infrastructure that refers to the establishment of formal procedures to allocate IT resources (Das, Roy, & Chakraborti, 2016);
(5) The organizational infrastructure that focuses on the internal function of IS department (Henderson &Venkatraman, 1993);
(6) The administrative infrastructure that deals with the managerial policies and actions of employees in IS department (Das, Roy, & Chakraborti, 2016);
(7) Technological scanning that includes the related information or technology acquisition, collection, analysis, diffusion, and prediction (Julien et al., 1999; Antunes & Canongia, 2006).

2.1.3 BITA

BITA is also a hot topic especially in the Internet and Big Data era. The concept of BITA has many synonymous terms including 'integration' (Broadbent, Weill, & Neo, 1999), 'fit' (Venkatraman, Henderson, & Oldach, 1993), 'harmony' (Luftman & Brier, 1999), 'fusion' (Smaczny, 2001), and 'linkage' (Henderson & Venkatraman, 1993). No matter what concepts it used, considerable literature has highlighted the importance of BITA in order to gain the core competence in a firm (Sledgianowski, Luftman, & Reilly, 2006; Versendaal et al., 2013)

The concept of BITA was first mentioned in the late 1970s (Mclean & Soden, 1976; IBM, 1981) and there are various definitions on BITA. There are two different concepts in the literature (Chan & Reich, 2007b): the first one regards matching as a final state, focusing on the results of matching; the second one regards matching as a continuous process, including specific behaviors and reactions, as well as recognizable patterns in the process. Alsolamy, Khan, and Khan (2014) view business-IT strategy as a detail plan to match updated IT with the business strategy. As Benbya and Mckelvey (2006) suggest, alignment is a continuous process with ongoing dynamic adjustment. Luftman (2000) defines it as an appropriate and timely way of the application of IT to meet the requirement of business strategies, highlighting the harmony

relationship between business strategy and IT. Pereira and Sousa (2005) define BITA as the extent to which the IT plans are supported by business strategy. BITA refers to how IT and business in an organization coordinate and integrate with each other to better achieve organizational goals (Zhang, Xiao, & Xie, 2010). Therefore, the static research based on theoretical model and the complexity dynamic research of BITA are the main contents of the literature.

2.2 Relationship between BITA and organization performance

2.2.1 The importance of BITA

BITA is the main reason for the persistent hot topic in information academic domain. This strategic alignment has beneficial effects and enhanced results in various firms (Chan et al., 1997; Tallon & Pinsonneault, 2011). Recently, with the popularity of Internet technology, more studies have focused on the BITA to link the rapid changing technology to enterprise strategy and operations. Before investigating the relationship, developing an instrument is critical to measure the BITA (Mclaren et al., 2011). Chen (2010) developed an instrument with six dimensions of BITA maturity. Based on the 155 Chinese firms' data, Yu and Hu (2009) developed a set of evaluation indexes from key success factors and performance perspectives to measure the integration of business and IT strategies, in which the first class indexes consists of environment analysis ability, planning resource input capacity, cooperative ability of planners, and output of business-IT strategy integration. Table 2.1 shows the evaluation indexes for business-IT strategic alignment. Since these measurements are examined by the Chinese enterprises, it may provide some useful implication to address the alignment problem within the China context.

Table 2.1 Evaluation index system for business-IT strategic alignment

Evaluation factors	Indexes
Environment analysis ability	Analyzing ability for external environment
	Analyzing ability for internal environment
	Implementation of IT strategy committed by CEO
	IT Knowledge of managers
Planning resource input capacity	Trust from CEO and other top managers
	Business related knowledge of CIOs
	Business knowledge and skills of employees in Information department
	Valuable suggestion proposed by Information department
	The difficulty to identify a target successfully
Cooperative ability of planners	Avoid overlapping development of major systems
	Consistent understanding of the risk and balance in a project
	Consistency of the sorted items
	Identifying and resolving potential resources that impede the IS plan
Output of business-IT strategy integration	Business-IT strategic alignment
	Shareholder satisfaction
	Degree of compliance with laws and regulations

Source: Yu and Hu (2009)

2.2.2 Impact of BITA on performance

As Leaver II (2015) points out, the application of complicated technology has increased the demand for BITA so as to achieve good performance. Considering the huge IT investment as well as the numerous questions for this expenditure, it is important to explore the influence of BITA on IT investment.

To address this issue, Byrd, Lewis, and Bryan (2006), by using a survey of 344 firms in the southern United States, conducted an empirical study. Their findings suggest that there is a synergistic coupling relation between BITA and IT investment. Luftman (2000) explains the growing needs of the enterprises to IT infrastructure for achieving or keeping their competitive advantage. Wagner, Beimborn, and Weitzel (2014) state that operational alignment can significantly influence IT service quality. Croteau and Bergeron (2001) examine the impact of the BITA on firm's performance. Specifically, they distinguish four types of strategy (prospector, analyzer, defender and reactor) to identify the fit of inward and outward profiles and strategy. Kimble, Bourdon, and Lehmann-Ortega (2009) examine the BITA in high and low performance firms respectively, showing that in general the greatest coalignment among the four variables (i.e., business strategy, business structure, IT strategy, and IT structure) will lead to the highest performance.

Table 2.2 Empirical studies on BITA and firm performance

Authors	Sample	Main findings
Broadbent and Weill (1993)	4 Australian banks	Strategic alignment is a predictor of advantage-yielding applications within a firm.
Zahra and Covin (1993)	103 manufacturing firms	Business strategy plays a moderating role between IT strategy and firm performance.
Sabherwal and Kirs (2007)	244 academic institutions	Strategic alignment enhances IT success and organization performance.
Chan et al. (1997)	170 firms in four industries	Strategic alignment has a positive impact on the business performance and effectiveness of the IS unit.
Croteau and Bergeron (2001)	222 firms in Canada	The outward and inward technology profiles have varying impact on performance under different strategies,
Palmer and Markus (2000)	80 specialty retailers	Strategic alignment has no significant relation with retail-specific measures of firm performance.
Sabherwal and Chan (2001)	226 firms in four industries	Alignment is correlated with perceptions of firm performance.
Kearns and Lederer (2003)	161 firms	Information intensity influence the extent to which the CEO and CIO participate in IT and business planning, respectively.
Bergeron, Raymond, and Rivard (2004)	110 firms	Low-performance firms tend to show misalignment between business and IT strategies.
Tallon (2008)	241 firms	Alignment is positively related to the perceived IT business value.
Lee et al. (2008)	151 businesses	BITA increased IS effectiveness and business performance.
Chen (2010)	130 business and IT managers in China	The current state of BITA of Chinese firms, on average, is between the level 2 and level 3 (i.e. between committed process and established focused process) in the BITA model by Luftman (2000).
Wang，Xue，and Liang (2011)	A SEM and a large state-owned enterprise (SOE)	The levels of BITA for SEM and SOE are in Level 3 and level 2 respectively.
Gerow et al. (2014)	Meta-analysis of 71 studies	Aligning factors have positive effect on performance like productivity and financial performance. Meanwhile, environment variables also affect influence the aligning level.
Charoensukmongkol (2014)	312 hotels in Thailand	BITA does exert a positive impact on organizational performance.
Wamba et al. (2016).	152 firms in the U.S.	Big data analytical capability-business strategy alignment shows significant moderating impact on firm performance
Nair & Dreyfus (2018).	688 hospitals in USA	Committee meetings and planning broaden IT scope, which is positively related to the IT capability.

Table 2.2 presents the main quantitative studies on the relationship between BITA and firm performance. We may find that all empirical studies show the significant positive impact of BITA to organization performance.

As a part of BITA, some researchers began to examine the alignment between IS and organization functional strategies. Hooper, Huff, and Thirkell (2010) conduct an empirical

study to explore the impacts of IS-marketing alignment. Taking 415 medium and large companies in New Zealand as a sample, their results show that IS-marketing alignment will affect marketing as well as business development. Chen (2010) designs a questionnaire to test the six dimensions in Luftman (2000) business-IT maturity model. Mclaren et al. (2011) also use a field survey method to build a multi-objective matching assessment model for BITA.

Different from the prior studies that view BITA as a whole, some scholars investigate more detailed relationships among business strategy, IT governance structure, IT functional department, and firm performance (Tiwana & Konsynski, 2010; Banker et al., 2011; Bharadwaj et al., 2013). For instance, Bharadwaj et al. (2013) consider the impact of the cooperation between IS and manufacturing by using the data from 169 firms in U.S. and find that they are all positively related to the firm performance, providing some new perspective to observe BITA from inter-functional and inter-organizational coordination aspects. Croteau and Bergeron (2001) empirically examine the impact of the matches of IT deployment with different business strategy on performance. Their results show that for the different kinds of business strategies including prospector, analyzer and defender strategy, firms will deploy different technologies to support the corresponding strategy, leading to a better organizational performance. Moreover, some researchers also investigate the IT. Drnevich and Croson (2013), from the system perspective, discuss the importance of IT in business strategy as well as its performance.

2.3 Modeling BITA

2.3.1 Four dimensions for the BITA analysis

According to Aversano, Grasso, and Tortorella (2012), to be an important phase of the BITA strategy, it is necessary to model the various entities involved in this alignment process and then measure the alignment degree existing between these entities. While Reich and Benhasat (1996) view the BITA from knowledge and social dimensions, Chan, Sabherwal, and Thatcher (2006) consider it from strategy and structure perspectives. Furthermore, Chan and Reich (2007a) integrate them into four dimensions including knowledge (strategy), social, structural and cultural dimensions.

2.3.1.1 Knowledge dimension

The knowledge perspective considers the match state of BITA, emphasizing the IT mission, objectives as well as the related planning methods. For example, Chan et al. (1997) discuss how to make the IT strategy according to the business strategy. Especially, Chan and Reich (2007b)

further point out that various IT strategies including efficiency, flexible and synergy strategies should match with different business strategies. Since the IT strategy can help achieve the business goals (Oh & Pinsonneault, 2007), the matches between IT and business strategy are multiple levels from functional operation to business strategy levels (Mclaren et al., 2011). By contrast, some studies also explore the misalignment of business and IT strategies, showing the adjustment process of management information system (MIS) and business (Yang, Huang, & He, 2003; Mao & Wang, 2012).

2.3.1.2 Social dimension

The social perspective of BITA mainly considers the business managers' understanding and commitments on the IT strategy and implementation (Reich & Benbasat, 2000), which may reduce the misunderstandings of business departments to the IT department, making the business managers consistent with IT managers. Therefore, according to Campbell, Kay, and Avison (2005), the alignment requires CIO and CEO to establish very strong and frequent linkages, which can be measured by whether CIO is the top management team (TMT) or whether CIO and TMT have formal and informal communications based on how similar their education background, common perception and knowledge are (Feeny, Edwards, & Simpson, 1992; Nelson & Cooprider, 1996; Bai & Lee, 2003; Preston & Karahanna, 2009a). The interactions between CIO and CEO is critical to the IT-business planning integration and strategic alignment (Yayla & Hu, 2009). There are many factors such as the common cognitions or even the historical relationships of two departments may affect the efficiency of their communication (Chan, Sabherwal, & Thatcher, 2006), which has been supported by the related empirical studies from developing countries (Zhao, Wang, & Fang, 2008; Chen, Wang, & Zhao, 2009; Yayla & Hu, 2011).

2.3.1.3 Structure dimension

The structure dimension of BITA focuses on the IT governance structure such as CIO position in an organization (Chan, 2002), CIO reporting structure (Luftman & Kempaiah, 2008; Banker et al., 2011), centralization and decentralization (Chan, 2002). For example, taking 197 companies all over the world as a sample, Luftman and Kempaiah (2007) found that direct reports of CIO to CEO will has higher efficiency than that where the CIO only reports to business managers, Chief Operation Officer (COO), or Chief Financial Officer (CFO). A later study by Luftman and Ben-Zvi (2009) also verified the findings by Luftman and Kempaiah. Further, Banker et al. (2011) considered the differences of business strategy, suggesting that for

a cost leadership strategy, the performance will be better for CIO reporting to CEO, whereas for the differentiation strategy, to report to CFO will bring about higher efficiency. Therefore, the IT structure should also match to business strategy (Tavakolian, 1989). In general, there are three types of IT structure: centralization, decentralization, and mixed structures (Brown & Magill, 1994). A survey by Luftman and Kempaiah indicates that mixed IT structure has higher maturity than centralization or decentralization IT structures. Compared to centralization, decentralization will exhibit more agility to adapt to the environment change (Tiwana & Konsynski, 2010).

2.3.1.4 Culture dimension

As an important factor to the communication and behavior in an organization, culture may also exert some impact on the business-IT aligning process through cultivating informal and common sharing environment (Tallon & Kraemer, 2003; Nickels & Janz, 2010). As Sandeep and Ravishankar (2016) suggest, different types of sub-culture may influence the alignment in different direction, in which strong sub-culture may facilitate the match between business and IT strategies whereas anti-mainstream culture will hinder the fitting of the two departments. Therefore, the top manager's commitment is important to the match of business-IT strategies since it can affect which kind of sub-cultures is popular in an organization.

2.3.2 Strategic alignment models

Many scholars have researched on how to improve BITA. Henderson and Venkatraman (1993) put forward the classic strategic alignment model (SAM), which has been supported by empirical research and has contributed to both theory and practice (Chan & Reich, 2007a). Luftman (2000) proposed a business-IT strategic alignment maturity model with six dimensions measurement of matching on the basis of SAM model. In addition, Reich and Benbasat (1996, 2000) suggest that the communication and the connection between IT and business, the sharing of knowledge and the matching of successful IT historical impact are important to BITA. Kearns and Lederer (2003) believe that the participation of the CIO and CEO in other department planning is conducive to promoting the relationship between BITA. Chan, Sabherwal, and Thatcher (2006) empirically investigate the impact of other factors such as shared knowledge, previous IS success, and firm's size on matching. Kearns (2006) also point out that the involvement of CIO and CEO in business and IT strategic formation and implementation is critical to BITA. In particular, CEO's IT knowledge has a positive impact on their participation. Preston, Chen, and Leidner (2009) believed that shared language, CIO's business knowledge

and business management team's IT knowledge play a positive role in promoting their shared understanding. Yayla and Hu (2009) highlight the role of linkage between IT and business strategy and view it as the driving factors for BITA. They suggest that the driving factors mainly include the structure of the IT department, knowledge sharing, IT success history and relationship management, and made an empirical analysis.

We may find that the static researches of BITA like SAM clarify the causes, measures and results of BITA, but there is insufficient attention to the dynamic process and complexity of BITA. For example, Baets (1992) questioned the hypothesis of SAM model (that is, participants all know the external environment and corporate strategy of an organization). He doubted the existence of generally accepted strategy or acknowledgement of corporate strategy for the managers. Ciborra and Lanzara (1997) believed that many studies are too theoretical. Sabherwal, Hirschheim, and Goles (2001) argue that these studies are often based on the experience to develop and test "perfect" matching patterns.

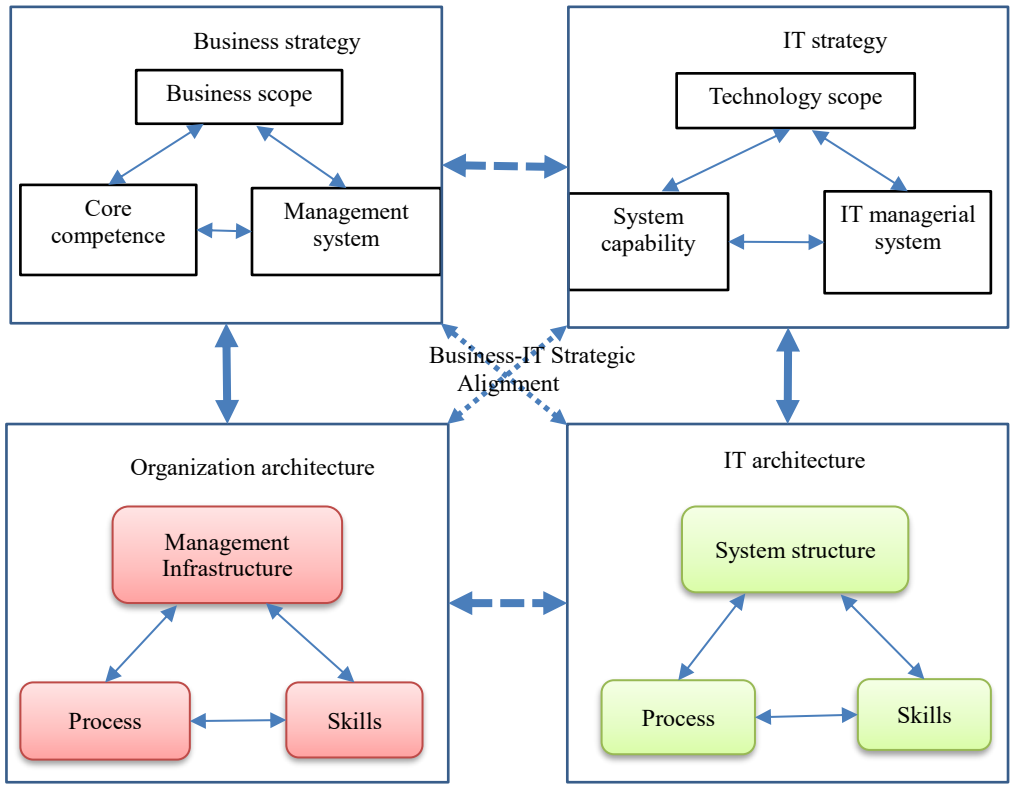

Figure 2.1 Strategic alignment model by Henderson and Venkatraman (1992)

Source: Henderson and Venkatraman (1992)

From the knowledge perspective, Henderson and Venkatraman (1992) propose a SAM as shown in Figure 2.1, which is divided into four domains: business strategic planning, IT strategic planning, organization processing framework and IT infrastructure. Among them, business strategy refers to a company selection of products and market positioning, including

the business scope, core competency, and management mechanism; IT strategy aims to the IT positioning of an enterprises, consisting of the IT technology scope, system capability, and IT management mechanism. The organization architecture considers the enterprise's internal resources distribution, producing process, and related skills to provide effective support to the business strategy, reflecting the resource integration strategy. The IT architecture includes IS infrastructure, IT processing and related skills, which are based on software and hardware facilities, communication system architecture and technology infrastructure data structure.

Therefore, the business-IT strategic alignment can be observed through the interactive or cross-section interaction activities between (1) business strategy and IT strategy; (2) organization architecture and IT architecture; (3) business strategy and IT architecture; (4) IT strategy and organization architecture. This SAM provides a direction to explore the business-IT integration from interaction between strategy and its implementation levels, laying the foundation for later research.

Table 2.3 Strategic alignment maturity model by Luftman (2000)

Criteria	Level 1 (Lowest)	Level 2	Level 3	Level 4	Level 5 (Highest)
Communication	Business/IT lack understanding	Limited business/IT understanding	Good understanding	Bonding unified	Informal, pervasive
Competency/ Value	Some technical measurements	Functional cost efficiency	Some cost effectiveness; Dashboard established	Cost effective, some partner value	Extended to external patterns
Governance	No formal process, cost center, reactive priorities	Tactical at functional level, occasional responsive	Relevant process across the organization	Managed across the organization	Integrated across the org & partners
Partnership	Conflict; IT a cost of doing business	IT emerging as an asset; process enabler	IT seen as an asset; process driver	IT enables/drives business strategy	IT-business co-adaptive
Scope & Architecture	Traditional (e.g., email)	Transaction	Integrated across the organization	Integrated with partners	Evolve with partners
Skills	IT takes risk, little reward; technical training	Differs across functional organizations	Emerging value service provider	Shared risk & rewards	Education/careers/rewards across the organization

Indeed, the most popular SAM is proposed by Luftman (2000) (see Table 2.3). For each of the levels, there are six practical criteria for an enterprise to help evaluate its current level. The proposed maturity model was used for 25 Fortune 500 firms in 2000, and has been valuable for assessing the BITA. Furthermore, as an application of the "5- Level model", Luftman (2000) examines the 197 firms all over the world and find that most of firms are at Level 3.

The model by Luftman (2000) is a classic model for BITA, having a wide application in

many researches. Furthermore, researches on strategic alignment transfer from firm-level alignment paradigm to process-level alignment. Also, from the socio-technical perspective, Lee et al. (2008) develop a model to evaluate the BITA. Viewing the SAM as a special internal setting in boundary-less environment, their study empirically investigate the relationship among social alignment, technical alignment, IS effectiveness, and organization performance measured by growth and profitability.

Moreover, considering the critical role of IT strategy in the competition, Yu, Huang, and Shi (2005) take American enterprises United Parcel Service (UPS) and Federal Express (Fedex) as a case to study how to build an effective IT strategy in a fierce competition environment. Based on the Henderson and Venkatrama (1992) model, their study distinguishes four ways for the alignment of business-IT strategy, as illustrated in Figure 2.2.

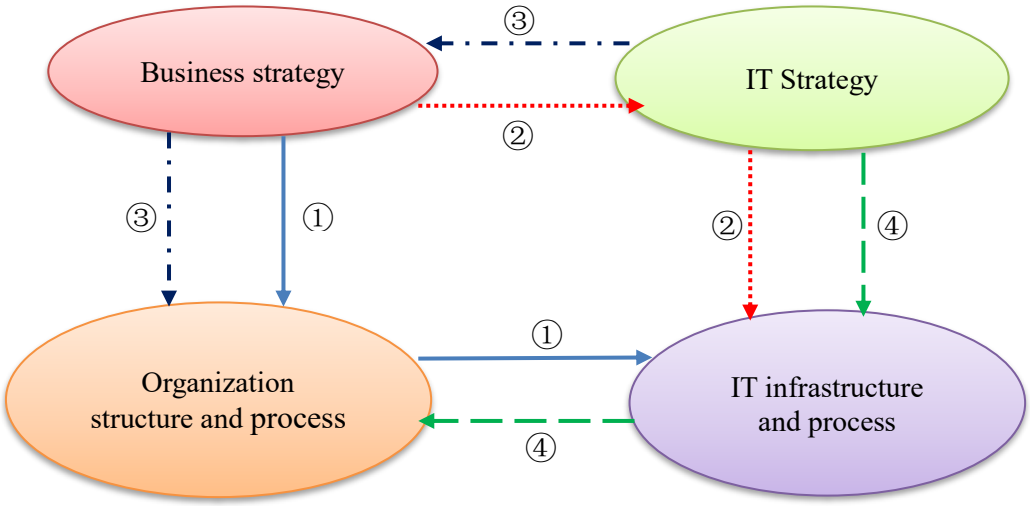

Figure 2.2 The ways of business-IT strategic alignment

Source: Yu, Huang, and Shi (2005)

2.3.2.1 Path 1: from enterprise strategy to organizational structure, and then to IT infrastructure and process

In this way, the business strategy acts as an engine to promote the aligning process. To achieve the proposed strategy, organizations have to redesign its structure and process, which requires the support from the IT infrastructure. The up-down strategic management procedure is popular in business-IT integration, during which the business strategies play a dominant role and determine the organization architecture. As the important function department, the IT department is in the secondary position and should adapt to the change of business strategy. Sometimes, there is even no definite IT strategy, and the IT department just provide some basic data collection and analysis function. Therefore, this path is completely business strategy driven (Yu, Huang, & Shi, 2005).

2.3.2.2 Path 2: from enterprise strategy to IT strategy, and then to IT infrastructure and process

While to be the same as *Path 1*, the technical transformation strategy is driven by the business strategy, *Path 2* emphasizes the role of IT strategy as the mediator to achieve the alignment. In general, this way is suitable for the large and medium enterprises that have independent budget and resources to formulate the IT strategy and carry out it. Given the certain organization structure, this approach depends on the appropriate IS and the IT infrastructure to realize the integration of two strategies. All activities focus on the construction of IS, among which IT application is the subordinate part of the completion of the IS (Yu, Huang, & Shi, 2005).

2.3.2.3 Path 3: from IT strategy to business strategy, and then to organization structure and process

Driven by the IT strategy, this path reflects the increasing importance of technology especially the Internet related technologies like Big Data, Cloud Computing, Knowledge Graph. Facing with the rapid change of new technology, enterprises have to consider how to make use of these technologies to build new core competences. This path shows that the integration is first on the strategy level and further influence the implementation of new business strategy (Yu, Huang, & Shi, 2005). This is an IT-driven aligning process, representing the power of technology in the current Internet era. To achieve the new business strategy, the adjustment of the organizational structure of the enterprise is required to change correspondingly.

2.3.2.4 Path 4: from IT strategy to its implementation, and then to the organization architecture

Similar to *Path 3*, this way is also initiated from IT strategy. However, it directly passes through the IT infrastructure and process to impact the organization structure, showing the stability of the business strategy (Yu, Huang, & Shi, 2005). In general, this happens when the technology changes are incremental, rather than radical. During this process, the business and IT is gradually matching through the functional level interaction.

Compared to the traditional *Paths 1 and 2*, the last two paths may exhibit the new trend in the business-IT strategic alignment. The four approaches by Yu, Huang, and Shi (2005) try to explore the process of this match in a competitive environment. Through analyzing the historical process of business and IT competition between UPS and Fedex, their study provides a selection framework for different approaches in different cases.

In addition to the maturity model, there are still two kinds of model: co-evolution and punctuated equilibrium (Zhang, Xiao, & Li, 2014). Co-evolution theory focuses on the dynamic aligning process and highlights the interactive activities and impacts between IT and other functional departments (Peppard & Breu, 2003). From complex system perspective, co-evolution of BITA is a complex overlapped or may repeated process with a series of adjusted procedure among individual agent, operational department, and strategic levels (Kearns & Lederer, 2003; Benbya & Mckelvey, 2006), in which multi-agents modeling and simulation may be used to explore the mechanism (Kearns, 2006; Yayla & Hu, 2011) . Meanwhile, Sabherwal and Chan (2001) propose punctuated equilibrium model to describe discontinuous business-IT aligning process, in which the suddenly jumping and stagnation are alternative to appear. Many factors such as environment change, continuous low performance, new leaders or even cognition change may result in this phenomenon (Sabherwal & Chan, 2001). Besides, in China, some special factors including government support, organization inertia, and social culture may also lead to the punctuated equilibrium (Wang, Xue, & Liang, 2011).

Many studies have emphasized that matching is a process rather than a final state (Sabherwal, Hirschheim, & Goles, 2001; Zhang, Xiao, & Li, 2011). Even if a firm has already achieved a match, the change of external environment may lead to the mismatch. If the business strategy or structure changes due to the environment, other parts will need to make synchronous transformation to maintain the match, or at this time, the organization is in a relatively low matching stage until other parts get a match again. Reich and Benbasat (2000) divided BITA into short-term matching and long-term matching, and examined the influence of different factors on the two matching. Sabherwal, Hirschheim, and Goles divided BITA into strategic matching, structural matching, business matching, IT matching and cross dimension matching which includes business structure and IT strategy cross dimension matching, business strategy and IT structure cross dimension matching. Allen and Varga (2006) explain the co-evolution of IT and business from the perspective of complex system. Each individual or subject in an organization has its own values, interacts with other subjects to co-evolve. The value framework based on the subject is the key to understand the evolution of the organization. The interaction between the subjects constructs a consensus and affects the ability and motivation of each subject to further evolution; Benbya and Mckelvey (2006) believes that the natural nature of coevolution and matching is the reason behind the difficulty of BITA.

Previous researches have explored various models or frameworks to analyze the dynamic development characteristics and evolution mode of BITA, such as SAM (Luftman, 2000), co-

evolution analysis (Peppard & Breu, 2003), and punctuated equilibrium model (Sabherwal, Hirschheim, & Goles, 2001). For example, in the punctuated equilibrium model, the matching is non-sustainable and emphasizes that the organization is constantly changing between high and low matching. There are many factors which may lead to the misalignment between IT and business, including environmental change, sustained low performance, new leadership, and cognitive change and other factors.

Although the models of stage and collaborative evolution describes the aligning process of business-IT strategies, they do not clearly explain how IS and business evolve together. Especially the collaborative model has carried out theoretical exploration but lacks the support of enterprise practice. More important, these three schools do not focus on specific organizational change situations, so they can only observe the dynamic change process of matching in the way of chronicle, and can't explain how to realize the continuous matching between IT and business.

The transformation and upgrading of Chinese manufacturing enterprises can promote the research progress of IT and business matching: on the one hand, the transformation and upgrading provides a specific research context for IT and business dynamic matching, which makes the dynamic research more specific and clearer (Xie, Xiao, & Wu, 2009). Meanwhile, the transformation and upgrading also puts forward a higher level for IT and business dynamic matching. It is required that enterprises not only need to match IT strategy with business development different evolving from original equipment Manufacture (OEM) stage to original design and Manufacture (ODM) or original brand Manufacture (OBM). Continuous matching in the process of organizational change can not only meet and support the transformation and upgrading of enterprises, but also better create its strategic value and organizational performance.

In addition, some researches on transformation and upgrading have found the important role of IS. For example, as Mao, Jiang, and Mo (2009) find, the introduction of efficient IT MIS is critical to upgrading from OEM to ODM and OBM and improving organizational performance. Zheng, Lin, and Xu (2012) explore the upgrading trajectory and point out that suitable IT system has multi-level roles on the integration of different stages in a supply chain. However, the internal mechanism of enterprise transformation and upgrading needs to be clearly explained by scholars.

2.4 Factors affecting the BITA

The alignment of IT strategy and Business strategy are influenced by four major factors including business planning and IT integration, Rational adaptation of SISP (Strategic Information systems planning), success of IT implementation and finally IT managerial resources (Zhang, Xiao, & Li, 2014). Taking more than 500 firms, Luftman, Rapp, and Brier (1999) investigate the enablers and inhibitors in BITA. Their survey results suggest that four factors are listed in both sides, including senior executive support, understanding of IT to the business, business-IT relationship, and leadership of IT, indicating their critical roles on the successful BITA. Luftman (1996) analyze the strategic alignment from 4 dimensions with twelve components as shown in Table 2.4.

Table 2.4 Factors affecting BITA

Authors	Main purposes	Factors influencing BITA
Feeny et al. (1992)	CEO/CIO relationship	Business and IT department Communication Relationship between CEOs and CIOs
Henderson and Venkatraman (1993) (Concept study)	How alignment is achieved	Business strategy IT strategy Organizational infrastructure and processes IT infrastructure and processes
Sabherwal and Kirs (1994) (Empirical study)	Success factors and IT capability	Environmental uncertainty Organizational integration IT management sophistication
Reich and Benbasat (1996) (Empirical study)	Social dimension of BITA	Cross references between business and IT plans mutual understanding Congruence between IS and IT deployment Executives' self-report
Luftman, J. (1996) (Concept study)	Relationships among the 12 components	Business scope Distinctive competencies Business governance Organization infrastructure and processes Administrative Structure Firm infrastructure and process kills Technology scope Systemic competencies IT governance IT infrastructure and process IT Architecture IT infrastructure and process skills
Teo and Ang (1999)	Success factors for IS planning alignment	Strategic use of IT Knowledgeable about business Confidence in IS department Efficient service of IS department Frequent communication between users and IS departments
Luftman (2000) (Conceptual study)	Factors that promote or hinder alignment	Six enablers: (CEO support, IT involved in strategy

Authors	Main purposes	Factors influencing BITA
		formulation, IT understanding of the business, Business/IT partnership, IT projects priority , IT leadership) Six inhibitors: (Not connection between IT and business, no priority of IT, Failure to achieve IT goals, not understand business, no support to IT, no leader of IT management)
Luftman and Brier (1999)	Alignment of IT plans with business plans	No close relationship between business and IT No priority for IT Failure to meet IT commitments No understanding between business and IT No support to IT Lack of leadership in IT management
Maes et al. (2000) (Conceptual study)	Generic framework for BITA	Management capability Information and communication Technology systems Infrastructure
Reich and Benbasat (2000) (Conceptual study)	Social factors influencing the alignment	Shared knowledge Successful IT history Communication between business/IT managers Connections between business and IT
Hussin, King, and Cragg (2002) (Empirical study)	Measurement of alignment	CEO commitment to IT IT sophistication External IT expertise
Bergeron, Raymond, and Rivard (2001) (Empirical study)	Alignment of IT strategy and environment	Mediation Matching Covariation Profile deviation Gestalts
Broadbent and Kitzis (2005) (Concept study)	Factors influencing the success of IT-enabled business projects	A CIO An executive team Clear IT governance Adopting management approach
Chan, Sabherwal, and Thatcher (2006)	Business strategy supported by IS strategy	Shared knowledge Planning sophistication Prior IS success Organizational size Environmental uncertainty
Kim and Park (2007)	Impact of BITA toward business performance	Sharing knowledge between business and IT technical people Maintaining IT belief in business executive/managers
Kashanchi and Toland (2008)	Social dimension of alignment	Confused strategy between business and IT Long-term relationship Communication
Preston and Karahanna (2009b)	Business-IT alignment	Shared understanding
Johnson and Lederer (2010)	Contribution of IS to the organization	Relationship between business and IT management Alignment direction
Strong and Volkoff	Reasons for the	Function

Authors	Main purposes	Factors influencing BITA
(2010)	misalignment of business-IT	Data Availability Roles Control Organization culture
Alaceva and Rusu (2015) (Case study)	Social barriers to alignment	Low understanding of counterpart's environment Poor communication Unclear specification Limited cooperation Lack of mutual support

Source: Luftman, Lyytinen and Ben-Zvi (2015); Alaceva and Rusu (2015)

Besides the factors mentioned in Luftman's studies, some scholars have also adopted concept-process approach (White & Hamermesh, 1981) and conceptual integrative paradigms (Boal, 2000) to explore its determinants from a social ecology point of view. For instance, Reich and Benbasat (1996) believe that both intellectual and social dimensions are important for the business and IT strategies, and they work together to account for the successful alignment. Lee et al. (2008) consider social and technical dimensions simultaneously and examine their impacts on IS effectiveness, in which the social alignment was measured by human components.

Furthermore, Kashanchi and Toland (2008) explore the impact of communication and knowledge sharing. While the antecedents of communication include the flow of communication, frequency of communication, managers and media choice, communication channels, and technology, factors affecting knowledge sharing are IT and business competence, trust and communication, incentives, partnership of IT and business, and technology (Kashanchi & Toland, 2008). Thus, the strategic alignment has the following two dimensions: (1) intellectual dimension defined as a interacting state (Reich & Benbasst, 1996), which consists of formal mechanism and processes and concerns about the strategies, structure and planning method in organization (Reich & Benbasst, 2000); (2) social dimension defined as the state in which the top managers understand both business and IT strategies.

Based on the empirical study on 202 pairs of CEOs and CIOs, Johnson and Lederer (2010) point out that the CEO/CIO mutual understanding on analysis, internal defensiveness, futurity, proactiveness, riskiness, innovativeness, led to IS contribution significantly. This study may provide a practical direction to improve the alignment through the increasing the mutual understanding between CEOs and CIOs (Wang, Zhong, & Mei, 2011).

Based on the SAM by Luftman (2000), Luftman and Lyytinen (2015) conduct an empirical study to further examine the extent of the six dimensions on the BITA. Their SEM statistical analysis, from the data of 1354 IT and non-IT executives and consultants in 16 industries, support all these dimensions including communication and value analysis have positive impacts

on BITA.

Many studies have identified a lot of factors influencing BITA, providing the theoretical support for enterprises to achieve the desired matching. According to Chan and Reich (2007a) and Zhang, Xiao, and Xie (2014), all these factors can also be classified with the following three dimensions: knowledge, social, structure and cultural dimensions. These dimensions also affect each other, showing that BITA is a complex process in practice.

First, social and structural dimensions are mutually causal. On the one hand, social level matching can promote the formation of IT vision within the organization and influence the strategic positioning of IT, which may positively influence the organizational business and IT performance through the knowledge diffusion (Preston & Karahanna, 2009b). Thus, the social dimension will affect the structural dimension and CIO status in an organization. In other words, social dimension will affect the structure in an organization especially the CIO status and IT governance structure in the structural dimension, which should be consistent with the organizational structure, competitive strategy, IT absorption, and IT previous successful matching (Peng, 2012).

On the other hand, social dimension emphasizes that the strong relationship between CIO and CEO is an important precondition for social dimension matching (Reich & Benbasat, 2000), but the relationship between them will also be affected by the structural dimension matching such as CIO status and CIO reporting system. In particular, the role of CIO can be strengthened through structural communication, knowledge exchange and CIO education matching systems. The common language and knowledge sharing between CIO and CEO greatly promote the matching of social dimensions (Mao & Wang, 2012). Meanwhile, CIO status also enables him/her to participate in the business strategic planning, so as to better make IT strategy to support or match business planning, showing that the structural dimension is an important premise of knowledge dimension.

The empirical results show that the support to information strategy, the structural power of CIO, the effectiveness of CIO, and the relationship between CIO and TMT directly affect the decision-making power of the CIO, which further affects the enterprise performance (Mao, Jiang, & Mo, 2009). An effective CIO should be given the strategic decision-making power so as to have a greater impact on IT contribution. In addition, with the improvement of the IT investment goal from the operational efficiency to the promotion of strategic growth, enterprises should strengthen CIO human capital, CIO structure power to enhance the support to IT so that CIO can further play more role on the basis of traditional supplier leadership.

As Preston and Karahana (2009a) suggest, CIO should actively share business knowledge

when their status is low, and actively participate in TMT's social network to improve their status, and then promote social dimension matching. If the CIO wants to be a member of TMT, the matching needs mutual understanding and commitment of the organization to support business strategy, that is, social dimension matching is an important condition for structure matching. However, how to address a social matching between business and IT strategies when the CIO is in comparatively low position in an organization is seldom discussed in the existing literature.

Second, there is also interaction relation between social dimension and knowledge dimension, which are the two inseparable parts of strategic management (Preston & Karahanna, 2009b). The knowledge dimension is related to business and IT strategies formulation stage. For instance, CIO will make use of all knowledge to formulate IT strategy, and then try to adapt it to business strategy through some methods and tools such as key success factor analysis, enterprise system planning, or service-oriented architecture (SOA). The IT strategy can help CEO and TMT members to pursue the long-term objective of an organization better. The social dimension mainly relates to the planning stage, during which members of the organization can participate on the implementation process of IT and business strategies in various ways. Therefore, the managers' ideas and abilities especially the CEO's behavior will all affect the business and IT strategic matching (Xiao, Xie, & Zhang, 2012). Therefore, the social dimension plays an important role on the implementation of both business and IT strategies within an organization. In addition, social dimension matching can enable CIOs to exert the strategic value of IT to influence business strategy, and promote CIOs and TMT to reach the goal of organization through better organizational planning. Thus, social dimension also positively influences knowledge dimension matching. Lee et al. (2008) develop a social-technical framework to study BITA. Their empirical results show that knowledge dimension matching has a positive impact on the performance of IT and business.

The concept of IT performance in the knowledge dimension is similar to the history of IT success in the social dimension matching, so there is a recursive circular relationship between the knowledge dimension and the social dimension. That is, the social dimension matching makes IT and the business understand and commit each other, thus positively affecting the knowledge dimension matching (Xiao, Xie, & Zhang, 2012). Knowledge dimension matching has a positive impact on organizational performance and its performance. As an antecedent of previous IT success history, IT performance affects social dimension matching. Although we realize the importance of social dimension and its influence on knowledge dimension, the existing literature seldom discusses how to match the business and IT strategy when the knowledge dimension and social dimension are both low (Niu & Li, 2007).

Third, few studies explore the interactive relation between the social and cultural dimensions. Cultural dimension creates conditions for current practice of social dimension (Bai & Mao, 2009). Social dimension emphasizes that the communication between IT and business managers can promote understanding between IT personnel and business personnel, thus affecting social dimension matching of both departments. Cultural dimension encourages the sharing and informal communication to create a good communication atmosphere between IT and business personnel. On the contrary, some culture like chameleon subculture will bring challenges to matching (Cenfetelli & Bassellier, 2009). Conversely, the cultural dimension also needs the support of social dimension. Matching fundamentally involves cultural and behavior changes, and under the higher social dimension matching, IT can get more support and commitment from senior leaders. When IT and business managers are lacking communication due to the low status of CIO, how to play the role of cultural dimension to form social dimension matching remains to be further studied.

2.5 Implementation of BITA

The integration ability of enterprise strategy with IT strategy is the knowledge collection that integrates the internal and external environment elements of the enterprise (Yayla & Hu, 2009). In the process of strategy formulation, the dynamic matching and coordination between business and IT strategies has two meanings: on the one hand, IT strategy must support business strategy. The best application of IT in an enterprise can only be possible if IT is developed together with the business strategy (Zhang, Xiao, & Xie, 2010). In the process of IT strategic planning, it is necessary to fully consider how the use of IT plays a role in the implementation of the enterprise strategy, and whether the existing management mode and organizational form of the enterprise are in line with the selected IT (Martins & Zacarias, 2015). BITA is not a one-sided pursuit of advanced technology. The correct IT strategy can successfully support the overall strategy of the enterprise, provide timely and reliable information guarantee for the realization of the strategic objectives of the enterprise, and enable the enterprise to obtain or maintain competitive advantage.

On the other hand, the enterprise strategy should be affected by IT strategic planning. In other words, IT strategic planning should try to develop key ability to create competitive advantage, and the application of IT enables the enterprise to obtain the strategic value (Martins & Zacarias, 2015). Through IT strategy, enterprises can gain competitive advantage, which is called competitive advantage-oriented application. The application-oriented IT strategy takes

IS as the leading factor to guide the development objective of enterprise strategy (Gerow et al., 2014). By transforming the advantages of IS into the advantages in operation, IS may become the basis of some specific enterprise strategies (Aversano, Grasso, & Tortorella, 2012).

From the perspective of integration level, strategic planning includes three levels: enterprise level, business level and implementation level. Each level includes direction and objectives, constraints and policies, plans and indicators (Aversano, Grasso, & Tortorella, 2012). Generally speaking, in IT strategic planning, the three elements should be analyzed. Each level of business strategy and IT strategies should be integrated in three aspects: direction and goal level, restriction and policy level, planning level (Zhang, Xiao, & Xie, 2014). The implementation of IT strategy should choose the priority of IS to be realized according to the priority of business strategic objectives. At the same time, the implementation of plan and business strategy should keep pace. In terms of indicators, the business and IT indicators should achieve coordination to ensure that IT system serves the business system (Ullah & Lai, 2013).

Achieving business-IT strategic alignment is a complicated ongoing process, during which some activities may provide guide to this practice. Luftman and Brier (1999) propose a six-step approach to implement BITA in an organization, which are (1) set the goals and build a team; (2) enhance the business-IT communication; (3) analyze the existing problem; (4) carry out the actions; (5) assess the success criteria; (6) maintain the alignment.

Based on their six-step ways, Tallon (2008) further regards the BITA as a process, changing from previous dominant firm-level alignment paradigm to process-oriented perspective. His empirical results drawn from 241 firms indicate that it is necessary for managers to reconsider the aligning process by paying attention to how IT can support the employees's activities, making it more efficient, rather than at how IT can support the entire strategy. Thus, according to Tallon, the alignment of business strategy with IT is not only the final objective, but more importantly, the firm should pursue the right type of fit during the whole process, which may provide new direction to BITA research.

However, the BITA practice does not mean the simple application of specific IT. For example, though Enterprise Resource Planning (ERP) software is matured and a successful software in developed countries, it still experienced many failures in Asia in the late of 1990s and early 2000s, leading to the reconsideration to the effectiveness of IT investment and showing the importance of the integration of IT and business operation (Tsai et al., 2012). Reich and Benbasat (2000), in their work found that business planning and ISs planning influence that state of strategic alignment positively. In addition, they also provide support for significance of

managerial resources, more on social dimension.

The state of strategic alignment is positively affected by IT managerial resources. Further, in support to Reich and Benbasat (2000), Lederer and Salmela (1996), agree that IT implementation success positively influences the state of strategic alignment. Thus, Malta and Sousa (2010) conduct a case study with a data set content analysis to show how to use Enterprise Architecture (EA) construction by process-oriented approaches to achieve BITA.

Joachim, Beimborn, and Weitzel (2013) discover that when corporations have clearly defined goals, there is no tradeoff between IT flexibility and strategic alignment. Instead, they claim that IT flexibility enhances strategic alignment and leads to improved IT business value, and have proved that IT flexibility and strategic alignment can be complementary rather than mutually exclusive. Hence, it can be said that the alignment problem does not seem to be pronounced in IT strategy and business strategy though it can exist faintly. Through the interview of 500 senior executives, Prahalad and Krishnan (2002) developed an approach to enhance the connections between business and IT managers, aiming to achieve the dynamic synchronization of business strategy and IT. Considering the weak information-infrastructure capabilities for most of the companies and changes of business environment, it is necessary to balance the flexibility and efficiency. They proposed the use of application-infrastructure and application-portfolio scorecards to promote the communication between line managers and IT professionals.

Recently, facing with the increasing updated digital technologies like Cloud Computing and Blockchain technology, how to integrate them with business strategy has become a new problem to nearly all firms. Akter et al. (2016) draw on the Resources-based Theory (RBT) to analyze how to develop Big Data analytics capabilities for firm performance improvement. From the sample of two Delphi studies and 152 online survey in the U.S. their empirical findings suggest that Big Data analytics capabilities is a hierarchical model with three primary dimensions (management, technology, and talent capability) and 11 subdimensions (such as planning, technical knowledge, business knowledge and relational knowledge). In addition, using repeated and partial least squares (PLS) indicator approaches, they confirm the value of higher-order Big Data analytics capabilities influence on firm performance, especially the moderating impact of the BITA between Big Data analytics capabilities and organization performance.

Taking a large Swedish company as a case, Alaceva and Rusu (2015) also investigate the factors achieving social dimension of BITA in large organizations and their findings reveal that there are altogether 19 barriers mainly like poor communication and unclear specifications.

Aversano, Grasso, and Tortorella (2010) propose a three-phase approach to manage the alignment of business strategy and software system. The first stage is to develop a model for the business process and software system; the second stage aims to evaluate the alignment degree; finally, the evaluation results are analyzed for misalignment.

Some Chinese scholars also explore how to achieve business-IT strategic alignment from different perspectives. For example, Yang, Huang, and He (2003) point out that enterprises can align business strategy and IT strategy by employing IT operation cost as a signal. They theoretically prove the existence of IT strategy equilibrium that is a signal of business strategy equilibrium under separating equilibrium. They suggest that incomplete information game can be transferred to complete information Stackeberg game with Harasanyi Transformation function and further analyze constrains under which IT strategy equilibriums of supplier and retailers are monotone market. Finally, bilateral business strategy alignment may be obtained through the match of IT operation cost.

For a long time, complexity and dynamics have been one of the key elements of BITA in IS behavior research or enterprise informatization research (Reich & Benbasat, 2000). For example, Sabherwal, Hirschheim, and Goles (2001) mainly explain the dynamics of BITA through the long-term and short-term development through case study. Allen and Varga (2006) focus on the subjects within the organization from the perspective of complex systems to explain the relationship between IT and business. In addition, Benbya and Mckelvey (2006) emphasizes to understand BITA from the nature of co-evolution and matching. These studies give the perspective and framework of the complex theory of BITA, but the impact on the interaction between subjects and the structure of social network has not been studied yet.

Thus, based on the theory of complex system in the dynamic research of BITA, Zhang, Xiao, and Li (2011) combine the static and dynamic methods to construct a game model to explore the impacts of various social networks on BITA. Through the multi-agent simulation experiment, the evolution process of the system is observed, and the multi-agent simulation of BITA with different social network structures is discussed. Their results show that: (1) from regular network to small world and then to random network, the threshold of matching cost to total matching is constantly raised; (2) the evolution of strategy is the key reason for the differentiation of total matching and total mismatch. The theoretical contribution of this study is to put forward the dynamic analysis framework of the key factors of BITA in the process of enterprise informatization such as ERP implementation, which deepens the complex dynamic research in the field of BITA, and contributes to the understanding of the nature of BITA.

From these studies, it is easy to conclude that in the process of obtaining or maintaining

BITA, organizations should establish a strong sense of crisis, examine different social network structures and their impact on BITA (Xie, Xiao, & Wu, 2009). Especially when the cost of matching is high, the organization should make clear cross department communication and cooperation relationship to avoid the disordered interaction between unrelated subjects. The randomness of subject interaction will also influence the BITA. To accelerate the evolution process of matching strategy, organizations should break the fixed communication between IT and business departments, develop effective interaction mechanism between it and business, and promote the emergence of overall matching as soon as possible, such as inviting important users to participate in the development and application of ISs, or assigning IT personnel to relevant business departments for long-term cooperation, and the mixture of the two ways (Zhang, Xiao, & Li, 2011).

Furthermore, due to the significant differences between China and the western developed countries in terms of the basis, environment and conditions of the integration of China's informatization and industrialization, there may also exist some specific paths or approaches for business-IT matching mechanism. In the social environment, the existing western researches on BITA are based on the more developed urbanization as well as industrialization. By contrast, while the urbanization process in China has not been completed, and there are significant differences in the enterprise management system, process and code of conduct required by IT and business alignment (Xiao, Xie, & Zhang, 2012).

Through the industrialization process, developed countries experienced the mechanization, automation, and informatization stages. After more than 50 years of progress, developed countries are becoming more and more matured in enterprise IT infrastructure, management software implementation and application, which lays a strong foundation for IS and business matching. China enterprises are entered into a mixed developing era. Considering the CIO status in the structural dimension as an example. The American CIO Magazine's survey on the CIO status in 2010 shows that 68% of the CIOs have joined the Executive Committee of the company. Whereas, the China Information Executive Development Report 2010 (with 3558 valid questionnaires) shows that in the CIO position level, the second level department heads account for 40%, and the first level department heads account for 30% (Peng, 2012). In addition, the 2010 China CIO System Research white paper surveyed 442 heads of enterprise informatization and the results show that most of China's directors are still a middle-level or upper middle-level manager. Moreover, according to the China Information Executive Development Report (2010) only 32% of information executives can participate in enterprise strategy making, organizational process innovation and decision support for senior management.

The same report in 2011 still shows that most of the information executives participating in the survey are still outside the decision-making level of enterprises. CIO status is one of the important contents of IT and business structure dimension matching, and the strong connection between CIO and CEO, CIO becoming TMT member, CIO and TMT sharing knowledge, IT and business strategic planning connection constitute the core of relevant theories and models of BITA.

Therefore, the reality of China's low CIO status makes the existing IT and business aligning theories and models difficult to guide the implementation of BITA. For example, Reich and Benbasat (2000)'s social dimension matching influencing factor model believe that IT business success history, sharing knowledge will affect the communication between IT and business managers, IT and business planning. When the CIO status of Chinese enterprises is low, enterprises often face the problems of low success history and knowledge sharing, lack of communication between IT and business managers, and lack of connection between IT planning and business planning, resulting in low level of social dimension matching. Reich and Benbasat models can explain the low level of Chinese enterprises' matching, but they cannot guide Chinese enterprises on how to achieve the BITA practice. To address this problem, Zhang, Xiao, and Li (2014) put forward the antecedent prior matching framework from the strategic management theory, and through case study, suggest that business success history and CEO belief can make up for the shortcomings of IT success history, knowledge sharing and current matching practice.

As Zhang, Xiao, and Xie (2014) conclude, although static multi-dimensional matching and dynamic perspectives have explained the difficulty of BITA, the complex nature of cross dimensional mutual constraints and continuous misalignment make Chinese enterprises face greater challenges in matching. Although Fujian, Guangzhou and other provinces and cities follow the example of the United States to promote the construction of CIO role the information directors of Chinese enterprises are still far away from the real CIO positions. How to break through the mutual constraints of structural dimension, social dimension, knowledge dimension and cultural dimension, promote IT and business matching and achieve dynamic and sustainable matching is not only the difficulty for Chinese enterprises, but also an urgent need for Chinese scholars to provide more local discussion and theoretical guidance.

2.6 BITA in banking sector

The banking sector has been experiencing a major transition from traditional banking to

electronic and digital banking with the advent of ever-changing technology globally. The expectations and demands of the customers today seem to be changing dramatically. Hence, financial service industries such as banks, have little options to embrace this change and align their business with IT-strategy. The digital world today demands every service industry to integrate IT into their operations, which enables them to provide fast track services.

The increasing ubiquitous mobile phone creates a natural channel for consumer financial services (Alaceva & Rusu, 2015). Digital capabilities can create value to a firm with banks being no exception and increase bank's connectivity with its stakeholders especially the customers, employees and suppliers, which may transform from online payment to mobile functionality, thereby giving an opportunity for banks to boost their brands in social media (Geva, 2018).

BITA has been a major issue for managers for decades, with the advent of IT and the core necessity to implement IT into the operations of banks, for their smooth functioning in order to keep pace with the global technology today, which dominates the world. The customer demands and expectations have to be met by financial services industry in order for them to survive, grow and expand. Past studies reveal that certain factors influence business strategy and IT alignment on intellectual, social, structure and culture dimensions (Yanlin et al., 2014). The alignment outcomes may be measured from intellectual and social dimensions (Motjolopane & Brown, 2004; Mitropoulos, 2012). Using case studies, Gbangou and Rusu (2016) explore factors that may hinder BITA. Their findings suggest that these factors include the task delay, no time for related knowledge, no IT trainings, dependency on telecom firms, workload of banking staff, and lack of talents.

Baets (1992) uses the sample from three banks in Europe to identify the major issue in IS strategy alignment and to determine their relationships. His empirical results indicate the importance of mindsets on IS strategy, in which the main problem during BITA is the lack of overall sector knowledge of banking managers. It is noted that the IS strategy alignment is observed from internal and external viewpoints, which is valuable for further research.

Hopkins and Hopkins (1997), in their experiment on 112 banks, found that the IT investment intensity especially in the strategic planning process has a significant impact on firm's financial performance. Meanwhile, this intensity can mediate the effects of managerial and organizational factors on bank's performance. Their experiment also indicated an interactive relationship between strategic planning intensity and outcome, showing that strategic planning intensity may result in better performance, and in turn, better outcome will lead to greater strategic planning intensity. So, this concept can be used to explore the

relationship between IT strategy and bank's performance. Further, this study tries to find the possible problems in aligning IT with business strategy through empirical evidence to seek solutions to improve the same.

By contrast, digital banking not only enables automation but also creates space for innovation of products and model. Hence, business strategy and IT establish a close-knit relation and help banks to function effectively in this high-tech era. The future development trend of banking will be the integration of homegrown and third-party digital products, which may offer many specialized services according to the customer's demand. Hence, business strategy integrated with IT is the future of success of the banking industry. Currently, more and more banks all over the world are seeking successful business models by trying to embrace digital, thereby investing heavily in implementing IT into their strategic operations and significantly upgraded web and mobile technology and created innovation and testing centers (Kekwaletswe & Mathebula, 2014).

In particular, Singh, Garg, and Deshmukh (2008) point out that there are several alignments from the lower operation strategy alignment to higher business and corporate strategy alignment. Singh, Garg, and Deshmukh (2008) take 22 commercial banks in South Africa as a sample to empirically investigate the extent of IS strategy on environmental uncertainty evaluation and the impact of IS environmental alignment on organizational performance. Their findings support the previous studies of the positive relationship between business performance and strategic alignment and more importantly, highlight the effective use of IS support, rather than the IS support and investment in IT, which influences the business performance.

2.7 State-of-art and research gap

From the previous review, we may find that the BITA research has achieved fruitful results and has become an important topic in IT field. More important, the significance of BITA has been widely accepted in both academic and practical domains. Many valuable BITA models have been constructed to explain how to match IT with business from strategic and tactical perspectives, and from static and dynamic aspects. Findings that IT and business matching can create higher organizational performance have been widely recognized. At the same time, BITA is also the primary concern of enterprise managers and information executives. Although academia has done a lot of studies on how to achieve BITA, most of them take BITA as a state to study its antecedents, measures and results. Indeed, BITA is an evolutionary process. In their matching process, how they interact within the organization and how the social network

structure in an organization affects the business and IT aligning extent remain unclear in the academic research.

Faced with the rapid changing environment especially in the new data economy era, it is an ongoing task for BITA. As Dhar (2015) suggests, it is nearly impossible to avoid discussing IT without Big Data. According to the presented literature review, we can conclude that although numerous studies have focused on the BITA topic, including its influence on performance, determinants, theoretical model of strategic alignment, and implementation, there are still problems that should be deeply explored. In particular, the following four problems should be addressed.

(1) Most of the existing researches focus on strategic matching, but ignore the matching on operational or individual level, and the relationship between strategic matching and tactical matching. At present, there are only a few researches on operational matching (Burn, 1993; Sabherwal, Hirschheim, & Goles, 2001; Bergeron, Raymond, & Rivard, 2004), mainly from the perspective of IT structure and organizational structure matching. However, within an organization, employees are the persons that use IT for their daily work. Thus, they can easily assess whether the IT can promote their business activities and further increase the organization performance. Therefore, it is necessary to evaluate the BITA from an employee level.

(2) The research of dynamic business-IT matching should be improved. Most of the existing researches examine or measure the business-IT matching statically (Chan et al., 1997; Bergeron, Raymond, & Rivard, 2004). Although scholars have developed a variety of methods to calculate the aligning degree, it is still difficult to accurately measure their alignment. Under the dynamic environment, enterprises often adjust their business strategies to adapt to external changes. Therefore, it is necessary to explore the BITA from a dynamic perspective (Hussin, King, & Cragg, 2002; Chan & Reich, 2007b). Some scholars think that business-IT aligning is a dynamic process, which should be paid more attention (Benbya & Mckelvey, 2006). Thus far, only few scholars have studied BITA as a dynamic process and care about the relationship between static matching and dynamic matching.

(3) The BITA from operational employees's perspective should be explored. Factors influencing BITA and working performance are different in different industries (Hussin, King, & Cragg, 2002; Kearns & Lederer, 2003). In addition, under different strategic orientations and industries, BITA may exhibit different effects on enterprise performance. The internal employee factors and external factors that affect BITA are

typically ignored in most of the existing researches, which focus more on knowledge sharing and communication between CIO and CEO (Reich & Benbasat, 2000), but less on the role and contribution of the IT department employees and business department employees in business-IT matching as well as the impact of external environment on business-IT matching.

(4) It is also very important for Chinese enterprises to match IT strategy with business, but there are still many gaps in matching level and preconditions compared with foreign countries. On the one hand, Chinese enterprise data not only verify the positive impact of knowledge dimension matching on performance (Yang, Huang, & He, 2003; Mao & Wang, 2012), but also examine the relevant model of knowledge dimension (Zhao, Wang, & Fang, 2008; Chen, Wang, & Zhao, 2009). Some empirical results also support the important role of IS and business matching. For example, Yin and Chen (2007) assert that business and IT coordination is the key factor to achieve the success of informatization; Wang, Zhong, and Mei (2011) declare that the value of IT is mainly to support competition through IS strategy and the realization of core competence and other intermediary variables; Peng (2012) points out that the combination of enterprise IT application and other managerial elements will result in the improvement of enterprise performance.

According to the Luftman (2000)'s business-IT strategic maturity alignment model, in terms of matching level, Chinese enterprises are at level 2 and level 3 (Chen, 2010). In terms of matching preconditions, Yang, Huang, and He (2003) investigate the Chinese enterprises and examine the structure dimension of BITA. Their empirical results show that for most enterprises in China, the position of IT managers is not high enough to influence the business strategy making and their suggestions do not receive the attention they deserve. Their finding is also supported by Yin and Chen (2007)'s study demonstrating that an enterprise without CIO as the head of the IT department in TMT, the low strategic ability of the coordination of IT and business.

The existing BITA research is mainly aimed at the western developed countries. China's institutional transformation, emerging market economy and other factors together create the uniqueness of China's situation. The research conclusions based on the Western situation may not be able to explain China's business-IT aligning phenomenon. Therefore, it is necessary to enrich and improve the existing IT business matching theory through some empirical and theoretical study. For example, we may first explain the IT business matching phenomenon in the Chinese context in theory and then based on the special matching problems in China's

enterprise, develop a novel BITA model. By analyzing its implementation mechanism and exploring the evolution process in Chinese enterprises, we can better summarize the business-IT aligning mechanism from the practice of Chinese enterprises so as to enrich the research on BITA theory, providing more useful guidance for enterprise informatization practice.

In addition, digital technologies and the Internet economy completely changed the business world. From this perspective, IT can be a core competence to lead to the sustainable competitive advantages that will influence the long-term development. Consequently, traditional business-IT paradigm gradually shifts to digital business strategy (Bharadwaj et al., 2013). Kahre, Hoffmann, and Ahlemann (2017) provide a structured category of the updated digital business strategies from knowledge-based perspective and discuss the future research agenda. Therefore, to explore the Business-IT Alignment in an Internet economy has become an urgent problem for all firms. For instance, what is the impact of such new technologies such as Big Data, Cloud Computing, Blockchain on the business strategy? How to establish the data-driven model in information strategic alignment? What is the application of artificial intelligence (AI)? How does it affect the managerial efficiency and decision making? However, to address these problems, organizational context is important since the huge differences of managerial styles may bring about the various ways of the alignment.

As Zhang, Xiao, and Li (2014) suggest, the China scenario is unique in the world in terms of culture as well as transformation economy, which calls for the study under the Chinese setting especially the sustainable BITA (Kehoe & Collins, 2008). To respond to their call, this thesis uses the BQD as a case study to empirically investigate how and to what extent the business and IT strategies are aligning in the company. Meanwhile, this study employs a punctuated equilibrium model to describe the longitudinal aligning process in the BQD, highlighting the IT-driven role during the aligning process in current Internet era and data economy. Since previous punctuated equilibrium and co-evolution models fail to explain how the equilibrium or coevolution happens, this study tries to fill this gap, providing a more comprehensive understanding of BITA in the Chinese context.

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Chapter 3: IT Development in CCBs of China

3.1 Financial technology in banking industry

As early as 1993, the term "financial technology (Fintech)" appeared in the relevant reports of Citibank. In March 2016, Financial Stability Board (FSB) preliminary define Fintech as the financial innovation brought by technology. Fintech can be simply understood as the combination of Finance and technology, that is, the application of technological innovation in the financial field. Since conceptualization of Fintech, banks have adopted strategies to integrate technology and finance. With regard to the scope and role of the application of banking Fintech, the Basel Committee on Banking Supervision has made the following definitions (Fintech Research Group of The Basel Committee on Supervision and Implementation, 2017):

(1) Deposit, loan and financing services of banks: at present, they are mainly used in the aspects of customer acquisition, identification, investigation and credit investigation, risk measurement, rating and credit granting, examination and approval, supervision and payment, post-loan management and risk disposal.

(2) Payment and liquidation services of banks: These two businesses have always been the traditional positions of banks, and they are also the key areas for banks to develop and apply computer and network technologies earlier.

(3) Investment Management Services of banks: The application of Big Data technology and Artificial Intelligence technology has fundamentally changed the object and mode of investment management services. In the past, investment management services were often limited to a few experts who depended on experience and devoted themselves to serving a few wealthy people and high-value customers. Different investment management models and advisory schemes are designed by Fintech to cover more people with complex and changeable investment needs, which greatly expand the thickness and breadth of the market and greatly increase the number of beneficiaries.

Even though Fintech have developed rapidly in the banks all the world, there is still no unified definition for Fintech. New technologies such as Big Data, Cloud Computing, Artificial Intelligence, Blockchain, Internet of Things and distributed technology have been greatly affecting business models in the bank industry.

Currently, Fintech has become an economic industry which applies new technologies in the

financial fields to deal with bank businesses such as transaction settlement, wealth management, loan financing, payment and liquidation. So far, the evolution of Fintech has gone through three main stages:

3.1.1 Stage 1: Fintech 1.0

The early stage of application of Fintech was to reduce operating costs. Firms set up financial departments to provide technical support for customer acquisition or control the risk like identifying authentication. Computers gradually replaced manual services.

3.1.2 Stage 2: Fintech 2.0

With the development and wide application of the Internet, Fintech has entered the Internet era, in which finance and Internet gradually integrated. In 2003, Internet crowdsourcing first appeared. In 2005, Zopa, the first P2P network lending platform in the world, was launched. Channel informatization has become an important feature of Fintech operations and practice.

3.1.3 Stage 3: Fintech 3.0

Recently, emerging technological are changing the Fintech landscape, making it enter the era of data finance. New technologies including Big Data, Cloud Computing, Blockchain, and AI have gradually penetrated the financial fields of credit, deposit and loan, risk control, asset allocation, promoting the reform and development of the entire financial industry. In October 2015, the Nasdaq Exchange released “Linq”, the world’s first Blockchain platform. In September 2016, Barclays Bank and an Israeli start-up completed the world’s first Blockchain-based trading.

In the future, with the maturity of bank digitization process, customer-oriented strategy will drive the sustainable development of Fintech. Fintech will be deeply integrated with the financial businesses and technology cross-innovation will continue to emerge, and then enter a benign cycle of interaction stage.

3.2 Fintech in CCBs

CCBs in recent times have adopted financial technological innovation as a tool to solidify its digital transformation agenda. In recent years, with the rapid development of Fintech, CCBs have increased their investment in IT infrastructure, and made great progress in Cloud

Computing, Big Data, AI, distributed computing and other new technologies. However, due to historical reasons, the IT architecture of City Commercial Banks is relatively old, and there is a lack of successive support for Internet business and big data applications under the background of Fintech. How to realize the transformation of IT architecture to better meet customer needs and social needs with more advanced, flexible and efficient IT architecture while improving the level of digitalization has become an urgent problem for technology departments in CCBs.

3.2.1 IT system architecture in CCBs

The development of an IT system architecture in CCBs has gone through three stages (CBA, 2018):

3.2.1.1 Stage 1: Chimney System Architecture

During the establishment of City Commercial Banks, the "chimney" system architecture was established, which is based on a single project characterized by a vertical architecture. Each IT system has its own storage and IT equipment, as well as independent management tools and databases. Different systems neither share resources, forming resource and information islands.

During the early days of CCBs, each new project or new system online meant a new chimney system to be built. At that time, the CCBs' businesses were simple and the demand was independent so that this architecture could support the establishment and development of CCBs. However, with the explosive growth of banking businesses, the drawbacks of the "chimney" system architecture gradually appear. For instance, first, duplicate investment largely increases the cost, leading to high operation and maintenance expenditure. It is obvious the waste of resources especially for skilled technicians and hardware; secondly, the integration and connection between different systems are expensive. The cost of interconnection between systems is relatively high, involving a lot of collaboration and optimization processes; thirdly, considering the life cycle of traditional IT construction, once the system goes online, it will enter the operation and maintenance stage. Faced with rapid changes of customers and markets, it is difficult to upgrade the existing system accordingly. Thus, the iteration cycle of traditional projects is hard to achieve and support the diverse businesses.

3.2.1.2 Stage 2: SOA

With the increasing service businesses in CCBs, IT systems began to shift to SOA in order to break the high cost of interaction and cooperation between chimney systems.

SOA divides the different functional units (services) of applications and enables services to interact in a unified and common way. SOA mainly aims to assist the interaction between "chimney" heterogeneous systems. Major software vendors have launched their own Enterprise Service Bus (ESB) products and solutions, at that time CCBs began launching SOA projects to build ESB. Through an ESB system, many CCBs have achieved good communication among independent systems, shielding the impact of service interface changes on service objects. However, SOA has its own disadvantages in the following two aspects:

(1) The stable state brings new chimneys. After the implementation of a SOA project, CCBs may limit these services according to the standards, making them in a stable state. The term “stability” here refers to the fact that after many services are first launched, few continuous innovations are developed later. Thus, the new business system or project gradually turn into a closed system whose realized function modules are similar to the original service, becoming a new “chimney”.

(2) By SOA, the business data of banks are scattered in different systems. To response to evolving business demands and rejuvenating business model, the construction and deployment of entirely new systems is required. Duplicate construction of basic functions and investment of resources, as well as the loss of business data precipitation in previous years, is the biggest damage and losses faced by CCBs.

3.2.1.3 Stage 3: Distributed Micro-Service System

In order to meet business needs and provide flexible services for customers, some CCBs have transformed SOA into distributed micro-services. Micro-service architecture is a new technology for deploying applications and services in the cloud (Hu et al., 2019). It divides a single application into many small services, which coordinate and cooperate with each other, providing users with the ultimate function. Each micro-service is constructed around specific business logic and operates in its independent process.

Compared with traditional SOA architecture, micro-service architecture is more flexible and implementable. It decomposes a single application into a set of services. Although the total number of functions remains unchanged, the application has been decomposed into manageable modules or services. It emphasizes the system architecture pattern of team with separate development, independent evaluation, IT application and operational process. It is possible for CCBs to develop innovative applications by using micro-service architecture like distributed core system, real-time risk early warning, real-time marketing application. Moreover, to solve the operational risk of individual applications and to allocate hardware resources, it is more

reasonable to enhance different business flexibility in the cloud environment.

However, there are still some drawbacks for the architecture of distributed micro-service system. Firstly, the standard of decomposition into micro-services is not clear. Micro-services emphasize service size, but in fact, there is no uniform standard. The logic and rules to divide the business into micro-services are difficult to identify in practice. Secondly, distributed systems are relatively complex to manage. Especially in the case of many services, different services may have different databases with high distributed transaction cost among multiple business entities. Finally, the micro-service architecture also brings great challenges to testing. Traditional monolithic applications only need to test a single interface, while micro-services need to start all other services on which they depend. Therefore, the implementation under micro-service architecture is much more complicated than SOA.

3.2.2 Application of Fintech in CCBs

The three driving forces for the application of Fintech in CCBs includes macro economy, competition and market demand. The initial purpose of banks to use science and technology is to improve services, enhance competitiveness, and obtain more profits and market share. The banking industry and the economy are highly interactive and influence each other. Price war is a popular strategy among CCBs in China, leading to fierce market competition. As previously discussed, CCBs are SMEs in the banking industry. Thus, in order to implement a differentiation strategy to achieve more profitable business, many CCBs try to employ Fintech to provide users with more customized products and services, avoiding the low-cost competition.

Currently, emerging technologies have a significant impact on the business service model of financial institutions. The following emerging technologies have gradually become the key drivers of banking industry development.

(1) Cloud computing. Financial institutions have opened the way of transformation of IS architecture based on cloud computing, gradually migrating business to the cloud.
(2) Big data. Financial big data is widely popularized. A large number of application cases of technology pioneering and business breakthrough has emerged specifically in areas of settlements, banking, securities, insurance and Internet finance.
(3) AI. The application of AI technology such as machine learning, biometrics, natural language processing in the financial field makes financial services more convenient and efficient.
(4) Blockchain. Blockchain technology may bring profound changes in financial service

mechanism. In addition to digital currency, the characteristics of this technology can play a very important role in payment, liquidation, supply chain finance, securities trading, as well as credit reporting.

Facing the rapid development of Fintech, CCBs should make use of the technology trend to enhance the product or service innovation and accelerate their digital transformation agenda. Under the new normal economic situation, the strategy of CCBs should transform from low-cost to differentiation to provide better service to the customers and take a more intensive developing path.

According to King (2012), the global banking industry has experienced four major phases from *Banking 1.0* to *Banking 4.0*, during which technology of banking industry has gradually turning from manual account, computer operation to Internet and digital systems. Nowadays, the most important task for all banks is the digital transformation. Along with the development of Internet and the smart mobile, it is much easy to obtain the financial services. Traditional banks have to take the initiative to seek upgrading and carry out digital transformation to maintain their market share. In China, some large traditional banks have successfully transformed, which has accumulated experience for the digital transformation of CCBs in China.

The transformation to the digital bank is no longer a self-efficiency improvement. It needs the support from other related firms. We may find that this digital transformation ecosystem may include e-commerce platforms, Fintech startups, research institutions, and traditional IT service providers. All these enterprises provide the necessary support, such as software and hardware, which helps small and medium-sized banks in the transformation towards digital banks. Different from the previous improvement from Bank 1.0 to Bank 3.0, which focused on the operation efficiency, this digital transformation aims at the business model innovation that centers on customers by digital technology and tools.

3.3 Challenges of CCBs in the digital era

3.3.1 Turbulent economic environment

In the past two years, the global economic growth has slowed down, the real economy has shrunk, the non-performing loan (NPL) rate is rising, the risk pressure has increased, the bank profits have eroded, and the single-digit net profit growth rate has been normal. According to the report of the International Finance Research Institute of the Bank of China, the China's banking industry is faced with two major challenges in 2017, which are the increasing revenue

capacity and credit costs. Compared with 18.9% in 2012, the growth rate has slowed down to 6% in 2017, which is decreased by nearly 13%. Meanwhile, the proportion of NPLs has risen from 1% in 2012 to 1.7% in 2017 (CBRC, 2018).

In order to survive in an unfavorable environment, all the banks have to try their best to innovate to meet the new demand of customers. Fintech provides a feasible solution to deal with these problems. Currently, in the China's banking industry, large banks and joint-stock banks have a high level of Fintech innovation with special Fintech subsidiaries. However, for the SMEs including CCBs, agricultural and commercial banks, their Fintech innovation is still at a low level. In particular, the development of Fintech in CCBs is limited by customer size, brand influence, and technology reserve (CBA, 2018). Considering the insufficient resources for CCBs, establishing their own Fintech infrastructure by themselves is a very high-cost investment, which makes it nearly impossible and economically unfeasible. Therefore, cooperating with other third-party Fintech companies has become an effective way to quickly break the technical barriers.

3.3.2 Regulatory policy in China's banking industry

Own to the significance of banking industry to national economy, the People's Bank of China, as the managerial organization of government, inevitably takes risk-control as the primary goal. It is necessary to control the risk and protect the customers' needs when formulating relevant policies, laws and regulations. However, the convenience brought by bank digitalization and Internet also increases the possibility of risk. Hence, the objectives of authority governance and commercial banks are not consistent. When formulating policies related to digitalization and Internet, the People's Bank of China will fully consider all kinds of risks such as network security risk, credit risk, and strengthen supervision coordination to reduce all possible risks (CBA, 2018).

In recent years, the interest rate in China has been experiencing a gradually marketization process. The liberalization of interest rate in China may reduce the banks' interest margin, leading to the drop of deposit growth rate as well as profit margin. In order to cope with the government regulation, banks have to continue to increase investment in IT technology and other fields including hardware and software, which will bring about higher cost pressures. This situation may imply that if banks do not innovate their strategies and business models, it might be difficult to survive, given the fierce competition of the Chinese banking industry.

In addition, recently, since many capital losses issues caused by improper bank management have affected the trust of bank in society, the government has strengthened the

supervision on operation procedure. Thus, the bank practitioners should consider risk control as a priority when conducting any business innovation. As we know, most of the traditional risks cannot be reduced or eliminated by IT. On the contrary, with the development of online loan products developed by CCBs, customers can complete their loan application only through the Internet. Although the processing time of customers has greatly shortened, the credit risk may increase because commercial banks and customers do not make face-to-face contact. This network security is a unique risk associated with the development of Internet and digitalization of CCBs. Compared with internet financial enterprises, CCBs have no advantage in technology. Therefore, some hackers who are unauthorized personnel can explore loopholes in the system to steal customer information, such as identity information, capital password, and this is a security danger that affects digital transformation of banks. To avoid the customer information leakage, in the process of digital transformation, CCBs need to have higher-level security measures such as data classification, encryption, access, and authority control during the process of digital transformation.

3.3.3 Threat from Internet finance

The emergence of Internet finance is a kind of disruptive innovation, which has overturned the business model especially profit-making mode of traditional commercial banks. Indeed, financial disintermediation has become more and more obvious phenomenon in China. The popularity of smart terminals has led to the rapid development of Internet financial enterprises whose main business is mobile payment technology, which has brought about a comprehensive impact on the banking industry. According to statistics of CBRC, third-party payment users continued to grow at a very high speed of more than 10% in 2018, reaching the highest peak in history at 78%. Moreover, according to “European Digitalization Program” by Mckinsey, retail banking business has been facing the technological threat from Internet financial enterprises and Fintech companies, in which payment business has been completely subverted. By 2025, retail banking is expected to lose 40% of its revenue and 60% of its profits due to the disruption of Fintech. The Internet financial enterprise has become the strongest rivalry for the traditional commercial banks, leading to the marginalization of the payment function in commercial banks (CBA, 2018).

Faced with severe challenges from Internet finance, it is urgent for CCBs to change their original service mode and make a customer-oriented strategy to integrate financial products and services with the Internet. However, in practice, due to the provisions and limitations of various

risk control policies, the customer-oriented strategy is difficult to be implemented in CCBs. For instance, the payment means of CCBs are relatively limited with only bankcard payment, online bank transfer, mobile bank transfer; the loan process of CCBs is cumbersome; the approval time is much longer, making it easy to miss the favorable time window. All these disadvantages may attribute to the bureaucratic organization structure of CCBs, in which each department is relatively closed and information is isolated, negatively affecting the efficiency for CCBs to complete the issuance of loans.

3.3.4 Mismatch between Fintech and managerial capability within a bank

Compared with the Internet banks, the traditional commercial banks have fallen behind in the managerial skills and operational modes, and the gap between them is expanding . Firstly, most business units are isolated from each other and there exist too many structure levels, making the examination and approval procedures cumbersome. This long decision chain may lose the market opportunities especially under the new era where everything changes so quickly. Due to the inconsistency of business data exchange rules and standards, the CCBs cannot make corresponding changes in time according to business changes, resulting in low efficiency or market losing. Secondly, since the Internet operation mode in CCBs has only developed for a short time, there are still many problems that need to be improved including the lack of customer analysis methods, lack of standardized process and system of operation service capability, and the low degree of tapping and transforming potential users.

In addition, since IT architecture is very complicated and updates very fast, compared with the Internet financial enterprises, most CCBs have obsolete IT architectures. The high maintenance cost as well as talents shortage also restricts the Fintech innovation to some extent. As the foundation of EA, IT architecture supports the construction and development of the upper business architecture. As the banking service mode gradually shifts to online, IT architecture becomes more and more important. Faced with various demand and the constant pressure of network security CCBs need to provide more differentiated and integrated convenient services on the premise of ensuring security to compete with Internet financial enterprises.

As small and medium-sized banks, CCBs have many obstacles except for the internal structures. Technical capability of CCBs has always been an important bottleneck in the processes of transformation to digital or Internet banks. In particular, because of the lack of Internet finance talents, CCBs have made a relatively slow progress on the road of transformation. Although CCBs have developed many digital products, they still largely lag the

Internet companies like Ali and Tencent. Under the competition of the Internet and many technology companies, the problem of technician shortage in CCBs is becoming gradually prominent. In addition, the traditional assessing approaches or performance appraisals may not be suitable for the IT department, lacking sufficient incentives for relevant talents.

3.4 Summary of this chapter

Recently, the external environment has changed dramatically such as stricter regulatory policies, the substitution of Internet finance, and more individualized. All these enhance the competition among banks, making the revenue declining or the bankruptcy of several banks. The survival of the small and medium-sized banks is becoming more difficult than before. Therefore, it is imperative for banks to take the digital strategy transformation from bank-oriented to customer-oriented. Since CCBs are SMEs in the banking industry, digital transformation of CCBs are even more urgent for their survival and sustainable development. By widely application of Fintech, CCBs expect to establish their competitive advantages by creating new business models and finding a niche market.

The development of Fintech in China has benefited from the progress of IT and the development of banking business. For example, mobile Internet technology enriches the payment channels and personalized consumption demand, and flourishes the financial market; AI technology creates the avenue to deploy intelligent customer service, intelligent investment, anti-fraud, and intelligent risk control. The application of large data enables banks to accurately market and obtain customers in scenarios based on security technology; technology makes the remote identification of trading objects possible, which improves the security of transactions and reducing the transaction costs greatly. The impact of financial technological innovation on banking business can be manifested as follows:

The traditional business of CCBs often has some shortcomings, such as inefficient operation, limited region and low innovation. Fintech are just good at solving these problems. Relevant business innovation has also led to a number of new financial applications, such as intelligent investment, Internet funds, digital bills and photon payment. Fintech has remarkable advantages in convenience, security, customer acquisition ability and risk control, which provide new growth space for the development of CCBs. In addition, based on the application of Big Data, AI, Cloud Computing and Blockchain technology, CCBs have continuously upgraded their traditional business and launched many new products to meet customer needs and provide personalized financial solutions, thus giving CCBs new ways of realizing and

organizing their traditional business.

The digital transformation of CCBs is still facing many challenges. It is an urgent problem for banks to construct new digital departments and business models. However, its digital transformation strategy and operation planning are difficult to implement because of the lack of suitable talents and organizational structure rigidity. In addition, due to the congenital deficiency of Internet thinking, strict supervision of policy conditions, short-term performance evaluation, and online risk, the digital transformation of CCBs has a long way to go.

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Chapter 4: Theoretical Framework and Research Method

This chapter presents the proposed theoretical framework and related hypotheses to show the antecedents of BITA and its impacts on working performance, developed based on the SAM model by Luftman (2000). In order to examine these hypotheses, a questionnaire was designed to collect necessary data and the BQD was selected as a sample to examine the proposed hypotheses.

4.1 Theoretical framework and hypotheses

As discussed in Chapter 2, there are various factors affecting the BITA, such as top management support, understanding between business and the IT department, communication, IT infrastructure and processes. Luftman (2000) proposed a theoretical framework namely, SAM model, to evaluate the extent to which business and IT align in an organization. SAM has also been used as a tool to assess the alignment between business strategy and IT development within a corporation (Luftman, 2000 Chen, 2010). In this study, we employed SAM as a theoretical framework to examine the business-IT strategic alignment in BQD since this maturity model has exhibited its applicability to Chinese firms, as reported in Chen. Based on the SAM model of Luftman, we proposed the following theoretical framework and hypotheses displayed in Figure 4.1.

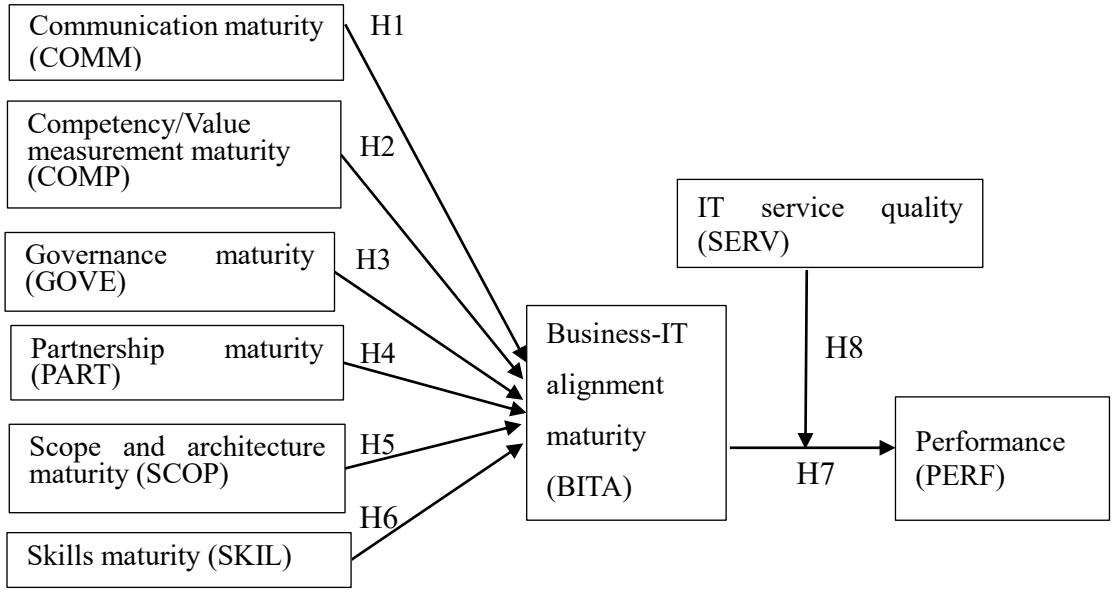

Figure 4.1 Theoretical framework and hypotheses in this study

4.1.1 Communication maturity and BITA maturity

The process of communication is the process of transferring information between people, which is a necessary condition for the implementation of both business and IT strategies (Reich & Benbasat, 2000; Chen & Chen, 2006; Chen, 2010). The establishment of communication systems focuses on the establishment of communication plan, information release, communication channels (Charoensukmongkol & Moqbel, 2014). The preparation of the plan is to achieve communication in a planned and purposeful way in the process of communication. As Zhang, Xiao, and Li (2014) point out, the release of communication information is very important for both business and IT managers. To achieve the expected requirements and effects, correct communication channels between the different units within a firm should be well established in order to transfer communication information and facilitate the coordination of all departments quickly and accurately (Chen, 2010). At the right time and in the right way, the purpose of communication is the concrete embodiment of the use of communication forms (Luftman & Kempaiah, 2007; Luftman & Derksen, 2012). For example, when to communicate by email, when to communicate by phone or SMS, and when to communicate by conference are all important research directions of communication management, which may affect the matching between business and IT strategies (Alaceva & Rusu, 2015). Chen (2014) distinguished the formal and informal communication roles. For example, how to accurately express the wishes of the publishers in the right form? Simple informal communication can be explained by phone, email or conference.

There have been many studies on communication channels. For example, Anderson and Narus (1999) discuss the timely communication and information between enterprises. They suggest that formal and informal communication channels are both important to any organization and that timely and effective communication can improve the performance of enterprises (Schlosser, Wagner, & Coltman, 2012; Xie et al., 2015). Different types of communication have different forms and meanings. For example, facial expressions and gestures can, to a certain extent, convey some key information in the process of communication (Bharadwaj, 2000; Tippins, 2015).

Effective communication of ideas and a clear understanding of the business demand are necessary for the IT department to provide support to the business strategy. Usually, the IT department is not familiar with the business, or the business department does not understand technology, making the alignment difficult (Lee et al., 2008; Kappelman et al., 2013). The ultimate goal of communication is to enable the information receiver to smoothly receive the

information sent by the sender, correctly understand IT through the right channels, and then send back the corresponding information to the sender in order to establish a bridge and play an unimpeded role in connecting the information (Campbell, Kay, & Avison, 2005; Coltman et al., 2015). Particularly, as organizations are in a dynamic environment, it is critical to share knowledge among departments (Chen & Chen, 2006). IT communication management includes all processes needed to ensure the timely and reasonable generation, collection, release, receiving, calling and final processing of project information (Oh & Pinsonneault, 2007). Communication management is not only a common sense of inter-personal communication, but also an art of using reasonable means to achieve communication effect (Kashanchi & Toland, 2008).

Communication management in domestic IT projects has made great achievements in how to establish communication systems, manage communication channels and corresponding communication skills and methods (Luftman & Lyytinen, 2015). Especially in the establishment of communication channels, the application of relationship is not available to some foreign IT project managers (Byrd, Lewis, & Bryan, 2006; Cenfetelli & Bassellier, 2009). Due to the different cultural backgrounds and communication concepts, most of the managers often pay attention to the handling of interpersonal relationships, and are good at working on communication channels and methods, and achieving the purpose of communication through different communication channels and corresponding communication means (Luftman et al., 2013). Effective communication between business departments and the IT department not only consider the department-level links, but also pay attention to communication within the department (Yu, Johnson, & Zhang, 2009). In cross-department IT project communication management, training is the most widely used and the most effective way to establish and maintain teams. Through training, we can eliminate differences and improve the overall quality and ability of the team, which may strengthen the knowledge and skill level of team members and enhance the understanding of projects and deliverables (Brodbeck, 2002; Preston & Karahanna, 2009a). Through establishing formal communication process, IT project management colleagues focus on the establishment of standardization, so that every team member knows what kind of process should be adopted to achieve the purpose of communication when encountering problems, which is conducive to the smooth progress of the project (Yu, Johnson, & Zhang, 2009; Luftman & Ben-Zvi, 2011). Facing the project members from different department and backgrounds, how to choose the right communication channel is an important means to strengthen communication and promote effective communication (Luftman & Lyytinen, 2015). Thus, we propose the following hypothesis:

H1: Communication maturity will promote the BITA maturity.

4.1.2 Competency/Value measurement maturity and BITA maturity

IT capability refers to the ability to control the cost related to IT and realize the enterprise's goal by implementing IT (Ross, 2015). As Bharadwaj (2000) suggests, IT competency is the ability of an organization to build and deploy IT resources, which is the interaction outcome of three kinds of IT resources including tangible and intangible IT resources. Armstrong and Sambamurthy (1999) define IT capability of an organization from the perspective of real options, and consider it to be a series of IT enabled ability existing in the form of electronic organization workflow and knowledge. With the rapid development of IT especially in the Big Data era, how to make an effective choice in front of a huge amount of information has become a huge challenge for enterprises (Cepeda-Carrion, Cegarra-Navarro, & Jimenez-Jimenez, 2012; Xie et al., 2015). In this context, many researches began to focus on the impact of IT on business success especially through promoting the enterprise's absorptive capacity. In the empirical research, researchers found that no matter what the individual absorptive capacity of employees, IT competency has a significant positive impact on the absorptive capacity of an organization (Xie, et al., 2015; Tippins, 2015). From a theoretical perspective, Peng (2012) provides an explanation on how IT capability can promote the absorptive capacity of an enterprise, who believes that IT capability can influence the organizational resources and mechanisms in the process of absorptive capacity based on the complementary theory. Hence, the BITA is a process, in which all business units use IT to create values for the customers. (Wang, Zhong, & Mei, 2011). Thus, this absorptive capability can be regarded as a kind of business and IT fitting competency (Yu, 2013).

Chen and Chen (2006) point out that many information technologies do not present their value to the business. Business and IT strategies often measure value differently, making it hard to match each other (Johnson & Lederer, 2010). Therefore, we need a balance to express IT value in business contribution (Nair & Dreyfus, 2018). IT service level of business commitment must be expressed in terms of business understanding and acceptance, and must be related to the criteria for clearly defining rewards and punishments for exceeding or failing to achieve the objectives (Lee et al., 2008). Organizations often invest resources in measuring performance factors, but rarely act on standards like measurement. In this study,we propose the following hypothesis:

H2: Competency/Value measurement maturity will enhance the BITA maturity.

4.1.3 Governance maturity and BITA maturity

There are different understandings for IT governance. For example, Wilkin and Chenhall (2010) define IT governance as the supervision, monitoring, and controlling of an organization through IT; Brown and Magill (1994) propose a contingency theory of IT governance to emphasize the importance of IT governance in corporate governance. Based on the centralization of IT infrastructure, IT usage management and project management, Armstrong and Sambamurthy (1999) divides IT governance into nine modes including centralization, decentralization and Federation. Since then, IT governance has gradually attracted people's attention. There are different definitions on IT governance. Tanriverdi (2006) summarized IT governance research into two schools: control type and guidance type. The former type emphasizes the control factors in IT Governance, focusing on how to balance IT risk and the return. With the development of IT governance research, scholars find that IT is not completely related to its performance (Weill, 1992), and more scholars tend to study IT governance from the perspective of organizational structure, process and communication mechanisms to ensure its performance (Peterson, 2004; Aral & Weill, 2007; Haes & Grembergon, 2009; Devos, Landeghem, & Deschoolmeester, 2012). Organizational structure refers to the formal organizational design and responsibility that take a framework for IT decision-making. Governance process refers to the formal process, technology and steps for IT decision-making and monitoring. Sambamurthy and Zmud (1999) suggested that the IT governance platform should consist of three parts: IT capability, IT relational architecture and IT integration architecture. Among them, relationship architecture includes cooperation, communication, dialogue, and shared learning between business and IT departments.

IT governance is very important for an organization to achieve its vision, mission and strategic objectives (Zheng, Lin, & Xu, 2012). IT governance has a broad term, including IS, technology, communication, business, all stakeholders, legitimacy and other issues (Lee et al., 2008). There are many tasks for IT governance, such as keeping IT consistent with business objectives, promoting business development, maximizing revenue, making rational use of IT resources, and properly control IT risks (Wang, Xue, & Liang, 2011; Xie et al., 2015).

The International Association for Information Systems Auditing and Control (ISACA) defines IT governance as a system that composes of relationship and process to guide and ensure the realization of enterprise objectives (Dong, Liu, & Yin, 2008; Xie et al., 2015). IT governance is an integral part of the strategic planning of the enterprise, which will affect the strategic competition of the enterprise and which includes IT management, organizational

structure and process to ensure that it maintains and expands organizational strategic objectives (Haes & Grembergon, 2009). The key contents of IT governance are as follows (Haes & Grembergon, 2009):

(1) To be consistent with the strategic objectives of the enterprise;
(2) To protect the rights and interests of stakeholders, make risks transparent, and guide and control IT investment, opportunities, interests and risks;
(3) To guarantee that information resources of enterprises can be used reasonably, and integrate and coordinate effectively;
(4) To ensure that IT is delivered in time according to the demands of the business strategy.

In addition, IT governance guides IT strategy to balance system investment, support enterprises, change enterprises, or create an information infrastructure to ensure business growth and competition in a new field (Shelly, Wu, & Liang, 2015). IT governance makes reasonable decisions on core IT resources, enters new markets, drives competitive strategies, creates total revenue growth, improves customer satisfaction, and maintains customer relationships (Dong, Liu, & Yin, 2008). Therefore, IT governance system ensures that the overall strategic objectives of the enterprise can be implemented from top to bottom (Dawson et al., 2016).

Like other governance activities, IT governance focuses on the top management (board of directors) and executive management (Hooper, Huff, & Thirkell, 2010; Markus, Sia, & Soh, 2012). In order to ensure effective IT governance, the underlying application should have the same principle as the overall goal of the enterprise and provide a consistent performance evaluation method (Bhatt & Grover, 2005). Good IT governance practices need to be implemented within the scope of enterprise recruitment (Huo et al., 2010).

The overall goal of IT governance is to realize the value of shareholders more effectively through the integration of IT and businesses. It is required to support the development of enterprise business within a given time, including improving service quality, controlling risks effectively and reducing service costs (Chen, Preston, & Xia, 2010).

From the resource-based view perspective, IT capability is a strategic resource of an organization, and its maximum value depends on the cooperation of other key resources in the organization (Patel, 2002; Setia-Atmaja, 2009). As an important institutional arrangement for IT implementation, IT governance is a key complementary resource of alignment of BITA. When an enterprise has a high level of IT governance, it will set up a special IT committee and formulate standardized IT strategic planning (Chen, 2014; Akter et al., 2016). These good

institutional arrangements ensure that on the one hand, the enterprise attaches importance to IT, and on the other hand, they are conducive to IT investment and management (Johnson & Lederer, 2010; Kappelman et al., 2013). The scientific decision-making will be beneficial to the exertion of IT capability and the promotion of IT capability to absorptive capability. By contrast, low IT governance level of an enterprise will make the enterprise lack of awareness of the importance of IT and will eventually hinder the development of IT capabilities (Lee, Lee, & Jeong, 2008).

The existing theoretical and empirical studies also show that IT governance is an important regulatory variable for the value of IT capabilities (Tanriverdi, Rai, & Venkatraman, 2010； Tippins, 2015; Xie et al., 2015). Tanriverdi (2006)'s empirical studies show that IT governance is an important regulatory variable for the performance value of IT capabilities. Wang, Xue and Liang (2011) believe that IT governance can help enterprises to manage IT capabilities well and consciously promote communication between business departments and information departments through various mechanisms, eventually promoting the matching of business and IT strategies (Chen & Chen, 2006). Therefore, the following hypothesis is proposed:

H3: Governance maturity will promote the business-IT strategic alignment maturity.

4.1.4 Partnership maturity and BITA maturity

As we know, the role of IT strategy may vary in different departments of an enterprise, which have different needs and attitudes to IT. These ideas and attitudes constitute the IT culture of the enterprise (Hooper, Huff, & Thirkell, 2010). IT culture, like corporate culture, takes a long time to form. IT has the characteristics of heterogeneity and complexity, and is the strategic resource of an enterprise (Aral & Weill, 2007; Charoensukmongkol, 2014). In IT planning, construction and implementation, a series of management systems, rules and regulations should follow, such as information security. IT culture will affect the formation of high-level IT human resources (Al-Alawi & Kuzic, 2007; Blumenberg, Wagner, & Beimborn, 2009). A high level of IT culture and system is conducive to creating communication and sharing among IT employees and between IT employees and other business units (Dwivedi et al., 2009). The interaction between them will promote the spread of information and knowledge within the enterprise, thus greatly promoting the work and organizational roles of each employee (Chen & Chen, 2006; Byrd, Lewis, & Bryan, 2006)

Therefore, the relationship between business and IT department is an important factor that may promote or inhibit BITA (Bart & De Winter, 2011). To build a favorable relation, some

critical problems should be considered such as how to understand the contribution of other departments, how to develop trust among participants, how to ensure the right business sponsors and IT supporters, and how to share risks and benefits are important factors for a mature match (Lee, Lee, & Jeong, 2008; Puvanasvaran, Norazlin, & Suk Fan, 2015). Naturally, these require a common and clearly defined vision and communication between CEOs and CIOs (Alaceva & Rusu, 2015). This collaboration between business and IT units or employees is critical in promoting or even driving the implementation of the business process and strategy.

With the change of environment and business, a set of flexible supply system is formed on the basis of unified planning, and the quick response to external changes is enhanced (Marakas, Johnson, & Clay, 2007; Johnson & Lederer, 2010; Toetenel, 2014). IT user flexibility emphasizes the attitude of business personnel towards IT quality and the role they play in IT construction. The purpose of IT application is not to establish IT itself, but to serve the business (Kashanchi & Toland, 2008). If business people can actively apply IT to seek support for business changes, then IT will have a positive impact on IT flexibility (Zhang, Xiao, & Li, 2011 Preston & Karahanna, 2009a). Communication and coordination between business and IT personnel can enable enterprises to build an evolving IT system that supports both efficiency and innovation (Singh, Garg, & Deshmukh, 2008). Thus, we suggest the following hypothesis:

H4: Partnership maturity will promote the business-IT strategic alignment maturity.

4.1.5 Scope and architecture maturity and BITA maturity

As Luftman and Lyytinen (2015) suggest, IT infrastructure mainly includes the following three levels: (1) IT component layer that composes of computer, router, printer and operation system; (2) IT service layer that composes of IT system management, communication and data management, and IT training; (3) IT application layer that composes of financial management, human resources management, and other application systems. Sharing, service and flexibility are three important characteristics of an IT infrastructure (Zhang, Xiao, & Xie, 2014). The sharing of IT infrastructure mainly refers to the application scope of IT infrastructure like the number of departments that apply this IT equipment and the complexity of IT infrastructure application (Xue, Ray, & Gu, 2011). Enterprises with weak IT infrastructure sharing can only update the data of a single department and transfer information within a single business department. Conversely, enterprises with strong IT infrastructure sharing can integrate various information from multiple departments, in which complex transaction processing can be carried out between different application systems (Johnson & Lederer, 2010; Huo et al., 2010). The

service ability of IT infrastructure refers to the level of service that IT infrastructure can provide. Different enterprises need different services. They need to determine services according to their own needs. Some services are necessary for most of enterprises, while some services are only needed by some specific enterprises (Charoensukmongkol, 2014).

Flexibility of IT infrastructure refers to the reconfiguration of IT infrastructure to support business activities due to changes in the external environment (Kyobe, 2004; Cretu, 2014). The flexibility of IT infrastructure is determined by the changing requirements of business processes, so enterprises need to analyze business processes to determine the flexibility of IT infrastructure (Luftman & Lyytinen, 2015). As Bhatt et al. (2010) suggest, IT infrastructure flexibility describes the extent to which IT resources can be shared and reused over time and the speed and cost of its integration with new business processes. Flexible IT infrastructure can support a variety of technologies, which can be easily integrated into the whole technology platform, released any type of information to any place within and outside the organization (Alaceva & Rusu, 2015). At the same time, IT infrastructure flexibility can also maximize the integration of technical functions and management functions, use information to control the behavior of the enterprise, quickly adapt to new changes, and help the enterprise to achieve its strategic objectives (Bhatt et al., 2010). Flexibility determines IT ability to respond quickly and effectively to system requirements caused by business or strategic changes. The ideal flexible IT infrastructure should change with the change of environment, adapt to the adjustment of enterprise strategy, support innovation, and make the business process and organizational structure continuously improve to adapt to the new strategic environment (Wong, Tseng, & Tan, 2014; Josephng et al., 2015).

The strategic purpose determines the way in which an enterprise invests in IT infrastructure. Some enterprises focus on cost saving through economies of scale, while some enterprises focus on the flexibility of current strategic demand or long-term demand (Haes & Grembergen, 2009). Strategic flexibility is necessary when an enterprise is in a complex and unpredictable dynamic environment and must respond quickly. At the strategic level of an enterprise, it is required to have the ability to adapt to the changes of internal and external environments, and to be able to make corresponding adjustments in time according to the changes of enterprise's strategy, application mode and organizational structure (Benlian & Haffke, 2016). Therefore, as an important part of an enterprise's overall development strategy, IT strategy must also be flexible to change with the corporate strategy (Benbya & Mckelvey, 2006). Only with a flexible IT strategy can the IT department or IT leaders recognize and predict major changes in the environment in a timely manner, and accept the changes to make appropriate adjustments to

respond to and adapt to the changes (Jank, Shmueli, & Zhang, 2010; Kappelman et al., 2013).

Byrd, Lewis, and Bryan (2006) further point out that IT infrastructure flexibility is one of the core competitiveness of an organization and have significant impact on the BITA. A good infrastructure should have the flexibility and robustness to adapt to changes, which focuses on speed and flexibility to address growing customer demand with low cost (Huo, 2010). Environment changes of an enterprise lead to changes in the enterprise's strategy, organizational structure and business processes. These changes will, in turn, put forward new requirements for the IT infrastructure (Gbangou & Rusu, 2016). To meet these needs of business changes, IT must update and change itself continuously. No matter at the strategic level, business level or technical level, flexible IT infrastructure architecture is required to ensure the realization of flexible requirements (Bhatt et al., 2010). Accordingly, it is reasonable to assume the following hypothesis:

H5: Scope and architecture maturity will promote the business-IT strategic alignment maturity.

4.1.6 Skills maturity and BITA maturity

Human resources are one of the important resources of an enterprise, having a great influence on the enterprise's performance (Chen, Mocker, & Preston, 2010). The knowledge and skills of IT personnel mainly include IT technical skills and IT management skills (Aral & Weill, 2007; Luftman & Lyytinen, 2015). IT technical skills refer to the technical quality of IT personnel, including programming language, experience of distributed operating system, understanding of communication protocol and products. These skills are often easy to be achieved through individual learning (Singh, Garg, & Deshmukh, 2008). High level IT technology skills can deal with the technical risks related to IT application. IT management skills refer to the management skills related to the use of IT, such as coordinating the relationship between users, and leadership skills of IT team (Chan, Bhagwat, & Wadhwa, 2008; Gerow et al., 2014). IT management skills are usually not easy to be acquired, as they require an explicit knowledge learning and a long-term experience accumulation. Therefore, IT management skills are not easy to be imitated and may be one of the core competencies of an enterprise (Schor et al., 2000). Thus, the improvement of the IT infrastructure will help IT staff to process internal and external information and knowledge, and strengthen internal and external information sharing (Kekwaletswe & Mathebula, 2014). Enterprises with high IT infrastructure level have relatively strong absorptive capacity and can enhance their own learning intensity (Luftman & Kempaiah,

2007; Luftman & Derksen, 2012).

IT personnel flexibility refers to the ability of employees to adapt to internal and external environment changes in IT development, maintenance and use, including IT professional flexibility and IT user flexibility (Greer, Lusch, & Hitt, 2017). IT professionals should not only have the necessary technical ability and technical management ability, but they should also have strong business, interpersonal communication and management abilities. Flexibility of IT professionals emphasizes the balance of these abilities (Maes et al., 2000). This balance can not only enable IT personnel to meet business needs through IT system and provide decision support, but also make them actively perceive and respond to the external environment (Mao & Wang, 2012). Analysis of the relationship between IT infrastructure, IT human resources, and IT infrastructure implementation provides a good platform for IT personnel to improve their skills which not only depend on their knowledge and skill base, but also on their group environment (Allen, Ericksen, & Collins, 2013). IT personnel can learn from the outside experience only by fully communicating with other employees and external entities, during which their information experience and individual knowledge are combined to innovate their knowledge structures (Multimedia, 2011). According to the previous literature, we propose the following hypothesis:

H6: Skills maturity will enhance the business-IT strategic alignment maturity.

4.1.7 BITA maturity and performance

Many scholars have confirmed that BITA has a positive impact on the organization performance since it can promote the success of IT strategy or improve the effectiveness of IT (Brown & Magill, 1994; Chan et al., 1997; Lee et al., 2008; Lee-Klenz, Sampaio, & Wood-Harper, 2010; Buchalcevova & Pour, 2015;Akter et al., 2016). Business-IT tactical matching can improve business effectiveness (Zhang et al., 2014) as well as organizational competitiveness (Kearns, 2000; Kearns & Lederer, 2003; Yu, 2013). BITA can positively facilitate the enterprise efficiency (Sabherwal & Kirs, 1994; Byrd, Lewis, & Bryan, 2006; Chan, Sabherwal, & Thatcher, 2006; Lee et al., 2008), and exert a direct and positive impact on organizational performance (Teo & King, 1996; Chan et al., 1997; Sabherwal & Chan, 2001; Hussin, King, & Cragg, 2002; Bergeron, Raymond, & Rivard, 2004; Lee et al., 2008; Luftman & Lyytinen, 2015). Based on the previous researches, it is reasonable to propose the following hypothesis:

H7: Business-IT strategic alignment maturity is positively related to the working performance

4.1.8 Moderating effect of IT service quality

IT service providers may effectively manage and guide the evaluation of their own services if they can evaluate the value of IT itself (Alaceva & Rusu, 2015; Akter et al., 2016). Johnson and Lederer (2010) point out that the research on IT service should focus on the timeliness and high quality of information, the improvement of decision-making, professionalism and satisfaction, and unreasonable expenditure. Keen (1996) believe that the traditional measures to evaluate the performance of the IT department are mainly financial measures, but these measures have serious defects regarding the IT service's evaluation. Some scholars also point out that IT service quality can be regarded as an alternative evaluation method because the problem of traditional financial evaluation on IT performance continues to be known (Greer, Lusch, & Hitt, 2017). Indeed, there are many problems in the applicability of the traditional method of measuring IT services. Therefore, many enterprises try to replace the old method with new IT performance indicators when evaluating the performance of the IT department and the intangible assets they create. Zhu, Sivakumar, and Parasuraman (2004) mention that in the past, most researches on service quality focused on general service quality and its components. In addition, Lee, Miranda, and Kim (2004) evaluate the quality of IT outsourcing services and Lacity, Khan, and Willcocks (2009) conduct a literature review on IT outsourcing service and suggest that service quality is important to the performance. Thus, in this study, we propose the following hypothesis:

H8: The service quality of the IT department plays a moderating role between business-IT strategic maturity and working performance.

4.2 Questionnaire design

The purpose of this empirical study is to investigate the determinants of BITA and its impact on performance within BQD. Therefore, related hypotheses are put forward to show the antecedents of BITA. To examine the proposed hypotheses, this study designed a questionnaire to measure the latent variables including all the six maturity criteria (i.e. communication maturity (COMM), competency/value measurement maturity (COMP), governance maturity (GOVE), partnership maturity (PART), scope and architecture maturity (SCOP), and skill maturity (SKIL)), as well Business IT strategic alignment (BITA), IT service quality (SERV), and performance (PERF). According to Churchill (1979) and Hinkin (1995), the main steps in this study are as follows to form the first draft of the BITA scale in the questionnaire.

(1) Finding measuring items from previous literature. In this study, the concept of BITA proposed by Chen (2010) is used. Since Chen investigated the Chinese enterprises, it is more suitable to this study. Based on indicators in Chen, the title item database of BITA was formed by selecting each item and the title items are merged and classified according to their meanings.

(2) Refining items by specific context. Because this study chose the BQD as the sample, the BITA was examined at the individual level, rather than at the organization level in previous literature. Thus, some items must be reconsidered in order to become easy to understand for the employees. Compared to the organization level, there are some differences for individual level in the source, scope and form of BITA. The first draft of the scale was further focused and refined through scenario limitation.

(3) Translating questionnaire into Chinese. After forming the first draft of the scale, the author and the other two proficient in Chinese and English doctoral students conducted two back-to-back translation of the first draft of the scale to form the first draft of the scale in Chinese. The concept, logic and formulation were discussed for many times, and were modified and adjusted according to the supervisor's opinions.

(4) Small scale test. Before the formal large-scale distribution, 10 persons including 2 senior managers, 3 middle managers, and 5 first-line employees were randomly selected to examine the questionnaire. We first asked each of them to answer the questionnaire and then conducted an interview to discuss the accuracy of the questionnaire. In general, the interviews were about an hour and respondents provided many suggestions to improve the questionnaire. This process had lasted for a month until the final questionnaire was formed.

The formal questionnaire comprises three parts including personal profile, BITA measurement, and opening question (See Appendix 1 for details). In the second part, the Likert 5-point scale is used, in which 1 represents "completely disagree", 2- "disagree", 3- "hard to say", 4- "agree", and 5- "completely agree".

4.3 Sample selection and background

In this study, BQD was selected to examine the proposed hypotheses. BQD was founded in November 1996. It was a joint-stock CCB composed of 21 city credit cooperatives in Qingdao, which was invested by the local government, enterprises and several residents. On April 28, 2008, it was officially renamed as BQD from the original Commercial BQD. Currently, it is the

largest local bank in Shandong Province.

Located in this study, SEM was employed to examine the proposed hypotheses by SPSS and AMOS24.0. This chapter first analyzes the demographic information of respondents and then reports on the empirical results. Through the cross-section data from BQD, we may explore the current situation of BITA of BQD from an employee level perspective.

Qingdao, as a coastal city in eastern China, has some geographical advantages. According to the strategy of Chinese "Belt and Road Initiative (BRI)", there are totally five sea and land routes of which four routes start from Qingdao, making Qingdao very important in the BRI strategy.

Among all CCBs in China, BQD entered the capital market earlier than others. After the IPO of Bank of Zhengzhou, BQD became the second listed CCB both in stock market of Mainland China as well as Hongkong (A+H). BQD went public on the main board of Hong Kong stock exchange on December 3, 2015 (Stock Code: 3866. HK) and on Shenzhen Stock Exchange on January 16, 2019 (Stock Code: 002948). According to the rank of top commercial banks by CBA in 2018, BQD ranked the fifth in terms of sustainable developing ability, and was also listed in the "*Top 1000 World Bank 2018*" by British *Banker* magazine.

In 2010, the BQD made a differentiated competitive strategy. For corporate banking business, wholesale was the main strategy in large cities, while in small cities, BQD focused on SMEs. Through the wholesale business, BQD largely increased its revenue and expanded government and shareholder customer resources, as well as forming professional operation capacity. As an important source of profit, BQD mainly aimed at providing differentiated services to SMEs in the Shandong province. In terms of retail banking business, BQD developed several new account products and established a customer-oriented account service system to provide local and foreign currency businesses comprehensively. Meanwhile, BQD also greatly expanded the self-service bank network and improved the number of self-service machines, as well as establishing a variety of electronic channels to server the retail customers.

In 2013, after achieving two hundred billion revenue, BQD started to set a new goal with 200 billion deposit and 300 billion assets. In accordance with the standards of listed banks and the specific deployment of the three-year strategic plan, BQD, guided by the mission of "intensive work, strengthening differences, seizing opportunities and strict management of risks", and characterized by "warm service, solid risk management and outstanding science and technology", was committed to achieving the second "two hundred billion" target.

To highlight the differentiation, BQD promoted the "new finance" concept to be applied to practice, which mainly referred to the innovations in financial market including trade finance,

small and micro finance, and interface banking. At the same time, BQD also encouraged its branches to develop special products according to the regional characters.

In 2016, the start year of China's *13th five-year plan,* BQD also formulated a new strategy to transfer from traditional to an interface bank. To maintain the steady growth, BQD tried to increase its market share in the Shandong Province through the implementation of "*Internet* +" as well as "*commercial bank* +" tactics.

In 2018, BQD made a focus strategy and repositioned the present four businesses through refining corporate business, concentrating on retail business, improving financial market, and expanding inclusive business. Among them, the corporate banking is still the pillar business of BQD to ensure its steady growth in firm's size and profit perspectives.

In order to promote the development of SMEs, BQD has developed a new financial service product namely "Qingyi Loan" for local enterprises. After incremental innovation, this product can satisfy the demand of SMEs in various sectors. Currently, "Qingyi Loan" has become a famous brand in the Shandong province.

Until December 31st, 2019, BQD has 14 branches which are located in the main cities of Shandong Province, including Qingdao, Jinan, Dongying, Weihai, Zibo, Dezhou, Zaozhuang, Yantai, Binzhou, Weifang, Laiwu, Linyi and Jining. There were altogether 3958 employees. Because of the close relationship between CCBs and local economy, the growth of BQD is highly dependent on the economy of the Shandong Province. From the operation level under the slowing down context of the overall growth momentum of the banking industry, BQD has shown a good trend of sustainable development in terms of asset, liability, profitability, and liquidity.

For BQD, the total asset and liability shows a gradually increasing trend and the rate of capital sufficiency and tier-one ratio are more than 10% since 2016. Meanwhile, the nonperforming loan ratio of BQD keeps stable in a low level. All these represent the development of BQD in a good condition. As an important index, net profit is critical for the sustainable development of BQD. The net profit from 2010 to 2016 had kept on increasing between 2017 and 2018, it shows a slowly decreasing trend but still in a comparatively good level. Provision coverage and loan provision rate is better than other commercial banks, and the risk level is still controllable.

4.4 Data collection

The large-scale survey has been conducted for two months, from July to August in 2019. Before

the questionnaire was distributed, a letter with the signature of CIO was sent to all employees to inform them the purpose of this investigation. In this survey, a total of 374 questionnaires were distributed through the internal system of BQD to all the employees except for the IT Department in Qingdao headquarters. Considering that the aim of this study is to investigate the match between business and IT, it is much appropriate to find the employees who use the IT daily to complete his or her work. By contrast, because nearly all employees in the IT Department are engineers and programmers who are responsible for the software and hardware maintenance, they are not familiar with the business of the bank and further difficult to answer the various questions on BITA.

To make the questionnaire convenient for different people, the questionnaire was distributed through two channels: email and WeChat. The number of complete questionnaires was 363, with accounts for a response rate of 97%. Among them, the invalid questionnaires with missing questions as well as abnormal answers were removed, and finally 350 effective questionnaires had been recorded to examine the hypotheses.

4.5 Measurement

From Table 4.1, we may find that all variables in the theoretical model are latent ones which need some indicators to be measured according to Luftman (2000).

Independent variables:

Communications (COMM). This variable is used to measure the communication between business departments and the IT department within an organization, such as the exchange of ideas, the sharing of various knowledge and information. The aim of communication is to promote the understanding of enterprise's business and IT strategies, their context and problems, and the approaches to implement these strategies. In this study, five items are employed to measure this variable.

Competency/value (COMP). It measures the contribution of IT to enterprise business. The value of IT must be acknowledged and accepted by the business department so as to set foundation to their alignment.

Governance (GOVE). This variable is employed to measure the decision-maker of IT strategy and the formal procedure of the communication between business and IT managers in terms of strategic as well as operational levels. It also shows the position of the IT department in an organization.

Partnership (PART). Partnership measures the relationship between business departments

and the IT department especially the role of IT in an organization, which may consider the trust between the two units, how IT is involving in business strategy decision, and the perception of IT contribution.

Scope and Architecture (SCOP). This variable mainly measures the extent that IT can support the changes of customer demand and business strategy, as well as the application of technology improvement. It also covers the capability of IT enhancing the flexibility of business process and providing timely solution to the customer needs.

Skills (SKIL). It measures the IT support to operational level activities especially the individual skills including the employee hiring, training, retention, learning and innovation. This variable also measures the capability for innovation.

In this study, the control variables include the employee's gender, age and working tenure.

Table 4.1 Measurement of variables in this study

Variable	Coding	Measurement Items	Reference
COMM	COMM1	My requirements can be answered by the IT department	Luftman and Lyytinen (2015); Luftman (2000); Johnson and Lederer, (2010); Kashanchi and Toland (2008)
	COMM2	Our bank has a special meeting to organize us to discuss the future strategy formulation with the IT department	
	COMM3	I can easily consult IT problem through the company's internal office system or telephone (4066)	
	COMM4	I think the communication between our department and IT unit is good	
	COMM5	The IT department will actively ask for our opinions on the existing IT system	
COMP	COMP1	IT level will affect my goal setting	Luftman and Lyytinen (2015); Bharadwaj et al. (2013); Johnson and Lederer (2010)
	COMP2	We often assess the value of IT from technical perspective (e.g. System availability, response time)	
	COMP3	My work goal often needs new IT technical support	
GOVE	GOVE1	The IT department will participate in work objectives of my department.	Luftman and Lyytinen (2015); Johnson and Lederer, (2010); Kashanchi and Toland (2008)
	GOVE2	The application IT reduce the cost and increase the efficiency of my work	
	GOVE3	I think the current IT software and technology are enough to support my daily work	
	GOVE4	IT system will continue to improve according to our requirements	

Variable	Coding	Measurement Items	Reference
PART	PART1	For most of time, IT equipment in our bank can support my work	Luftman and Lyytinen (2015); Bharadwaj et al. (2013); Johnson and Lederer (2010)
	PART2	I think the system provided by the IT department is first-class	
	PART3	IT is used to enable our business strategy	
	PART4	IT also takes some risks	
SCOP	SCOP1	The business system and office software I use now are relatively convenient	Luftman and Lyytinen (2015); Johnson and Lederer (2010); Kashanchi and Toland (2008)
	SCOP2	The existing business system or office software can be upgraded easily according to our needs	
	SCOP3	Our IT system can quickly respond to the changes of customer demand fast	
SKIL	SKIL1	My innovative ideas can be said boldly without worrying about the consequences	Luftman and Lyytinen (2015); Aral and Weill (2007)
	SKIL2	I need to spend more energy and time learning new software	
	SKIL3	The IT department will help me learn new systems or software in a proper way	
	SKIL4	The IT department provide some technical training for us	
BITA	BITA1	The business strategy and IT strategy of my department match well	Luftman and Lyytinen(2015); Johnson and Lederer (2010); Lee et al. (2008)
	BITA2	The improvement of my work performance is closely related to the progress of IT technology	
	BITA3	The IT department participated in the process of strategic development of my department	
	BITA4	The IT department provides the comprehensive support needed in the implementation of the strategy of my department	
	BITA5	In the process of performance evaluation of my department, IT technology will be used for more comprehensive and in-depth data analysis	
	BITA6	My department will make new strategic plans or goals based on new IT technologies	
PERF	PERF1	My department is satisfied with my work	Luftman and Lyytinen (2015); Johnson and Lederer (2010); Bharadwaj et al. (2013); Kashanchi and Toland (2008)
	PERF2	I will take the initiative to learn new technology to improve my ability	
	PERF3	I'm able to accomplish my work objectives and tasks with high quality	
	PERF4	I am satisfied with the current business and workflow	
	PERF5	Compared with the industry, I think our bank is leading in the application of IT technology at present	

Variable	Coding	Measurement Items	Reference
SERV	SERV1	I think the service attitude of the IT department in dealing with problems is good	Bharadwaj et al. (2013); Lee et al. (2008)
	SERV2	I think the IT service desk (4066) can meet my needs in terms of processing time and solutions	
	SERV3	Any problem on IT terminal equipment can be repaired quickly	
	SERV4	I am satisfied with the processing efficiency of existing business system faults	
	SERV5	The IT department often collects our opinions and suggestions	

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Chapter 5: Empirical Results

In this study, SEM was employed to examine the proposed hypotheses by SPSS and AMOS24.0. This chapter first analyzes the demographic information of respondents and then reports the empirical results. Through the cross-section data from BQD, we may explore the current situation of BITA of BQD from employee level.

5.1 Profiles of respondents

Table 5.1 presents the demographic information of respondents. We may find that more than half respondents are female. While the male interviewees account for 44.3%, and the proportion of female interviewees is 55.7%. The ages of interviewees are mainly between 20-29 and 30-39 with 38.3% and 43.1%, respectively, showing that most of employees are very young. By contrast, respondents with the age of 40-49 and 50-59 only account for less than 18%. In addition, there are only 12% employees who have been working in BQD for more than 12 years, showing that BQD is a young enterprise compared with other large banks.

Table 5.1 Profile of respondents (*N=350*)

	Category	Frequency	Percentage (%)
Gender	Male	155	44.3
	Female	195	55.7
Age	20-29	134	38.3
	30-39	151	43.1
	40-49	59	16.9
	50-59	6	1.7
Working Tenure	Less than 3 years	93	26.6
	3-5 years	123	35.1
	6-11 years	92	26.3
	12 years or longer	42	12.0

5.2 Reliability test

The reliability and validity of the questionnaire need to be evaluated and assessed before using the empirical data to examine the proposed hypotheses (Ma, 2002; Li, 2004). Reliability is the credibility of the questionnaire filled by the respondents, which is the ratio of the total variance and the sample variance. The higher the reliability is, the smaller the standard error of the measurement is. There are mainly three types: stability, equivalence and internal consistency

(Li, 2004).

Cronbach is a coefficient used to measure the reliability (Wu, 2003). The criteria is as follows: If $\alpha < 0.50$, the reliability is unsatisfactory ; if $0.50 \leq \alpha < 0.60$, it is acceptable to add and delete items; if $0.50 \leq \alpha < 0.7$, the reliability is still good; if $0.70 \leq \alpha < 0.80$, the reliability is high; if $0.8 \leq \alpha < 0.9$, the reliability is ideal; if α is greater than 0.9, the reliability is very good (Hinkin, 1998).

In this study, we found that the Cronbach α coefficient of each variable is more than the standard of 0.7. Thus, each variable has good internal consistency and stability.

5.3 Validity analysis

Validity means the degree of the items reflecting the latent variable, which may contain content validity and construct validity (Wu, 2003). The former focuses on the extent to which the indicators can represent the latent variable to be measured (Chen, Xu, & Fan, 2008). Because the indicators developed in this thesis mainly come from previous literature and consults by the academic experts in this research field, the content validity of the items is high. The latter is often examined by exploratory factor analysis and CFA (Chen, Xu, & Fan, 2008). In this paper, SPSS19.0 is used as the operation tool of exploratory factor analysis and AMOS 24.0 is used as the analysis software for CFA.

5.3.1 Exploratory factor analysis

Before exploratory factor analysis, Kaiser-Meyer-Olkin (KMO) sample measurement and Bartlett sphere test should be carried out to determine the correlation between indicators.

KMO index is between 0 and 1 and its standard is as follows: if $KMO < 0.50$, the variable is unsuitable for factor analysis; if $KMO > 0.60$, the scale can barely carry out factor analysis; if KMO is greater than 0.70, the variable can carry out factor analysis; as $KMO > 0.80$, it implies that the measurement indicator is suitable for factor analysis; when $KMO > 0.90$, the scale is very suitable for factor analysis (Wu, 2003). Table 5.2 shows the KMO index and the Bartlett's test of sphericity for each variable in this study.

Table 5.2 KMO and Bartlett's test of sphericity for each variable

Variables	KMO	Bartlett's Test of Sphericity		
		Appro. χ^2	DF	Sig.
COMM	0.838	626.253	10.000	0.000
COMP	0.693	254.606	3.000	0.000
GOVE	0.808	680.553	6.000	0.000
PART	0.819	555.492	6.000	0.000
SCOP	0.714	376.744	3.000	0.000
SKIL	0.775	577.773	6.000	0.000
BITA	0.878	947.849	15.000	0.000
PERF	0.836	633.726	10.000	0.000
SERV	0.828	716.271	10.000	0.000

From Table 5.2, we may find that the KMO values of COMM, COMP, GOVE, PART, SCOP, SKIL, BITA, PERF and SERV are all more than 0.70, with 0.838, 0.693, 0.808, 0.819, 0.714, 0.775, 0.878, 0.836 and 0.828, respectively. Meanwhile, the *p* value of Bartlett's sphericity test is significant at 0.001 level, showing that the population correlation matrix is not identity. According to Ma (2002), factor analysis is suitable when KMO is greater than 0.70 and the statistical value of Bartlett is significant. Therefore, the questionnaire data of all variables is suitable for exploratory factor analysis.

Furthermore, principal component analysis via varimax rotation was conducted to extract the common factors for exploratory factor analysis. The results revealed an eigenvalue of every component is greater than 1.0. The principle of extraction is the common factors with feature root should be larger than 1. If a common factor is extracted from the scale, the factor rotation will not be carried out; if the number of common factors ≥ 2, the factor rotation method of the maximum variance method will be used to rotate the factor so as to get a clearer common factor.

The results of exploratory factor analysis of each variables are presented in Table 5.3. For example, items COMM1 to COMM5 belong to communication dimension and their factor loadings are between 0.729 to 0.811. COMP1, COMP2 and COMP3 belong to competitiveness and value maturity dimension, factor load is between 0.786 to 0.824. GOVE1, GOVE2, GOVE3 and GOVE4 belonging to the governance maturity dimension, have a factor load between 0.773 and 0.860. PART1, PART2, PART3 and PART4 belonging to the partnership maturity dimension, have a factor load between 0.765 and 0.831. SCOP1, SCOP2 and SCOP3 belong to the scope and architecture maturity dimension, and their factor load is between 0.816 and 0.836. In terms of the skills maturity dimension, the factor load of SKIL1, SKIL2, SKIL3 and SKIL4 is between 0.724 and 0.854.

A common factor was extracted from the business and IT strategy matching scale. The

variance interpretation rate was 61.666%, and the factor load was between 0.735 and 0.839. The common factor interpretation ability was strong and the validity was good. A common factor was extracted from the performance scale. The variance interpretation rate was 60.407%, the factor load was between 0.725 and 0.854. the common factor interpretation ability was strong, and the validity was good. A common factor was extracted from the service scale. the variance interpretation rate was 62.723%. the factor load was between 0.755 and 0.820, the common factor interpretation ability was strong, and the validity was good.

Table 5.3 Result of exploratory factor analysis

Component	Items	Factor Loadings	Eigenvalue	Variance Percentage (%)	Cumulative Variance Percentage (%)
COMM	COMM1	0.750	3.079	13.388	68.390
	COMM2	0.754			
	COMM3	0.780			
	COMM4	0.811			
	COMM5	0.729			
COMP	COMP1	0.786	2.056	8.940	
	COMP2	0.817			
	COMP3	0.824			
GOVE	GOVE1	0.844	2.867	12.467	
	GOVE2	0.860			
	GOVE3	0.778			
	GOVE4	0.773			
PART	PART1	0.795	2.756	11.984	
	PART2	0.765			
	PART3	0.831			
	PART4	0.821			
SCOP	SCOP1	0.836	2.229	9.691	
	SCOP2	0.816			
	SCOP3	0.835			
SKIL	SKIL1	0.809	2.742	11.920	
	SKIL2	0.854			
	SKIL3	0.724			
	SKIL4	0.826			
BITA	BITA1	0.770	3.7	61.666	61.666
	BITA2	0.735			
	BITA3	0.789			
	BITA4	0.783			
	BITA5	0.792			
	BITA6	0.839			
PERF	PERF1	0.854	3.02	60.407	60.407
	PERF2	0.742			
	PERF3	0.787			
	PERF4	0.725			

Component	Items	Factor Loadings	Eigenvalue	Variance Percentage (%)	Cumulative Variance Percentage (%)
	PERF5	0.772			
SERV	SERV1	0.786	3.136	62.723	62.723
	SERV2	0.755			
	SERV3	0.804			
	SERV4	0.820			
	SERV5	0.793			

5.3.2 CFA

Structural Equation Modelling is a multivariate regression method to examine the relationship between variables. Before the regression, CFA is necessary to resolve measurement errors that may influence the results. CFA provides opportunities to improve the measurement model on several discrepancies. Using the output on modification indices some error terms on the measurement items were co-varied to attain appropriate measurement model fit. The obtained fit indices for the measurement model were then compared with the suggested values of model fit measures to decide on the fitness of the measurement model. In this study, AMOS24.0 software was employed for CFA.

As Wu (2003) suggests, CFA is widely used and is considered as a relatively conservative test for the validity of the model. The CFA is therefore used to measure the validity of latent variables priori to modelling inter-relationship of variables in SEM. The purpose of CFA is to evaluate the fit of the model, and modify the measurement model to improve the model's fit. According to the Hu and Bentler (1999), the fitting parameters of the model are mainly χ^2/df (Chi-square/df fitness), GFI (Goodness of Fit Index), AGFI (Adjusted Goodness of Fit Index), NFI (Normed Fit Index), CFI (Comparative Fit Index), and RMSEA (Root Mean Square Error of Approximation). CFA examines the matching degree of measurement model and data according to these fit indexes. Generally, there are two kind of indexes including absolute fit index and relative fit index.

(1) Absolute fit index. It is similar to R^2 in the regression equation, which refers to the proportion of the covariance matrix of the model. The smaller the chi square χ^2 is, the more the indicators can explain the variable. DF reflects the complexity of the model. The simpler the model, the higher the degree of freedom is. Generally speaking, the smaller the χ^2/df ratio is, the higher the model fitting degree is. Generally, 2:1 or 3:1 is an acceptable scope of good fitting degree (Chen, Xu, & Fan, 2008). RMSEA <

0.08 indicates that the fit model is acceptable. RMSEA < 0.05 indicates that it is very good for fit model. As GFI and AGFI are generally more than 0.8, showing that the fitting effect is good while more than 0.95 indicates that the fitting effect is very good (Hu & Bentler, 1999; Wen, Liu, & Hou, 2004).

(2) Relative fit index. It indicates the degree of improvement of the fitness of the research model compared with the independent model. Generally, CFI and NFI above 0.9 show a good fit and more than 0.95 indicates a very good fit (Hu & Bentler, 1999; Wen, Liu, & Hou, 2004).

The criteria of each index and the corresponding value in CFA are shown in Table 5.4.

Table 5.4 Measurement model fit test results

Type of fit	Indexes	Suggested Value	Corresponding Value
Absolute fit	χ^2/df	< 3 best < 5 sometimes acceptable	1.464
	RMSEA	< 0.05 good 0.05 - 0.10 reasonable > 0.10 not allowed	0.036
	GFI	> 0.95 very good > 0.80 good	0.88
	AGFI	> 0.95 very good > 0.80 good	0.859
Comparative Fit	NFI	> 0.95 very good > 0.90 good > 0.80 sometime acceptable	0.861
	CFI	> 0.95 very good > 0.90 good > 0.80 sometime acceptable	0.951
	TLI	> 0.9	0.945
	IFI	> 0.9	0.951

From Table 5.4, we may find that χ^2/df value of the model is less than 3 with 1.464, meeting the standard. RMSEA is 0.036, showing a good fit. GFI and AGFI are 0.88 and 0.859, respectively, and meet the 0.8 threshold. TLI, IFI and CFI values are 0.945, 0.951 and 0.951, respectively, which are all more than 0.9. Even though NFI is 0.861, it is still acceptable by the standard. In sum, CFA shows that the goodness of fit value for the proposed model is good and meets the requirements.

Standardized factor loading is an important test index for the convergent validity tests. Figure 5.1 exhibits the results of CFA. Hair et al. (2010) suggest that the standardized factor loading is more than 0.5 is acceptable. In CFA, AVE (Average Variance Explained) is another important index of convergent validity test and its square root is also used to test the discrimination validity of the scale.

Discriminant validity refers to the extent to which the items intended to measure different

variables. When multiple items of a construct aggregate, the measurement items of this construct should not be related to the measurement items of other constructs. There are two methods for discriminant validity test used in the current research.

(1) The square root of AVE is compared with the correlation coefficient between variables. If the square root of AVE is larger, the discriminant validity is good.

(2) Comparing the theoretical model with other possible competition models with data by means of structural equation model with chi square difference test and fitting index. If the matching degree of the original theoretical model is better than that of the competition model, the original theoretical model is more appropriate to differentiate variables, and the differentiation validity between variables is higher. Generally, AVE value with more than 0.5 indicates that the internal quality of the measurement model is good with acceptable aggregation validity (Wen, Hou, & Marsh, 2004).

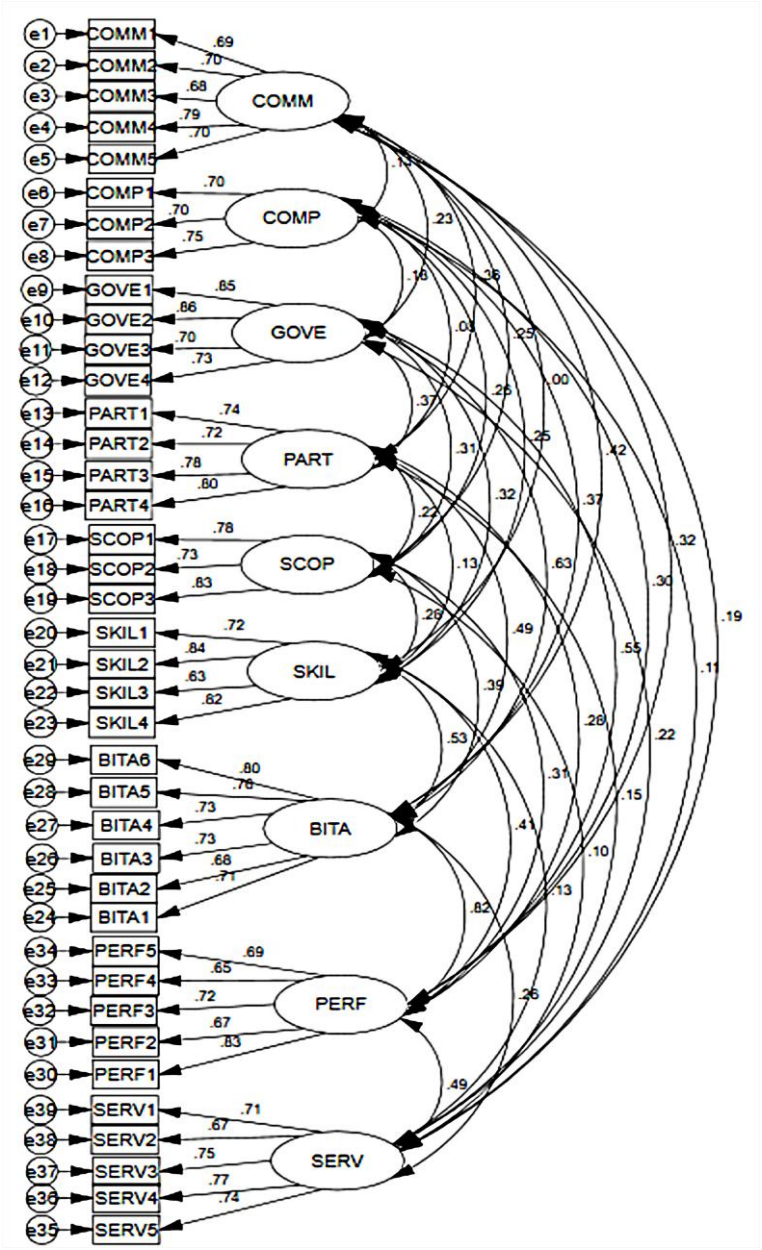

Figure 5.1 CFA

Table 5.5 Convergent validity and reliability test

Variables	Items	Non. Std. Factor loadings	Std. Error	*T* value	*P*	Std. Factor loadings	CR	AVE
COMM	COMM5	1	/	/	/	0.704	0.838	0.51
	COMM4	1.137	0.089	12.811	***	0.792		
	COMM3	0.509	0.045	11.312	***	0.682		
	COMM2	0.988	0.085	11.598	***	0.702		
	COMM1	0.746	0.066	11.355	***	0.685		
COMP	COMP3	1	/	/	/	0.748	0.772	0.531
	COMP2	0.946	0.094	10.103	***	0.704		
	COMP1	0.986	0.098	10.068	***	0.696		

GOVE	GOVE4	1	/	/	/	0.73	0.868	0.623
	GOVE3	1.142	0.091	12.573	***	0.703		
	GOVE2	1.469	0.096	15.303	***	0.863		
	GOVE1	1.475	0.098	15.107	***	0.848		
PART	PART4	1	/	/	/	0.801	0.846	0.58
	PART3	1.216	0.083	14.627	***	0.784		
	PART2	1.059	0.079	13.397	***	0.72		
	PART1	0.97	0.071	13.729	***	0.737		
SCOP	SCOP3	1	/	/	/	0.832	0.823	0.609
	SCOP2	0.756	0.058	12.966	***	0.728		
	SCOP1	0.797	0.059	13.54	***	0.778		
SKIL	SKIL4	1	/	/	/	0.818	0.823	0.609
	SKIL3	0.532	0.045	11.822	***	0.627		
	SKIL2	1.015	0.062	16.335	***	0.844		
	SKIL1	0.724	0.052	13.921	***	0.721		
BITA	BITA6	1	/	/	/	0.706	0.876	0.542
	BITA5	0.842	0.07	12.01	***	0.679		
	BITA4	1.182	0.091	12.954	***	0.733		
	BITA3	1.062	0.082	12.915	***	0.731		
	BITA2	1.126	0.084	13.472	***	0.764		
	BITA1	1.09	0.078	14.054	***	0.798		
PERF	PERF5	1	/	/	/	0.827	0.838	0.688
	PERF4	0.636	0.048	13.123	***	0.667		
	PERF3	0.732	0.05	14.531	***	0.724		
	PERF2	0.852	0.067	12.81	***	0.654		
	PERF1	0.758	0.056	13.576	***	0.686		
SERV	SERV5	1	/	/	/	0.745	0.852	0.535
	SERV4	1.05	0.078	13.513	***	0.772		
	SERV3	0.922	0.07	13.179	***	0.751		
	SERV2	0.802	0.068	11.799	***	0.672		
	SERV1	0.821	0.065	12.55	***	0.714		

Note：*** $p<0.001$

It can be seen from Table 5.5 that the standardized factor loadings for all measurement items of a single item is more than 0.5, and their t-test values are also significant. Meanwhile the average variation extraction (AVE) values for COMM, COMP, GOVE, PART, SCOP, SKIL, BAITA, PERF, and SERV are 0.51, 0.531, 0.623, 0.58, 0.609, 0.609, 0.542, 0.688, 0.535, respectively. They are all more than 0.5 showing that the convergent validity for each factor is good. According to Bentler and Bonett (1980), combination reliability (CR) value with more than or equal to 0.6 indicates that the consistency of the scale is good. In this study, the mean CR values are above 0.7. Thus, combining Cronbach α test results, the reliability of each factor can be verified.

5.4 Descriptive statistics

In this study, SPSS21.0 software was used to calculate the minimum, maximum, average, standard deviation, skewness, and kurtosis of each item. Table 5.6 presents the details of descriptive statistics. According to Hu and Bentler (1999), skewness and kurtosis can be used to test whether the data is normal distribution. If the absolute values of kurtosis and skewness are less than 10 and 3, respectively, the data follows a normal distribution. As shown in Table 5.6, the absolute value of kurtosis of each item is less than 10, and the absolute value of skewness is also less than 3. Therefore, the data is subject to normal distribution, satisfying the premise for structural equation modelling.

Table 5.6 Descriptive statistics

Variable	Item					Skewness		Kurtosis	
		Min.	Max.	Mean	SD	Mean	SD	Mean	SD
COMM	COMM1	1	5	3.47	0.732	0.760	0.130	0.082	0.260
	COMM2	1	5	3.65	0.947	0.089	0.130	-0.616	0.260
	COMM3	1	5	3.25	0.502	1.326	0.130	2.712	0.260
	COMM4	1	5	3.47	0.965	-0.170	0.130	-0.258	0.260
	COMM5	1	5	3.55	0.956	-0.092	0.130	-0.164	0.260
COMP	COMP1	1	5	3.37	0.689	0.693	0.130	0.916	0.260
	COMP2	1	5	3.34	0.653	1.125	0.130	1.637	0.260
	COMP3	2	5	3.35	0.650	1.143	0.130	0.850	0.260
GOVE	GOVE1	1	5	3.66	0.950	0.047	0.130	-0.690	0.260
	GOVE2	1	5	3.68	0.931	-0.022	0.130	-0.582	0.260
	GOVE3	1	5	3.59	0.888	0.048	0.130	-0.091	0.260
	GOVE4	1	5	3.48	0.748	0.440	0.130	0.402	0.260
PART	PART1	1	5	3.48	0.835	0.411	0.130	0.049	0.260
	PART2	1	5	3.61	0.932	-0.234	0.130	-0.052	0.260
	PART3	1	5	3.61	0.983	-0.187	0.130	-0.219	0.260
	PART4	1	5	3.41	0.792	0.128	0.130	0.846	0.260
SCOP	SCOP1	1	5	3.43	0.933	-0.049	0.130	-0.342	0.260
	SCOP2	1	5	3.53	0.944	-0.042	0.130	-0.190	0.260
	SCOP3	1	5	3.13	1.093	0.193	0.130	-0.577	0.260
SKIL	SKIL1	1	5	3.51	0.872	0.386	0.130	-0.217	0.260
	SKIL2	1	5	3.38	1.044	0.185	0.130	-0.905	0.260
	SKIL3	1	5	3.42	0.736	0.712	0.130	0.722	0.260
	SKIL4	1	5	3.26	1.062	0.188	0.130	-0.477	0.260
BITA	BITA1	1	5	3.52	0.862	0.082	0.130	-0.017	0.260
	BITA2	1	5	3.47	0.756	0.448	0.130	0.372	0.260
	BITA3	1	5	3.66	0.982	-0.050	0.130	-0.689	0.260
	BITA4	1	5	3.52	0.885	0.151	0.130	-0.045	0.260
	BITA5	1	5	3.51	0.898	0.169	0.130	-0.118	0.260

Variable	Item	Min.	Max.	Mean	SD	Skewness Mean	Skewness SD	Kurtosis Mean	Kurtosis SD
	BITA6	1	5	3.47	0.831	0.398	0.130	0.085	0.260
PERF	PERF1	1	5	3.55	0.639	0.260	0.130	0.092	0.260
	PERF2	2	5	3.29	0.504	1.300	0.130	0.868	0.260
	PERF3	2	5	3.35	0.535	0.954	0.130	0.133	0.260
	PERF4	1	5	3.52	0.688	0.495	0.130	0.358	0.260
	PERF5	3	5	3.39	0.584	1.222	0.130	0.491	0.260
SERV	SERV1	1	5	3.43	0.710	0.258	0.130	0.674	0.260
	SERV2	1	5	3.43	0.737	0.291	0.130	0.522	0.260
	SERV3	1	5	3.41	0.758	-0.014	0.130	0.900	0.260
	SERV4	1	5	3.41	0.841	-0.111	0.130	0.608	0.260
	SERV5	1	5	3.35	0.829	-0.135	0.130	0.618	0.260

Table 5.7 reports the Pearson correlation coefficient and discriminant validity test. Particularly, the data on the diagonal is the square root value of AVE. The AVE square root values of COMM, COMP, GOVE, PART, SCOP, SKIL, BITA, PERF, and SERV are higher than the correlation coefficient between the factor and other factors, so there is a good discriminant validity between each factor.

Table 5.7 Pearson correlation and discriminant validity test

	1	2	3	4	5	6	7	8	9
1.COMM	**0.714**	/	/	/	/	/	/	/	/
2.COMP	0.136*	**0.729**	/	/	/	/	/	/	/
3.GOVE	0.234**	0.179**	**0.789**	/	/	/	/	/	/
4.PART	0.363**	0.083	0.369**	**0.762**	/	/	/	/	/
5.SCOP	0.249**	0.260**	0.312**	0.224**	**0.780**	/	/	/	/
6.SKIL	0.001	0.250**	0.322**	0.134*	0.283**	**0.780**	/	/	/
7.BITA	0.423**	0.370**	0.632**	0.487**	0.387**	0.533**	**0.829**	/	/
8.PERF	0.325**	0.304**	0.547**	0.282**	0.312**	0.407**	0.823**	**0.714**	/
9.SERV	0.186**	0.113	0.217**	0.152*	0.100	0.126*	0.262**	0.488**	**0.731**

Note: $^{***}p<0.001$, $^{**}p<0.01$, $^{*}p<0.05$; The value on the diagonal is the square root of AVE for the variable

The Pearson correlations only reflect the possible correlation rather than causal relation between two variables without considering the impact of other variables (such as control variables). The purpose of correlation analysis is not only to judge preliminarily whether the model setting or hypothesis is reasonable but also to decide whether to examine the collinearity problem. The value range of correlation coefficient is between - 1 and 1. The larger the absolute value is, the higher the correlation between two variables.

As shown in Table 5.8, the correlation coefficients between BITA and communication, competitiveness and value maturity, governance, partnership, scope and framework, skills are all significant ($p < 0.001$) with 0.423, 0.370, 0.632, 0.487, 0.387, 0.533, respectively, indicating the strong correlation between dependent and independent variables. In addition, service level also has correlations with BITA as well as performance with 0.262 ($p < 0.001$) and 0.488 ($p < 0.001$), respectively. In addition, the correlation coefficients among COMM, COMP, GOVE, PART, SCOP, and SKIL are from 0.001 to 0.369, less than 0.4. The weak correlations among these independent variables may imply there is no serious multicollinearity problem in our model.

Table 5.8 Regression estimates of direct paths

Path	Non. Std. Coefficient	Std. Coefficient	S.E.	*T*-value	*P*-value	Hypothesis Results
COMM→BITA	0.201	0.252	0.041	4.888	***	Supported (H1)
COMP→BITA	0.217	0.184	0.061	3.555	**	Supported (H2)
GOVE→BITA	0.406	0.381	0.062	6.532	***	Supported (H3)
PART→BITA	0.169	0.186	0.047	3.564	***	Supported (H4)
SCOP→BITA	0.018	0.029	0.031	0.592	0.554	Not supported (H5)
SKIL→BITA	0.273	0.364	0.045	6.086	***	Supported (H6)
BITA→PERF	0.726	0.810	0.064	11.379	***	Supported (H7)

Note：*** $p<0.001$，** $p<0.01$ (two-tails)

In practice, Variable Inflation Factor (VIF) is usually employed to test multicollinearity among independent variables. The smaller the VIF is, the smaller the collinearity problem is. If VIF is greater than 10, the multicollinearity problem is much serious (Hair et al., 2010). As shown in Table 5.9, the VIF values for six variables COMM, COMP, GOVE, PART, SCOP, and SKIL are 1.165, 1.080, 1.268, 1.212, 1.185, 1.169, respectively, which are all less than 1.5, far below the acceptable standard 10, showing that there is no serious multicollinearity between the factors. In this search, the control variables included gender,age and working tenure.

Table 5.9 Moderating effect test

	Variable	*B*	95% confidence interval	*T*	*P*
Control variable	Gender	-0.007	[-0.063,0.048]	-0.255	0.799
	Age	-0.010	[-0.051,0.031]	-0.471	0.638
	Working tenure	-0.004	[-0.035,0.028]	-0.220	0.826
Independent variable	BITA	0.569	[0.524,10.614]	24.638	0.000
Moderator	SERV	0.211	[0.166,0.256]	9.273	0.000
Interaction term	BITA * SERV	0.308	[0.258,0.357]	12.226	0.000
	R^2	0.702	/	/	/
	MSE	0.064	/	/	/
	F	134.832	/	/	/
	P	***	/	/	/

5.5 Structural model and hypothesis test

5.5.1 Structural model results

In this section, AMOS24.0 is used to examine the structural equation model. According to the theoretical model, the six independent variables including COMM, COMP, GOVE, PART, SCOP, and SKIL may directly affect the BITA. To test the goodness of the structural model, fit of indices such as χ^2/df, GFI, AGFI, TLI, IFI, NFI, CFI, and RMSEA, are selected, which are similar to the indices for CFA model. The test results are shown in Table 5.10.

From Table 5.10, we may find that the χ^2/df value of the structural model is 1.431, less than 3, which meets the standard and the AGFI is 0.878, which is higher than 0.8. Meanwhile, TLI, IFI, CFI and other indicators are all higher than 0.9. With 0.956, 0.961, 0.960, respectively, satisfying the criteria. The RMSEA is 0.035, less than standard 0.08. Although the above two index GFI and NFI are both less than 0.90 with 0.896 and 0.880, respectively, they are still acceptable. Overall, the structural model has a good goodness of fit, and the model fits the data, which can be used to examine the proposed hypotheses.

Table 5.10 Results of structural model fit test

Type of fit	Indexes	Suggested Value	Corresponding Value
Absolute fit	χ^2/df	< 3 best < 5 sometimes acceptable	1.431
	RMSEA	< 0.05 good 0.05 - 0.10 reasonable > 0.10 not allowed	0.035
	GFI	> 0.95 very good > 0.80 good	0.896
	AGFI	> 0.95 very good > 0.80 good	0.878
Comparative Fit	NFI	> 0.95 very good > 0.90 good > 0.80 sometime acceptable	0.880
	CFI	> 0.95 very good > 0.90 good > 0.80 sometime acceptable	0.960
	TLI	> 0.9 good	0.956
	IFI	> 0.9 good	0.961

Figure 5.2 illustrates the parameter estimates of the structural model in this study and the regression estimates of direct paths are shown in Table 5.8.

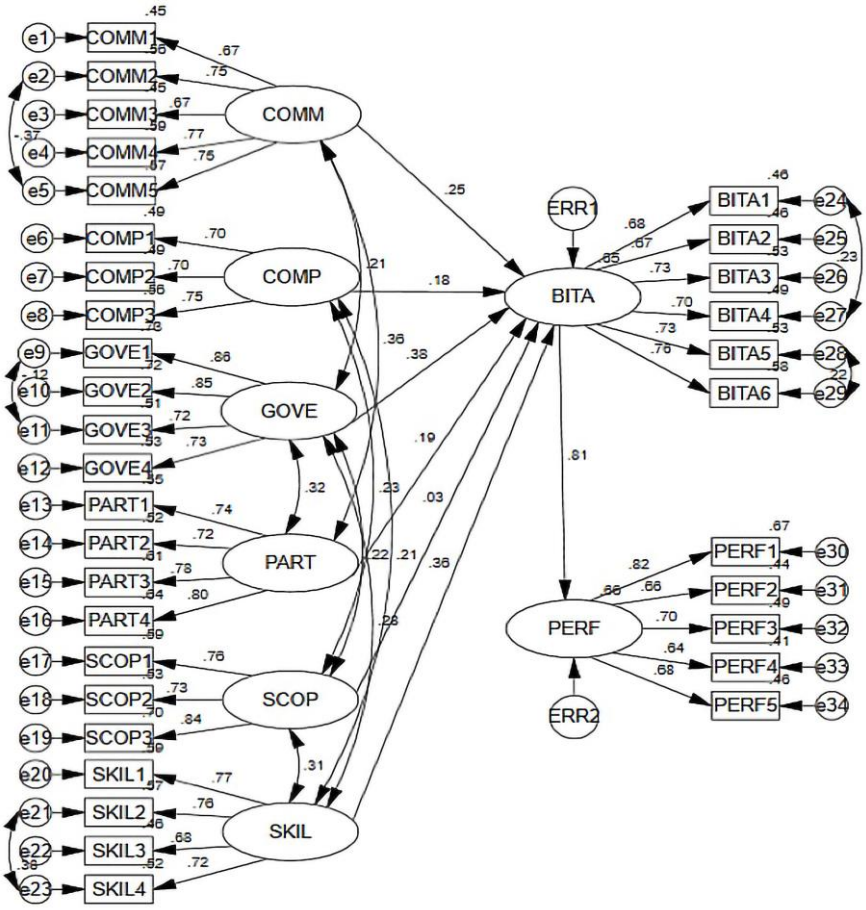

Figure 5.2 Parameter estimation of the structure model in this study

Combined with the parameter estimates of the structural model in Figure 5.2 and the path coefficient in Table 5.8, the proposed seven hypotheses were examined.

In H1, we assume that communication maturity positively affects the matching degree between business and IT strategy. The higher the communication level is, the better the alignment of business-IT strategies is. In this study, the standardized path coefficient of COMM is 0.252 with $p<0.001$, showing that H1 is significantly supported by empirical data.

In H2, competitiveness and value maturity are supposed to have a positive impact on the BITA. The higher the competitiveness and value maturity are, the higher the matching degree of business and IT strategies is. From Table 5.8, we can find that the standardized path coefficient of COMP is 0.184 with $p < 0.01$. Thus, H2 is supported in this study.

H3 supposes that IT governance maturity has a positive impact on the BITA. The higher the IT governance level is, the higher the matching degree of business and IT strategy is. The standardized path coefficient of GOVE is 0.381 ($p < 0.001$). Therefore, H3 is significant and supported by this study.

In H4, partnership is supposed to have a positive impact on the matching degree of business and IT strategy. The standardized path coefficient of PART is 0.186 with $p < 0.001$, showing the significant effect of partnership on BITA within an organization. Hence, H4 is supported in this study.

H5 supposes that impact of IT scope and architecture is positively related on the matching degree of business and IT strategies. However, by our sample from BQD, the standardized path coefficient is 0.029 with $p > 0.05$, indicating that this impact is not significant. Thus, H5 is not supported in this study.

For H6, skills are supposed to positively affect the BITA. As shown in Table 5.8, the standardized path coefficient of SKIL is 0.364 with $p< 0.001$. Thus, the regression coefficient of SKIL is positive and significant and H6 is supported by our data from BQD.

In this study, the relationship between BITA and its performance was also examined. The standardized path coefficient of BITA is 0.81($p < 0.001$), showing that H7 is supported by our sample.

5.5.2 Moderating effect

The moderating role of IT service level on the relationship between BITA and performance was tested by model 1 in SPSS process. Table 5.9 shows the test results. First, from Table 5.8, we can find that the direct effect of BITA on performance is significant with standardized coefficient 0.801 with $p < 0.001$, showing remarkable impact. Then the coefficient of

interaction term BITA * SERV on PERF is 0.308 and the confidence interval of 95% is [0.258,0.357] with $p < 0.001$. Therefore, the positive moderating effect of IT service level on the BITA on performance is established.

Figure 5.3 also shows the results of simple slope test for the moderating effect direction. When the IT service is in a low level, the impact of service on the link between BITA and performance is 0.380 with 95% confidence interval [0.339, 0.421]. When the service is in a high level, the impact of service in business and IT strategy matching degree on performance is 0.758, with 95% confidence interval [0.693, 0.823]. As the service level gradually rises, the service moderating effect also gradually increases. Thus, H8 is supported in this study, namely, the IT service quality plays a positive moderating role between the BITA and performance.

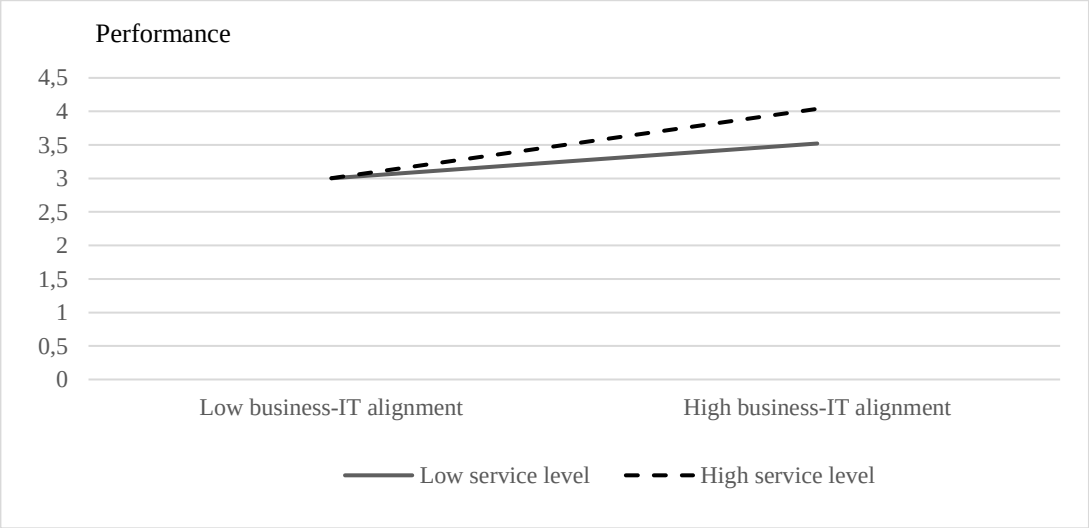

Figure 5.3 Moderating effect test

5.6 Summary

The analysis shows that the variables and scales constructed in this thesis meet the test criteria of reliability and validity, and the empirical data can be used to test the proposed hypotheses. The empirical test results are shown in Table 5.11, of which seven are supported and one is not.

Table 5.11 Results of proposed hypotheses test

	Hypothesis	Results
H1	Communication maturity will promote the business-IT strategic alignment maturity	Supported
H2	Competency/Value measurement maturity will enhance the business-IT strategic alignment maturity.	Supported
H3	Governance maturity will promote the business-IT strategic alignment maturity	Supported
H4	Partnership maturity will promote the business-IT strategic alignment maturity	Supported
H5	Technology scope maturity will promote the business-IT strategic alignment maturity.	Not supported
H6	Skill maturity will enhance the business-IT strategic alignment maturity	Supported
H7	Business-IT strategic alignment maturity is positive related to the working performance	Supported
H8	The service level of the IT department plays moderating role between BITA and performance	Supported

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Chapter 6: Discussion

6.1 Evaluation of business strategy and IT strategy in BQD

6.1.1 Business strategy of BQD

There are three kinds of businesses for BQD including corporate banking, retail banking and financial market business. Corporate banking business provides a variety of financial products to enterprises, various agencies and financial institutions, covering corporate loans, corporate deposits, trade financing and international settlement services. Retail banking business focuses on individual customers providing personal loans and deposit services. Meanwhile, financial market business consists of inter-bank lending transactions, repurchase transactions, debt instrument investment, and non-standardized debt investment. The corresponding revenues of BQD are as follows

As shown in Table 6.1, the corporate banking business accounts for more than half of total revenues in BQD. The second largest revenue of BQD comes from financial market business, which accounts for about 25.81% of total revenues each year. Among the three main businesses, retail banking business contributes least with only about 20.85% each year. The innovation and development of corporate banking business, retail banking business and financial market business have become the three engines for the development of BQD.

Table 6.1 The proportion of revenues of different businesses in BQD (2015-2018)

Business/Year	2018	2017	2016	2015
Corporate banking	52.42%	53.97%	50.65%	53.10%
Retail banking	21.49%	21.01%	20.72%	20.60%
Financial market	23.50%	22.14%	28.67%	26.21%
Others	2.59%	2.88%	-0.04%	0.09%
Total	100.00%	100.00%	100.00%	100.00%

Source: BQD Annual Reports (2015-2018)

With the rapid growth of total assets, business volume, products varieties as well as IT, BQD has implemented, since 2010, an innovation-oriented strategy. Combining Internet technology with various businesses, BQD established an efficient and self-improvement financial service platform. With the development of electronic banking, BQD has completed a financial product system including payment and settlement, credit card, trade financing, international business, financial services, and other business services. Accordingly, the IT

investment also has increased sharply since 2012 and is kept in a stable level in recent years. This investment was spent mainly on human resources, development projects, software procurement, system operation and maintenance, infrastructure construction.

6.1.1.1 Corporate banking

BQD has set up specialized departments to deal with the corporate business. There are four departments including corporate banking department, trade finance business department, small enterprise finance department, and bill center in the head office to operate and manage the company's business, providing differentiated products and services according to their various needs. The corporate clients of BQD include those from industrial and commercial enterprises, government departments and public institutions. As shown in Table 6.1, corporate banking of BQD has always been the most important income for BQD even though there is a decrease in 2018.

As of December 2018, the loans and deposits of corporate banking are as shown in Table 6.2. Serving small and micro enterprises has gradually become one of characteristics of BQD, effectively promoting the development of inclusive finance in China. BQD is committed to serve small and micro enterprises with a new interface bank mode. At present, BQD has more than 2000 small and micro customers. In addition to providing standardized financial services to these enterprises, BQD also provides differentiated financial service solutions for them according to their demands.

Table 6.2 Loans and deposits of its corporate banking business

Unit：RMB thousand				
Business	**December 31, 2018**	**December 31, 2017**	**December 31, 2016**	**December 31, 2015**
Corporate loans	78,264,271	64,363,848	62,463,909	52,820,399
Corporate deposits	118,644,749	107,274,155	92,649,142	69,928,163

Source: BQD Annual Reports (2015-2018)

6.1.1.2 Retail banking

Figure 6.1 illustrates the proportion of retail banking business to total operating revenues in BQD. We may find that the operating revenue of retail banking business accounts for about one fifth of the total operating revenue, and it is in a slow growing trend. Since 2015, BQD has made niche market strategy to pay much attention to customer classification management for selecting customer groups. Through analyzing customer's behavior and characteristics, BQD developed specific products to different customer groups. Currently, BQD is implementing interface bank strategy to build connections between banks and customers. So far, BQD has constructed five interfaces including transportation, health care, cloud payment, park, and

network financing platforms.

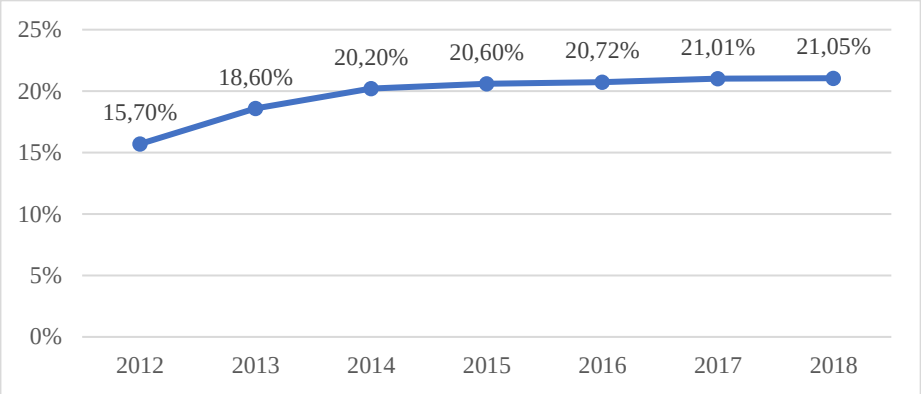

Figure 6.1 The proportion of retail banking business to total operating revenues

Source: BQD Annual Reports (2012-2018)

Personal loans, as one of the most important parts of retail banking, personal loan is critical to the development of BQD. Thus, to provide better service to individual customers, BQD developed a new service namely “Chain e Loan” through Internet and Big Data analysis to connect with the national famous Fast-Moving Consumer Goods (FMCG) enterprises. For example, in the second half of 2015, BQD successfully cooperated with Coca Cola and greatly promoted the development of supply financial business. So far, it has collaborated with more than 10 large-scale FMCG enterprises in China. Supply chain financial business is a successful attempt of the BQD to transfer towards an “Interface bank”. With the increase of the number of cooperative enterprises and the continuous expansion of scale, this development pattern has greatly enhanced the brand influence of BQD and increased the total revenues of the personal loans business.

6.1.1.3 Financial market business

In 2014, BQD established a special financial market business department which is responsible for asset management, trading, investment banking business and research, risk control and operation. The financial market business department makes use of the asset management platform to arrange all kinds of asset investment businesses and improve the efficiency of fund use. At the same time, BQD also innovated interbank financial business, optimized the structure of assets and liabilities, established a perfect investment product line and improved the comprehensive income of assets on the basis of ensuring the liquidity of the whole bank. As shown in Figure 6.2 from 2012 to 2016, the financial market business had a rapid growth and later from 2017 to 2018, it was experienced a sharp drop.

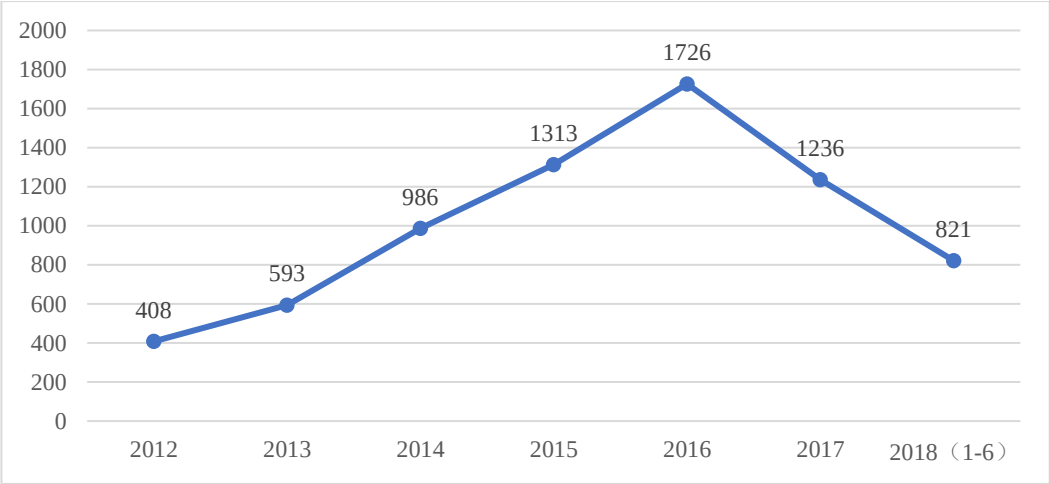

Figure 6.2 Revenue of financial market business in BQD (unit: RMB million）

Source: BQD Annual Reports (2012-2018)

In response to interest rate marketization, financial disintermediation and inter-bank competition, BQD made a focused strategy, taking capital transaction business as the center and asset management and inter-bank business as the complementary. Moreover, BQD also payed attention to the business innovation and risk control to guarantee the development of the financial market business. Among them, BQD investment mainly targets in government bonds issued by China's policy banks, other financial institutions, and non-financial institutions.

In terms of asset management, as of June 30, 2018, the scale of financial management has reached 61.805 billion RMB, increasing 22.50% over the same period of last year. The total amount of financial products reached 192.816 billion RMB. Recently, BQD has developed many new financial products such as "Hairong Wealth" for individual customers, "Quick Decision & Quick Win" for corporate clients, "Haiying" for inter-bank financial business, and "Qingxin Sharing" for financial needs. All these innovative products vigorously support the strategy of interface bank and extend the access channels to customers.

In addition, the investment bank business of BQD not only expands financing channels for customers, but also provides effective help to marketing and maintenance of branch customers. During these processes, the local government played an important role to guide the development of fund business, actively explored and promoted innovative businesses such as debt financing plan, Merger and Acquisition (M&A) fund. BQD targeted additional issuance fund and overseas asset allocation businesses such as overseas issuance of preferred shares, US dollar bonds, and entrusted investment of overseas assets by Chinese financial institutions, which broadened the source of profits. The number of inter-bank customers has increased from more than 400 in 2013 to 1080 in the first half of 2018, laying a solid base for capital trading, independent debt issuance and liquidity management.

6.1.2 IT strategy in BQD

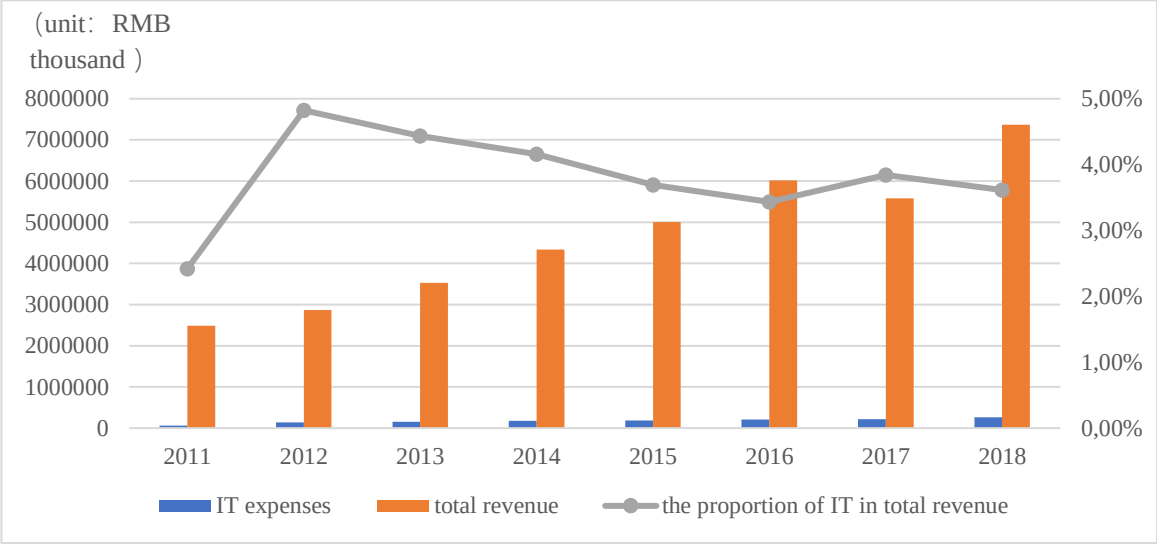

Figure 6.3 IT expenditures in BQD (2011-2018)

Source: BQD Annual Reports (2011-2018)

The IT Department is critical to the development of BQD especially in the Internet and Big Data era. Figure 6.3 exhibits the IT expenditures, total revenue as well as the ratio of IT investment on total revenue from 2011-2018. It is easy to find that the in 2012, this ratio reached the pick with 4.82% and then it slowly drops down to 3.44%. In the most three recent years, it is comparatively stable with about 3.6%.

6.1.2.1 Organization structure of the IT Department of BQD

The IT Department of BQD was established in 1996. In terms of organizational structure, the IT Department established the test center in 2012 to strengthen test management and completely separate the responsibilities of system development and operation maintenance. In addition, to establish and improve the information security management, the security internal control office was set up to cultivate professional information security managers and internal auditors and to enhance the analysis of IT risks.

In 2013, the IT Department initially established three lines of defense including IT management, risk management and IT audit. Furthermore, BQD also established a committee for IT management to implement the IT strategy, which consisted of a president, a CIO and three persons in charge of each line of the whole bank. Thus, the “Five centers and One office” IT structure was completed, in which the five centers were research and development (R&D) center, operation and maintenance center, test center, project management center, technical support center, and business management office.

In 2018, the R&D center has nine groups, including retail development group, mobile

financial development group, big data development group, corporate development group, core development group, channel development group, financial market development group, risk management development group and internal management group. In 2019, the original project management center was merged into the R&D center. The architectures of the project management center set up an independent architecture group, and the groups of R&D centers increased from nine to 10. At present, the IT Department has formed an organizational structure with four centers and one business management office. In 2018, the number of personnel of BQD's IT Department is nearly three times that of 2011 as illustrated by Figure 6.4, in 2018. Meanwhile, there are more than 400 outsourcing persons for the IT Department of BQD.

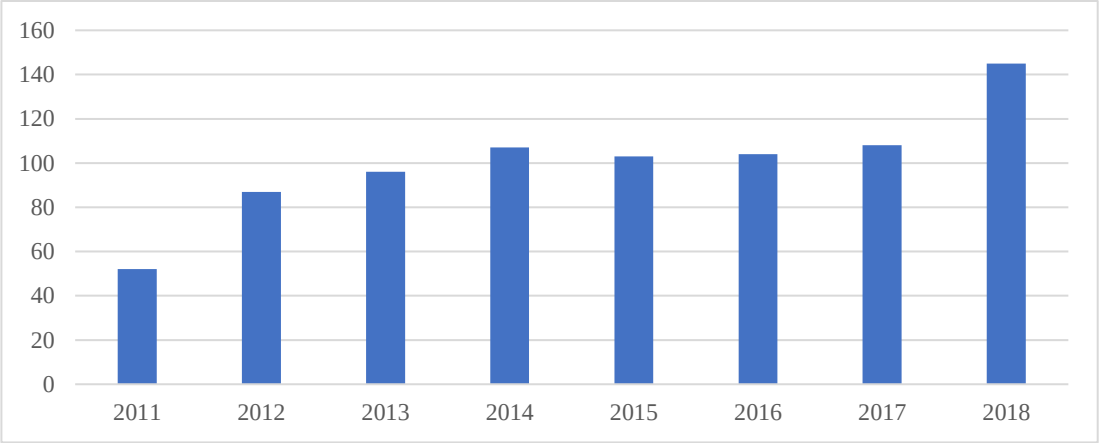

Figure 6.4 The number of personnel of IT Department in BQD (2011-2018)

Source: BQD Annual Reports (2011-2018)

6.1.2.2 IT Architecture Evolution in BQD

With the launch of ESB, customer service system, mobile banking 4.0 and other major projects, the IT architecture of BQD has also experienced the transformation from "chimney" architecture to SOA architecture, and then to distributed micro service architecture.

At the very beginning of IT architecture, the establishment of a single system or a single project makes the system architecture with separate characteristics like "chimney". In this architecture, a large number of functions and businesses exist in multiple systems at the same time, resulting in high costs and resources' waste. The system iteration cycle was slow, making it difficult to respond to the business quickly.

With the development of business and the increase of services provided, in order to break the separation of different subsystems and promote the cooperation between chimney systems, the SOA was introduced, which uses the ESB system to achieve a good connection between multiple independent systems and to shield the impact of service interface changes on service objects.

However, as the SOA architecture makes the business data of banks to be scattered in different systems, it is difficult for IT system to accumulate related knowledge and keep continuous innovation. Thus far, in order to quickly respond to business needs and provide customers with more flexible services, BQD has transformed into a distributed micro service system architecture. Each micro service is built around the specific business logic and runs in its independent process. The efficient communication mechanism is also adopted among various services to communicate with each other.

6.1.2.3 IT management system construction

In 2010, BQD completed the construction and upgrades of dozens of application systems, including new data center construction, computer room relocation, single sign-on of counter system, which laid a solid foundation for the development of science and technology-support business. Through continuous development and innovation, BQD has built a strong foundation of IT.

In 2012, the construction of remote disaster recovery project and Tivoli storage manager (TSM) data centralized backup project greatly improved the security of key business systems and enhanced the ability to control IT risks. Cooperated with the support of the business departments, the IT Department of BQD completed the transformation and upgrades of credit management system, off-site supervision, financial statistical monitoring, large amount anti money laundering, telephone voice verification and other systems. All the systems can identify, warn and deal with potential operational risks effectively, which upgraded the operation and maintenance management level of BQD.

In 2013, BQD built a local disaster recovery center and realized local application level disaster recovery of important business systems. In 2014, after five years of investment and construction of IT infrastructure, BQD initially completed the IT architecture, forming totally 77 application systems including customer service, internal management and operation and maintenance system. In 2016, the special emergency plan was made, in which a number of simulation exercises and the third-party security assessment of Internet business system were carried out. BQD also successfully passed certificate renewal audit by Information Security Management System (ISO27001). Particularly, in 2016, in order to support the business strategy, BQD established a project quality control mechanism based on the international software development capability maturity model integration (CMMI). BQD also optimized its organizational structure and procedure by employing several new operation modes such as “Embedded Demand Service” and “Project Management”, which not only improved the

response speed and quality of IT to business, but also reduced the IT expenditure and established a multi-dimensional IT personnel evaluation and incentive system.

Since 2017, BQD has paid more attention to the BITA innovation by establishing a virtual demand management team based on business need. This new service mode can break through the boundary of different internal departments and enhance the cooperative activities between business departments and the IT Department. Therefore, the quality of demand analysis has been improved, making the business more efficient. Since IT talents are rare resources with very high cost, outsourcing strategy has become an alternative to enhance its IT capability in a short term with comparatively low cost. However, recently, BQD has gradually recruited more knowledge workers, increasing the proportion of internal R&D compared with outsourcing. The large investment on IT human resource strengthens the core competence of BQD and reduces the dependence on other companies. Currently, BQD has continuously strengthened its own infrastructure construction, improved its own management level in terms of fault handling, event handling, service phone. In addition, a multimedia customer service center was built based on mobile Internet technology to achieve the connection with marketing management system and improve the quality of customer service.

6.1.2.4 Development of online banking and mobile banking

To extend the service channels, in 2012, through the construction of SOA and ESB, BQD expanded service channels, reduced the costs and the system operation and maintenance risk. Meanwhile, the launch of operational customer relationship management (OCRM), wealth management system, performance appraisal system, and SMS business platform system in 2012 effectively supported BQD's customer-faced segmentation management as well as the service and marketing needs. In 2013, the construction and upgrades of mobile banking and enterprise online banking were completed. The number of new users of personal online banking exceeded 100000.

In 2015, the direct selling bank officially put into operation, which integrated the e-commerce platform, online finance platform, mobile banking, WeChat banking, online banking and other electronic channels. Meantime, E-banking business ushered with rapid development, especially mobile banking business which experienced a leap forward growth. In 2017, BQD focused on mobile terminals, aiming to improve customer experience and enrich marketing interaction. BQD also completed the upgrading of mobile banking 3.0 and developed Internet micro credit products such as online loan repayment and card loan. New intelligent technology like facial identification was also used in BQD.

In 2015, the construction of payment system including unified collection and payment platform, network financing platform and Coca Cola supply chain financing platform, expanded the advantages of BQD contacts with key local enterprises such as port, customs, subway, hospital, communication and public transport. In addition, the IC card Metro application system was built and the “Metro joint brand card” with flash payment function was launched. Through the "Yinyitong" platform, the cooperation between BQD and hospitals was also enhanced, and the IS has been carried out within 15 enterprises and institutions related to the people’s livelihood industry, such as public utilities, public transport, mobile communication, which effectively supported the implementation of the interface bank strategy.

In 2016, to carry out the interface bank strategy, BQD completed the construction and implementation of a series of key projects such as financing gateway platform and cloud payment platform, and made efforts to develop a “Huimin bank card” that aims to integrate various daily payment system in terms of subway, bus, hospital, pharmacy, and stores.

BQD completed the construction of the second phase of the interface bank platform in 2017. Moreover, the intelligent CRM project of BQD realized the integration of external and internal data and improved the capability of big data value mining, which provides strong data support for managerial decision-making.

In 2018, the bank-wide enterprise knowledge platform based on big data and knowledge map technology was launched. Through the analysis of data integration inside and outside the bank, business personnel can directly use "business knowledge". Big data platform project groups such as intelligent CRM project, business data processing (BDP) query platform and enterprise knowledge platform can realize the integration of various data, tap the value of big data, and lay a foundation for the realization of intelligent transformation.

In 2018, based on Mobile Platform as a Service (MPaaS) platform, BQD and Alibaba cooperated to complete the mobile terminal construction project and put it into operation. Based on the new platform, the mobile terminal construction of smart outlets and gray-scale release of mobile banking 4.0 were realized. Meanwhile, mobile banking 4.0 was officially released in the early 2019. Currently, a highly centralized and unified e-banking system has been established in BQD, integrating various functions such as mobile banking and WeChat banking. In addition, BQD completed the construction of intelligent fast counter system, paperless counter and other projects in 2018, which supported the rapid development of counter business greatly. The smart network system based on MPaaS platform fully uses face recognition technology to complete customer identity verification, improving the security level. This provides customers a warm and efficient one-stop service. The continuous construction of the

interface bank platform has improved the “Finance + Internet” service mode in the Internet era.

Furthermore, the BQD, in combination with the Internet, developed a novel Fintech product that can promote the business and IT alignment. The construction of many projects such as credit card, smart outlets, two or three types of accounts, new functions of interface bank strongly supported the development of retail banking business and corporate banking business. For example, the first type of credit card jointly launched by BQD and Meituan.com focuses on life consumption scenario, which provides customers with differentiated financial services through “*scenario + finance*” mode and connects the last mile of inclusive finance. IT and business departments of BQD and Meituan Reviews had completed the construction of credit card core and peripheral system within three months. This project spent more than 40 million RMB and was successfully launched online in September 2018.

6.2 Business-IT punctuated equilibrium alignment model

In this section, based on the evolving processes of business strategy and IT strategy in BQD, we first analyze how business and IT strategies match each other during the whole developing process in BQD and then propose a punctuated equilibrium model to reflect the relationship between business and IT strategy.

6.2.1 Business and IT aligning processes in BQD

BITA addresses how an enterprise aligns its IT with business strategies. Facing with the dynamic environment, this alignment process of an organization may exhibit its special trajectory. Though many researches has explored the determinants for BITA, there is still little literature on the change of alignment as well as its basic mechanism throughout the entire evolution. Figure 6.5 illustrates the business and IT strategic alignment process in BQD.

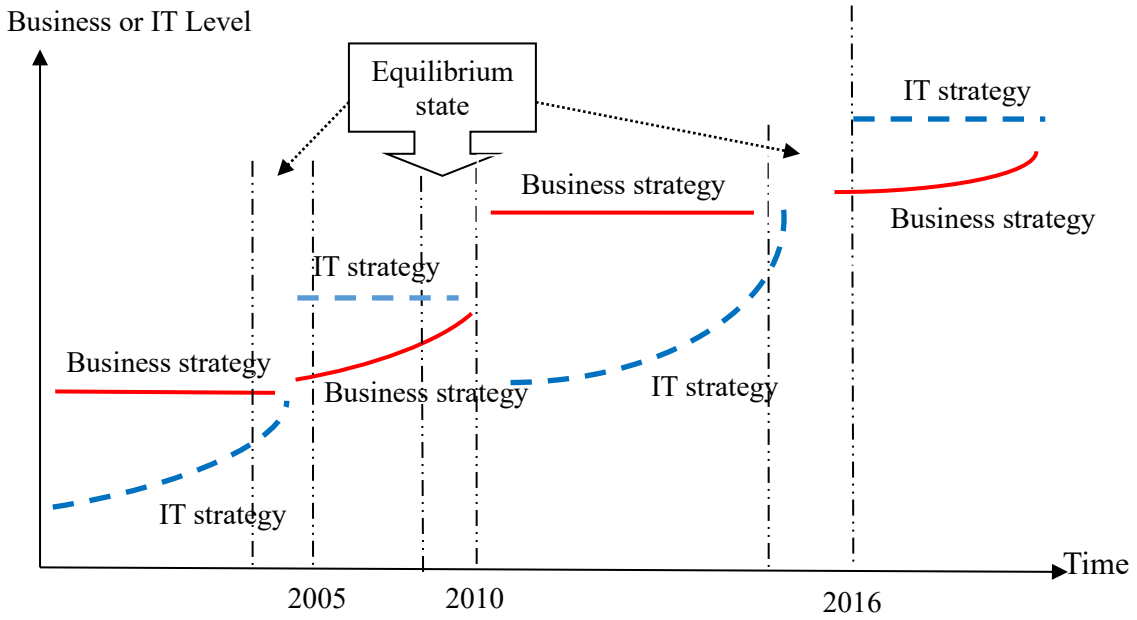

Figure 6.5 Multi-stage aligning process of business-IT strategies in BQD

BQD was set up in 1996 and at that time the electronic construction foundation in BQD was very weak. The IT was scattered in many credit sub-corporations with quite different systems. Still in 1997, BQD did not have an department which was responsible for IT maintenance and early informatization construction. In the first half of 1997, the leaders of BQD decided to integrate business process system so as to speed up the pace of electronic infrastructure building. The first generation of integrated business process system was developed by a domestic software development company in Shanghai. With the support from the staff in BQD, the first savings business system in integrated business process system came into use. It was the first time that universal cash saving and withdrawing was achieved. In 1999, the business system for government came into use and 38 branches could use internet to handle some businesses. However, it was constrained to only counter business. In order to meet the quick development of individual load service, Qingdao Urban Cooperative Bank set up a personal credit business management system in 2001. It invited the world famous home appliance enterprise Haier to join this reform, which largely reduced the losses and helped to achieve enterprization. From 1996 to 2001, the lack of adequate IT investment and professional teams led to the disalignment between IT strategy and business strategy.

In 2002, China entered the World Trade Organization (WTO). Faced with the fierce competition from potential oversea as well as domestic banks, BQD had to establish a new core bank system. Due to the lack of innovation of its information systems, BQD was at an inferior position in the banking industry. In 2003, a new generation of integrated business process system started to be used. The whole IT system needed to be reconstructed.

In April 2004, the new silverlake integrated banking services system went online, BQD became the first bank in small and medium financial institutions of China to adopt both IBM and silverlake systems. Moreover, BQD provided customers with 24 hours service and new financial products. The stability of the new business process system was excellent in terms of risk control as well as electronic access ability. Indeed, before the new generation of integrated business process system come into service, the staff of the bank participated in training, which laid the foundation for applying the new generation system. To match the new generation system, the core business process system has been restructured since 2005. During this period, business strategy did not match IT strategy at first. After the improvement of business strategy, the alignment was reached around 2005.

Since 2006, the BQD made a new business stategy focusing on providing the best service to the customers. Thus the previous IT did not match this strategy, leading once again to a misalignment between business and IT strategies. This time, the focused strategy of BQD pulled the constrution of IS. Therefore, BQD paid much attention to IT governance and continued to increase investment. In the first half of 2012, this bank cooperated with Klynveld Peat Marwick Goerdeler (KPMG) in an information security consulting project. In order to improve information security management, BQD passed the ISO 27001 International Standard Certification.

BQD also began to develop some new technologies such as cloud computing and big data. In 2015, BQD set up a technical innovation model and architecture transforming with SOA. At the same time, open API (Application Program Interface) packed the basic service of the bank, making it easier to meet customers' demand and to achieve the fast response of external services. The cloud computing usage not only reduced the investment on hardware, but also optimized the IT infrastructure. It also reduced the cost of operating maintenance and made it more efficient.

Later, BQD put forward a new IT strategy termed as "excellence in technology" and made a significant investment on IT and teams building. From 2012 to 2014, the total expenses on IT equipment, systems and relevant software and hardware amounted to approximately RMB 430 million. The mobile financial projects enriched the functions of mobile business. Mobile internet has become an important channel for BQD. In June 2015, 88.6% of transactions businesses were through electronic banking channels. In 2016, BQD had developed IT strategies which matched business strategies well, achieving fruitful results due to the development of IT strategies.

Thus from the case of BQD, we may find that the business and IT strategies alternatively

lead the aligning process. For example, as illustrated in Figure 6.5, from 2006 to 2010, at the beginning, the new focused strategy broke the originally equibrium, pushing it to the state of misalignment. At that stage, the performance of BQD was not very well due to the mismatch between IT strategy and business strategy. Then at the approaching stage, from 2010 to 2016, BQD had to work hard to improve its IT to achieve alignment. With the successful operation of new IS, this alignment was achieved in about 2016, and a new equilibrium was reached. However, the advanced IT also brings about a potential problem. It seems that at the present time, the originally focused business strategy has been lagged behind. Thus how to develop a new business strategy to transfer current IT into competitive advantage has become a challenge for BQD. We may find that enterprises will work hard to achieve punctuated equilibrium alignment. As circumstance changes, business strategy and IT strategy will change, and some other factors may affect their alignment.

6.2.2 Business-IT punctuated equilibrium alignment model

Based on the aligning process in BQD, in this section, we propose a theoretical model named as Business-IT punctuated equilibrium alignment model (BIPEAM) to explore the mechanism of BITA, which may provide practical guideline to the alignment of Business-IT in an organization. Figure 6.6 displays the multi-stage of business-IT aligning process in BQD.

As shown in Figure 6.6, there are three stages for each cycle: misalignment, approaching, and alignment. At the beginning stage 1, the mismatch between business and IT strategies will become the engine to trigger the aligning process. An enterprise may reallocate the resources to enhance the business or IT strategy and push it to approaching stage 2. Gradually, the gap will be narrowed to high level alignment between the two strategies. At that period of time, we may state that the business and IT strategies are at an equilibrium (i.e. Stage 3) during which the two strategies almost match each other and the enterprise may enjoy the benefit from this alignment. However, this equilibrium will be broken by any changes from external environment such as customer's new demands, government regulation, as well as the strong competition from industrial rivals. Once the equilibrium can not be maintained, the evolution will enter the next cycle and repeat the process as described before.

Thus, BIPEAM describes the evolutionary process of business and IT strategies alignment. More importantly, the proposed model may provide some hints why some enterprises can self-organize to achive the alignment while others fails. Even if some enterprises were successful to align business and IT strategies in a specific cycle, it does not guarantee that in the next cycle, they can still achive the alignment due to the limitation of their capabilities or resources to

handle the different obstacles from the last cycle.

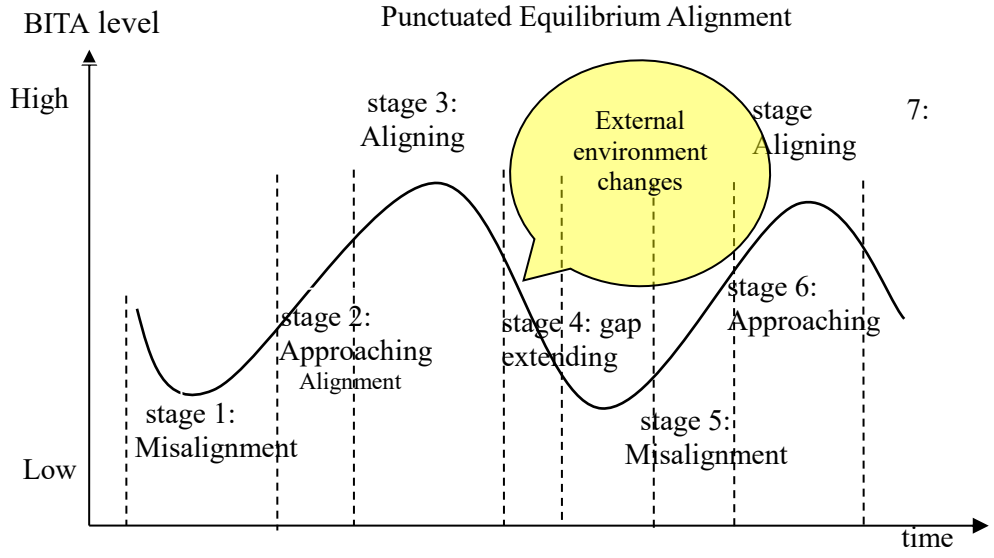

Figure 6.6 BIPEAM

This model aims to answer the following two questions: (1) how does an enterprise align its IT with business strategies when it goes through revolutionary changes every few years? (2) why do some organizations quickly fail when turbulent environmental changes occur? The research chooses BQD as a case to show the proposed BIPEAM. Our findings suggest that during the three stages which BQD experienced, business and IT strategies alternatively led to the alignment process. This study contributes towards a better understanding of the BITA mechanism within an enterprise.

6.3 BITA in BQD from an operational perspective

From previous literature presented in Chapter 2, we may find that even though numerous researches have focused on BITA, the internal employee factors that affect IT and business matching are ignored. This study aims to fill this gap and explore the BITA from an operational employees's perspective.

6.3.1 Factors influencing BITA and working performance in BQD

The empirical results described in Chapter 5 show that while the communication maturity, competency/value measurement maturity, governance maturity, partnership maturity, and skill maturity positively affect the business-IT strategic alignment, the impact of technology scope and architecture is not significant. The IT service quality maturity positively moderates the relationship between BITA and working performance.

6.3.1.1 Communication impact on BITA

In this study, *H1* is supported by the empirical data, showing that most of the business employees in the head office and branches of BQD can easily communicate with the IT Department. They can actively put forward demands to the IT Department through formal or informal channels according to the work demands. The existence of various channels is the base for BITA. However, the feedback efficiency and communication methods need to be strengthened and improved.

6.3.1.2 IT competitiveness/value impact on BITA

In our study, *H2* is supported, indicating that IT competitiveness or value is significant to BITA in BQD. Business employees can feel the continuous improvement of IT and they heavily depend on the IT system to complete their daily work. However, they also mention that there is still a big gap with the large banks in China like ICBC. IT has affected the formulation of their own work objectives, and businesses increasingly need new IT support.

6.3.1.3 IT governance impact on BITA

In *H3*, we assume that IT governance maturity is positively related to BITA maturity, which has been supported by our empirical data. The employees in business department think the IT is vital to their work and the IT Department often participates in the strategic planning or work goal setting of their departments. They believe that the IT only play a supporting role in providing service to their businesses.

6.3.1.4 Partnership impact on BITA

The employees in BQD business department regard IT as a very important partner to their work. Our data also supports *H4*, showing a direct impact of partnership on business-IT matching. Most business personnel think that IT strategy is a part of business strategy, and the development of IT can lead the business to process optimization and improve service level. The investment on IT in BQD is huge and sufficient. However, the technical level and service quality need to be improved.

6.3.1.5 Skills impact on BITA

In this study, *H6* is also supported, indicating that individual skills on IT are a significant factor affecting the business-IT fitting in BQD. They all agree that a good understanding on new IT can make them work better. Especially in the new era with many advanced technologies like big data and AI, they have a lot to learn and are willing to communicate with the IT Department

personnel to improve their theoretical understanding as well as practical skills. However, when it comes to learning new software, business-people need to devote more energy and time, and have difficulties in using new technologies. Therefore, how to make the software friendly as well as easily to learn has become a big challenge for IT researchers and developers in BQD.

6.3.1.6 Impact of BITA on working performance

This study also examines the positive impact of BITA on working performance (*H7*), demonstrating the importance of business-IT matching. Business employees believe that BITA can provide good support for the implementation of their strategy and enhance their performance. However, many people think that there are still many problems between business level and the application of new IT development. For example, some new technologies like Blockchain have not been used in the work, and it is not clear how to improve work performance with the help of new IT. The IT Department should improve the stability of ISs and the ability to solve problems.

6.3.1.7 Moderating effect of service quality between BITA and performance

In terms of service capability, our survey indicates that IT service quality positively moderates the relation between BITA and working performance (*H8*). Service attitude can enhance the working performance. From the survey of BQD in this study, we may find that the project construction cycle of ISs is too long to meet their needs.

In the theoretical model (Figure 4.1), only *H5* is not supported by the empirical data, showing that the impact of IT scope and architecture on BITA is not significant. From business employees's perspective, once the change of customer demand happens, the IT system of BQD is always lagging and it is difficult to adapt the new business strategy very quickly, leading to the mismatching between business and IT strategies.

6.3.2 Problems of BITA in BQD

Table 6.3 reports the typical answers to the problems in terms of BITA in BQD. As shown in Part 3 of the questionnaire (see Appendix 1), some questions are given to explore the current problems in BITA.

Table 6.3 Typical answers to the questions in the questionnaire

Question 1: What do you think are the main problems in IT strategy, technology, system, software and management of the bank?	
System	➢ "Due to the rapid changes in financial context and the rapid updating and iteration of business requirements, the IT system construction support of the bank needs to be further strengthened at present." (a1) ➢ "The system development process chain is too long, and the whole development cycle is long". (a2) ➢ "There are many business systems with poor coordination". (a3) ➢ "The IT Department pays attention to infrastructure construction and ignore software system construction. In IT budget, the actual investment of hardware equipment accounts for a relatively high proportion, and the actual investment of software products is relatively small." (a4) ➢ Compared with the top business manufacturers and products used by hardware equipment, the manufacturers and products selected for software implementation are not advanced in the industry, and they always want to spend small money to do great things, resulting in poor system operation on good equipment". (a5) ➢ "Each business line system is not uniform enough, and business interaction between lines is prone to problems." (a6) ➢ "The databases in BQD are not perfect, part of the data needs manual statistics, increasing the workload." (a7) ➢ "The system is relatively backward, the query processing function is not perfect, and the operation process is tedious." (a8)
IT HR management	➢ "Most of the employees and managers in the technology industry can't make programs, and their technical ability is not good. They just rely on outsourcing! The problem cannot be solved very quickly." (b1) ➢ "Overstaffed, always running process, wasting time." (b2) ➢ "IT personnel are miscellaneous and the business processing process is long and cumbersome, which needs constant urging." (b3) ➢ "IT staff do not understand the operation and the business. They ususally do not start from the actual needs of the business. They did not consider the problems from the actual use of the front-line personnel, and simply design the system from the perspective of IT. "(b4) ➢ "Project managers are not familiar with the business system and lack the ability to analyze the impact of business requirements."(b5) ➢ "There are fewer scientific and technological personnel."(b6) ➢ "The outsourcing is not advanced enough in the industry."(b7) ➢ "There are no good top-level design and professional IT talents in line with the current development".(b8)
Project demand	➢ "the demonstration time of project requirements is too long, and the requirements processing and development are slow."(c1) ➢ "If the demand involves a wide range, the system development is relatively slow, sometimes as long as one year or more, resulting in the failure of timely use."(c2) ➢ "Now, the business department first puts forward demand and the IT Department tries to solve the problem. This process has some disadvantage especially when the demand is not very clear or standard, which may lead to the misunderatanding of IT programmers." (c3) ➢ "The system construction is slightly different from the actual situation. At the same time, the managerial ways of the IT Department is relatively backward. It does not activate the initiative and attribution of the IT team members, which does not make use of IT advantage." (c4)

Question 1: What do you think are the main problems in IT strategy, technology, system, software and management of the bank?	
Project demand	➢ "Now, IT acts as a servant, passively accepting and meeting the needs, which also causes the current situation of the IT Department becoming a back boiler man. IT position is not very high. The initiative is not self-confident, and the self positioning is fuzzy." (c5) ➢ "From the current trend, IT should take an active leading role and actively participate in the business process." (c6)
Feedback channels	➢ "The channel of feedback and problem-solving needs to be strengthened." (d1) ➢ "The IT Department has no receptionist responsible for the communication with other departments. Sometimes, the confirmation of a question requires the business personnel to coordinate with different persons in the IT Department." (d2) ➢ "There are few operation manuals related to common faults." (d3)
Risk warning	➢ "The IT system is not as intelligent and convenient as other banks. Many errors should be prevented by computer automatically." (d4) ➢ "At present, it is still post-risk analysis, rather than before-risk warning." (d5)
Question 2: How to coordinate IT and business strategy better in BQD?	
HR management	➢ "The IT Department should improve their own professional level. Sometimes, it takes a long time for a small problem." (e1) ➢ "The bank should invest more on IT system construction and development." (e2) ➢ "IT personnel should be further familiar with relevant businesses and integrate business strategies in the development process." (e3) ➢ "The IT Department will visit the sub-branch regularly to solve the problem." (e4)
Managerial procedure	➢ "The IT Department should dispatch one person in each related business unit." (f1) ➢ "To implement joint training of technical department and business department regularly." (f2) ➢ "To establish the IT Fintech Department to be responsible for the overall business and technology alignment." (f3) ➢ "To update the system frequently make us difficult to learn and understand" (f4)
Strategic planning	➢ "To make the IT strategy from the whole bank perspective." (g1) ➢ "The IT Department should participate in the formulation of business planning" (g2)
Question 3: What are the main problems of IT in meeting your daily work needs?	
Fault handling	➢ "IT system should improve the effectiveness of troubleshooting and problem finding." (h1)
System	➢ "Lack of correlation analysis among multiple systems. (j1) ➢ "A new and powerful OCRM system is urgently needed to develop retail business and deepen customer group operation." (j2) ➢ "The system data is unstable and uneven. The business data is not standard and uniform, and the processing time is too long." (j3) ➢ "The types of reports in computer system are not comprehensive. It is recommended to add management reports." (j4) ➢ "OC system is unable to update customer holding information in time, such as structural deposit, trust fund." (j5) ➢ "There is no way to know which account manager the customer belongs to". (j6)

Question 3: What are the main problems of IT in meeting your daily work needs?	
Data analysis	➢ "The ability to use big data is relatively weak, and the basic business data cannot be effectively integrated and utilized. It is recommended that the head office investigate the benchmark of banking industry, establish the bank wide data warehouse, and meet the data needs of business departments and branches." (k1) ➢ "The relevant business system functions are single and the version is out of date, which limits the work efficiency." (k2) ➢ "The construction of our bank's IS focuses on business system, and the construction of auxiliary MIS is missing. Most of the management work is still in manual account stage, which is far from the other banks." (k3) ➢ "The process of the new office system is too slow to improve and supporting documents are missing. We have to try to use it to by ourselves." (k4)

6.3.3 An initial Balanced Scorecard analysis of the IT Department in BQD

Since the purpose of BITA is to enhance the business competitive advantage, in the previous chapters, we empirically investigate the factors influencing BITA from business employees's perspective. However, in business and IT strategic aligning process, the IT Department also play an important role. In this section, we use the Balanced Scorecard approach, developed by Kaplan and Norton (1992; 1996), to discuss the implementation of the IT strategy in BQD. Specifically, we use the Balanced Scorecard approach to group the key performance indicators (KPI) as follows: financial, customer, internal processes, and learning & growth.

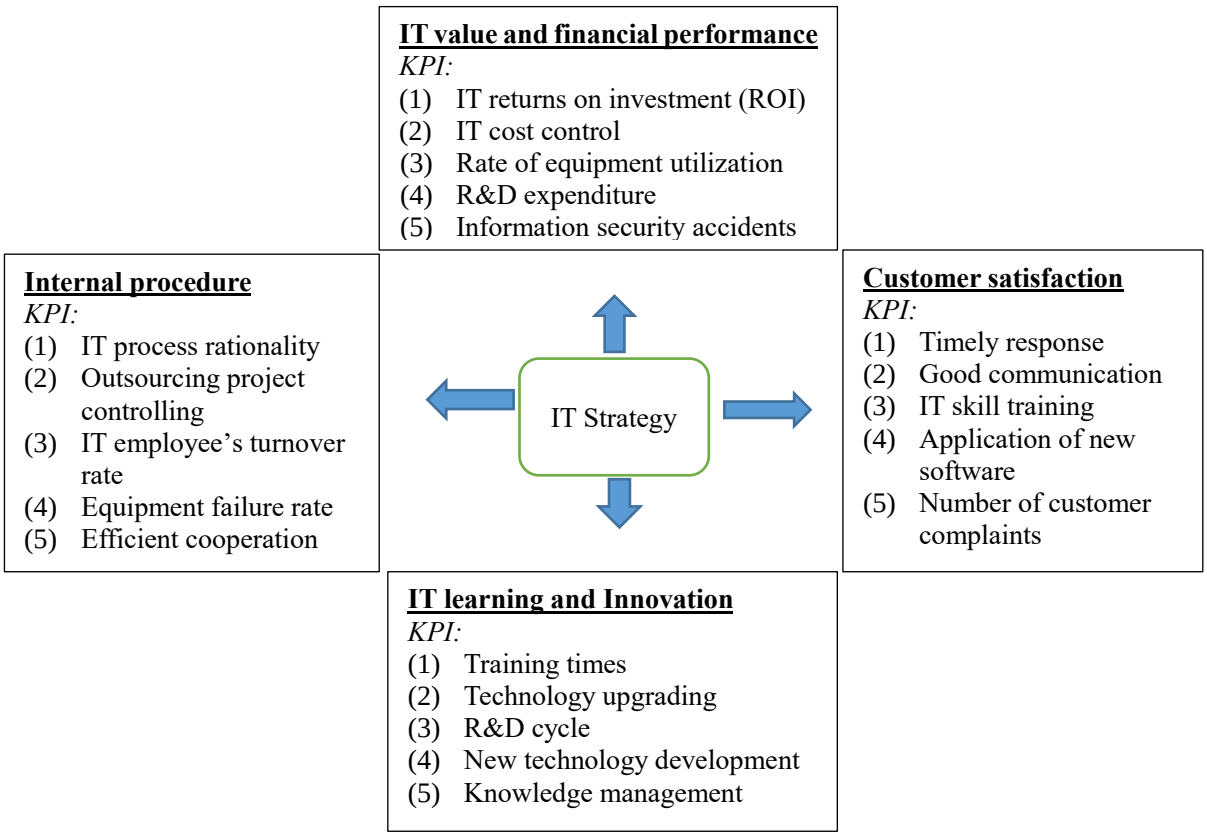

Figure 6.7 A high-level Balanced Scorecard analysis of the IT strategy in BQD

Currently, the IT strategy of BQD is to continuously develop new technology and provide high quality services to other departments. Figure 6.7 shows the key performance indicators (KPI) of the IT Department in BQD. These indicators are used to evaluate the performance of the IT strategy implementation. the customers of the IT Department are the other departments including the first line businesses and supporting platforms are all its customers. Thus, how these departments evaluate the IT role is critical for the IT Department to improve its service and capability. According to the survey in this study, we may find that generally the business employees are satisfied with the IT service. Regarding the KPI of customer satisfaction in Table 5.3, the average values of questionnaire items COMM1-5, SKIL4, SERV3 are 3.47, 3.65, 3.25, 3.47, 3.55, 3.26, and 3.41 respectively, showing that the other departments overall appreciate the work of the IT department. However, as indicated in Table 6.3, while some staff complains about the misunderstanding of business knowledge for IT persons (e.g., a6, a7, b1, b2, b3, c2, d1, d2, d3, f1, f4, g2, j2-j6, k2, k3), several point out that IT should make use of big data technology to develop new products (e.g., a5, c4). All these dissatisfactions are related to not only IT internal processes, but also cooperation between IT and other departments. Although most of respondents believe that the IT Department in BQD provides a good support to their works, there are still many complains from the business units. As shown in Figure 6.1, compared to the large bank like ICBC, China Construction Bank, IT internal operation and decision procedure of BQD is not very efficient and many processes are too tedious to meet the needs of businesses (see a2, a8, c1, c3, c5, e4, h1, j1, k4). Therefore, it is a big challenge for the IT Department of BQD to improve its efficiency.

In the study, from the business employee perspective, they all believe that IT is very important to their works and the quality of IT service is generally good according to the questionnaire. Our empirical results reveal that the IT service quality positively moderates the relation between BITA and working performance. In terms of KPI of IT value and financial performance, IT return on investment is comparatively high. This is consistent with the interviewing outcomes in Table 6.3 (e.g. A3, a4, c6, d5, e2, f3, g1), which also mentioned that the expenditure of IT investment on hardware is too high and should pay more attention to the software development.

In the big data era, many revolutionary technologies like Blockchain are developed to provide numerous opportunities for business innovation. Whether BQD can make use of these technologies to achieve sustainable development has become a key issue for the CEO and CIO. In Table 6.3 (e.g., b7, b8, d4, e1, e3, f2, k1), we may find that the learning new technology and business knowledge are critical to the future development of BQD. Considering the KPI in IT

learning and innovation, R&D cycle and new technology development are longer than expected, indicating the innovation capability of the IT department in BQD should be improved significantly.

To further explore the BITA of BQD from an operational perspective, an interview with the CFO was conducted to understand the internal procedures of the IT department. The interviewing results show that it is difficult to control the outsourcing processes. One of the serious problems faced by BQD is the comparatively high turnover rate of outsourcing companies. Meanwhile, since BQD is a SME with limited IT investment, the IT equipment failure rate is also relatively high, leading to the dissatisfaction of customers. In addition, the cooperation between different IT sub-units is another problem. As complained by the CFO, in his daily work, he often spends a lot of time dealing with various kinds of conflicts among subunits. How to improve the internal processes to make the cooperation more efficient has become a big challenge for the IT Department of BQD. Thus, regarding the KPI of the internal procedure perspective, we may conclude that there are still many internal procedures still need to be improved, though the IT Department has attempted to do its best to provide a good service to the business. Some employees also point out the need to shift from a business-driven to an IT-driven mode, which may set up new competitive advantages for BQD.

6.4 From business-driven to IT-driven alignment in a digital economy era

In the digital economy era, new IT technologies have improved dramatically, providing many opportunity to business innovation. How to make use of these new technologies to develop new products and services to better satisfy its customers is a new challenge faced by BQD.

In this section, we will take the knowledge graph technology as an example to show the IT-driven aligning process. Currently, China's small and medium-sized banks are facing with huge challenges from the reduction of deposit and loan differences as well as the fierce competition of the homogeneous marketing strategies. However, the new technologies like Internet, Big Data, and Cloud Computing also bring about many opportunities for these SMEs in the banking industry to explore their niche markets. Thus, many banks try to implement "customer-oriented" differentiated strategies to tackle the huge challenges from the peers and Internet banks, in which CRM is in the central position. A CRM system aims to understand and satisfy customers during any given interaction with the company (Chen & Popovich, 2003). Compared to the traditional CRM system focusing on the automatic data collecting, the new strategies call for the deeper data mining capabilities to provide better services to the customers.

Consequently, the core competence of banks has been changing to the customer insight capability. In this sense, CRM should integrate IT into business process to provide more efficient services, sales activities and marketing.(Bose, 2002; Vaish, Vaishya, & Bhawal, 2016).

In this study, we investigate why the traditional CRM is not efficient and how to construct a smart CRM system using the knowledge graph. Recently, knowledge graphs have gradually caught the attention in the knowledge management domain (Zhu & Iglesias, 2017). Knowledge graphs are defined as a kind of processes, methods as well as tools to visualize them (Speel et al., 1999; Li, Ma, & Qu, 2017). There are various techniques that can be used to create knowledge graphs (Li, Ma, & Qu, 2017). Taking the BQD as a case, this thesis discusses a 3-stage model to upgrade CRM and exhibits the role of knowledge graph on the application architecture of the intelligent CRM in BQD.

6.4.1 Traditional CRM system in BQD

In many small and medium-sized banks in China, the traditional CRM system has been criticized by business managers due to its limited functions. Most CRM systems only focus on hardware improvement, replacing traditional manual works with automatic and online ones, rather than providing comprehensive analyses of the customers. Lacking the core capability of discovering the demand of customers, these SMEs must imitate each other, leading to the provision of homogeneous products and services. Therefore, differentiation strategies are difficult or nearly impossible to achieve. However, compared to the Internet banks, they have no cost advantages, making the cost leadership strategy inefficient for them. As a result of an interview with the company business director of BQD, the following main problems of the CRM system were uncovered:

(1) The capabilities of valuable data collection are not strong. Data are the basic and most important basis for any CRM system, setting the foundation for the later data mining and analysis. However, both business and information departments are faced with the missing of high value data and inflexibility of customer and environment data, making it difficult to support the business strategy's formulation and implementation. The data in the traditional CRM is not flexible enough to align with the business strategy, especially the efficient demand analysis.

(2) The managerial abilities for various data are weak. Currently, customer data in CRM are coming from different business systems without a uniform format. Moreover, the lack of uniform data management platform makes it difficult to integrate data even if

most small and medium-sized banks have built their own databases. Due to the limitation of data access channels, many internal and external data are not stored in the CRM. Meanwhile, the present data architecture cannot adapt to the change of business needs and fail to deal with huge unstructured data from logs and Internet. This slow timeliness makes it nearly impossible to gather insight into the changes of customer needs.

(3) The knowledge mining and exploration abilities are insufficient. The main functions of traditional CRM systems in these banks still focus on the sorting and displaying of static information of existing customers. They cannot even classify customers according to the needs from business departments and they hardly predict the trend of data, let alone integrate the different sources and types of data.

(4) The innovative capabilities to adapt to the new environment are deficient. With the rapid changes of business needs and the emerging technology such as big data and Internet banking, marketing and risk management in these banks are facing with great challenges. Since the traditional CRM emphasizes sales rather than providing better services to the customer, it is gradually deviating from the present businesses and tend to become only a sales management tool. This situation is far from the current expectation of a CRM system.

To address these problems, many banks tried hard to upgrade their CRM systems to smart ones.

6.4.2 Knowledge graph

Knowledge graph is derived from Google, aiming to describe the relationships among all kinds of entities or concepts in the real world (Steiner et al., 2012). Thus, the knowledge graph can be regarded as a huge network drawn from the data. Compared with the existing string fuzzy matching approach, knowledge graph has changed the way of information retrieval, showing users the structured knowledge classification, and helping people find the useful information through filtering the data using a specific algorithm (Shan, Li, & Chen, 2017).

In general, a knowledge graph is composed of entities, concepts, contents, and relations. Among them, entity is the most basic element, which refers to a person, a city, a plant, a kind of commodity. In the knowledge graph and there are different relationships among different entities. A concept or a semantic class is a collection of entities of the same characteristic, such as the state, the nation, the book, and the computer. While content descripts the meaning of an

entity or a concept, which can be expressed by text, image, audio and video, attribute interprets the specific properties of an entity like 9 million. Moreover, a relation can be regarded as a function that maps a graph node (entity, semantic class, attribute value) to a Boolean value (Shan, Li, & Chen, 2017).

Knowledge graph can be divided into pattern level and data level. The data layer is mainly composed by a series of facts and knowledge will be stored in fact units. If some triples such as (entity 1-relation-entity 2) or (entity- attribute- attribute value) are used to express facts, a graph database can be used as storage medium. As the core in the knowledge map, pattern layer is built on the data layer and the ontology library is usually used to manage the pattern layer in the knowledge graph (Franco-Salvador, Rosso, & Montes-y-Gómez, 2016; Zhu & Iglesias, 2017).

The architecture of the knowledge graph refers to the construction of a pattern structure. The part of the dotted line frame contains both the construction and update process of knowledge graph. In general, a knowledge graph is constructed from the original data, using a series of automated or semi-automated techniques to extract knowledge facts from the original and the third-party databases, and then stored them in the data and model layers of the knowledge bases (Shan, Li, & Chen, 2017). This process mainly has four stages: information extraction, representation, integration, and inference, all of which are included in each updated iteration. Knowledge graphs can be built in two ways: top-down and bottom-up (Li, Ma, & Qu, 2017).

6.4.3 Building smart CRM system by knowledge graph technology in BQD

In this study, BQD was chosen since it has employed knowledge graph to rebuild the CRM system and upgraded the traditional CRM into a smart one. To investigate how knowledge graph was employed to reengineer the CRM system, BQD was taken as a case and in-depth interviews in BQD were conducted in this study to explore the problems of traditional CRM and the process of smart CRM building especially by knowledge graph. Along with the second-handed data like archival information, this case study tried to show how the new IT led to the new business strategy in BQD.

By using the knowledge graph technique, BQD first integrated the internal and external data. Then, through accurately identifying and classifying clients BQD upgraded the CRM system to enhance customer recognition, customer service, customer analysis and team cooperation abilities. BQD also generated the comprehensive attributes of each client using

data mining, information processing, knowledge identification and graph drawing approaches. Using different perspectives like customer clustering, market segmentation, product service positioning, BQD categorizes the users into four groups: loyal users, core users, target users and potential users and portraits them in terms of preference and property. Moreover, combining with big data and machine learning, BQD successfully support the business strategy in the new era.

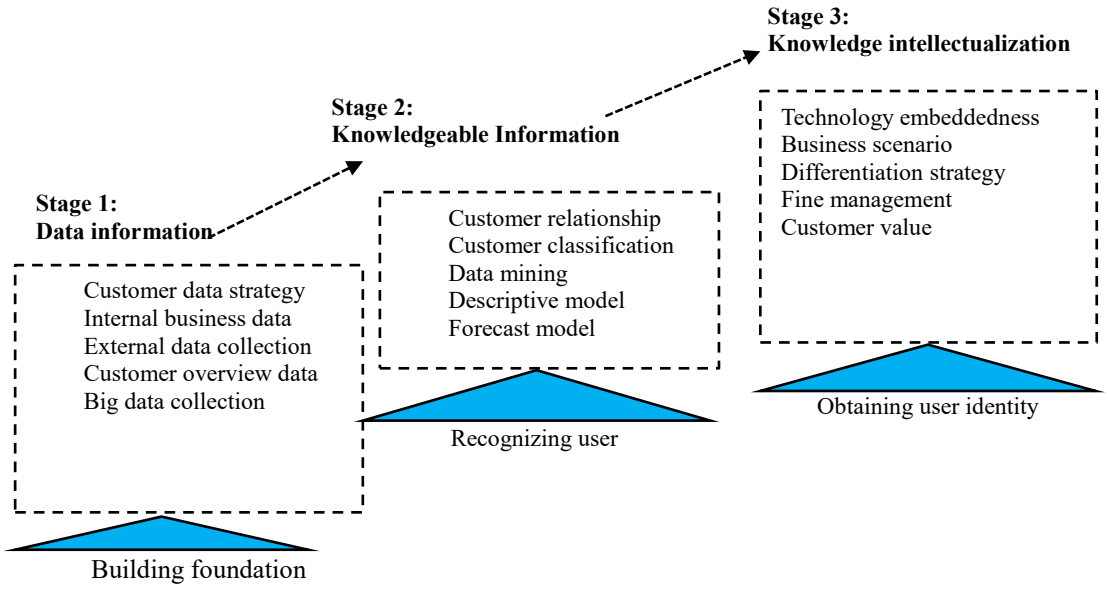

Figure 6.8 The 3-stage model for smart CRM built in BQD

Figure 6.8 exhibits the 3-stage model of the smart CRM built in BQD. While the first stage is to collect data and transfer them to information, the second one continuously seeks to turn the information into knowledge. The last stage is to apply the knowledge intelligently by the needs of business strategy. During these processes, at the beginning, several approaches like Natural Language Processing (NLP), machine learning, and pattern identification were used to obtain huge data and extract valuable information from the big data. Later graph analysis tools and graph mining algorithm were employed to establish the linkage of these information and store them in specific dynamic databases with updating and dynamic scanning mechanism. Then based on these databases, quick search can be achieved easily by anybody. Finally, using deep learning and massive data mining, implicit or imperceptible rules, linkages or knowledge may be discovered and recognized.

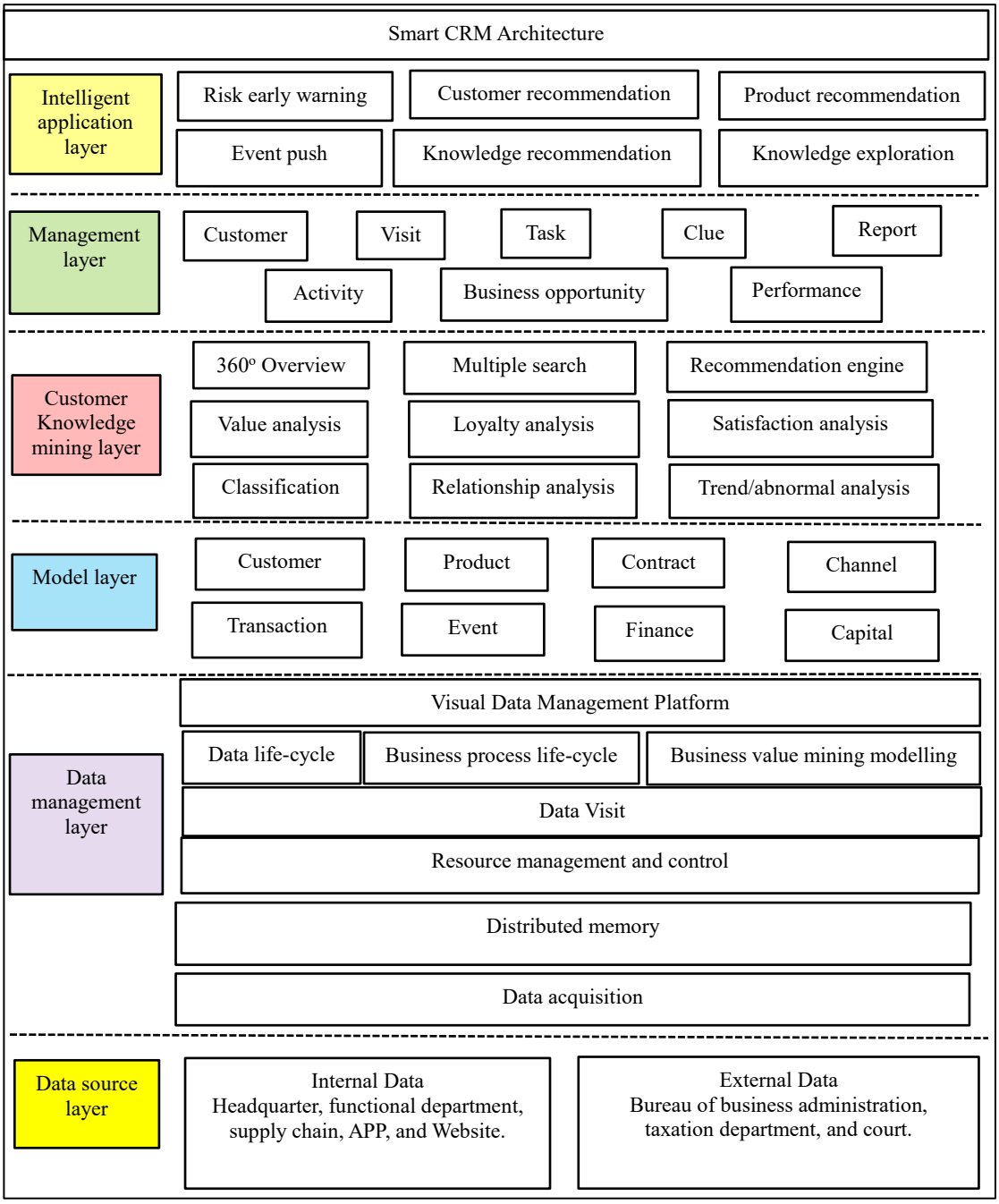

Figure 6.9 Application architecture for smart CRM in BQD

In order to carry out the 3-stage model, BQD reconstructed the architecture of its intelligent CRM system. As shown in Figure 6.9, the application architecture of the smart CRM is divided into six layers: data source layer, data management layer, model layer, knowledge mining layer, basic functional layer, and intelligent application layer.

(1) *Data source layer.* This is the bottom of the whole CRM platform. The data sources consist of bank internal and external data. The internal data come from the bank inside such as headquarters, functional departments, supply chain, APP, and Website. Meanwhile, external data are mainly gathered from government and public

organizations like the bureau of business administration, taxation department, and court.

(2) *Data management layer.* This layer mainly uses the distributed storage technology to save all kinds of data. It is based on distributed storage and REST architecture, which makes it easier to integrate internal and external sources and can easily perform flexible tailoring and expansion of business functions, providing flexible support for all kinds of application integration.

(3) *Model layer.* BQD classified the data into eight types: customer, transaction, product, event, contract, finance, channel, capital. For each of them, a corresponding model was established to meet their specific properties.

(4) *Knowledge mining.* In this layer, knowledge graph is used to identify the data entities, data attributes, and data relations so that data mining can be achieved for the business needs.

(5) *Basic function layer.* The basic functions for CRM system cover eight parts in the smart CRM of BQD, namely: Customer management; visit management; business opportunity management; task management, clue management; report management; performance management, and activities management.

(6) *Intelligent application layer.* This is the top layer in the CRM architecture, including early risk warning, potential customer recommendation, product recommendation, event push, knowledge recommendation, and knowledge exploration.

Based on the knowledge graph, through the integration of Spark, Hadoop, Elastic search and other leading big data technologies, the smart CRM in BQD realizes the massive heterogeneous data storage, computing, and knowledge retrieval. It not only considers the compatibility requirements of different types of data as well as the timeliness, but also considers the massive data query and processing, providing a more coherent information for the user or decision maker. As the knowledge graph can explore more in-depth, extensive, and complete knowledge, it brings great value for small and medium-sized banks, and largely enhances the CRM position in the bank's strategic management.

Therefore, through data collection, information extraction, graph building, knowledge storage, fast retrieval, and knowledge detection, the traditional CRM is gradually turn into a smart system. This transfer provides a direction to solve the CRM dilemma in China's small and medium-sized banks. Using knowledge graph, BQD can easily recognize the individual and group customer characteristics from various perspectives, which may enhance business managers' perception on customers, and effectively support the differentiated strategies. From

this sense, we may find that the application of knowledge graph technology pushed the transfer from traditional CRM to intelligent one and further promoted the innovation of business strategy in BQD.

This study explores the reasons why the traditional CRM is reluctant to meet the needs of business strategy for China's small and medium-sized banks and how Knowledge Graph is employed to promote the transfer to smart CRM in BQD. Especially, it introduces the knowledge graph in terms of the 3-stage model for smart CRM building and builds a full line of enterprise knowledge platform. From the analysis, we may find that new technologies can also act as an engine to lead to the new business strategy. The application of knowledge graph in the intelligent CRM in BQD has brought benefits to managers as well as customers. Particularly for the business managers, the smart CRM has largely extended the traditional CRM from after-sale service to strategic management. The knowledge graph in the smart CRM system can provide real-time and convenient services for client managers as well as any other decision makers in the company, making CRM much more intelligent than before. The smart CRM strongly support the customer-oriented strategy of BQD.

6.5 Summary of this chapter

The technology in financial services refers to a range of activities related to banking, funding, loaning and so forth. In recent years, internet technology revolution has brought new challenges and opportunities to bank management. IT which integrates with various resources has become a vital component of business strategy and plays a key role in banking industry. The interdependence between IT and business strategy is a major concern not only for many IT executives but also for business managers, making the alignment more important than before.

In this chapter, the BITA maturity framework is examined from employee perspective. In this chapter, combining with the questionnaire and interview results, we first explore the longitudinal matching between business and IT strategies, and then analyze the current situation of business-IT fit based on the empirical results. Finally, in the big data era, this study also proposes that the IT-driven strategy in BQD may provide some new approaches to lead the innovation of business strategy.

Chapter 7: Conclusion and Recommendation

7.1 Main results of this study

This study empirically investigates the BITA in BQD from the perspective of employees. The main results are as follows:

(1) Based on the empirical data of BQD, there are five critical factors that positively influence the BITA maturity, including communication, IT competency/value measurement, IT governance, partnership, and IT skills. By contrast, the positive impact of IT scope and architecture on BITA has not been supported by this study.

(2) The BITA exerts positive and direct impact on working performance of employees in the business departments in BQD. Meanwhile, the service quality moderates the relation between BITA and working performance.

(3) Through the longitudinal study of BQD, we find there is an alternative driven relation between business strategy and IT strategy. During more than 20 years, BQD has experienced misalignment for most of time with business-driven and IT-driven alternatively leading the matching processes. From 2005 to 2010, IT strategy was leading the matching between business and IT.

(4) Currently, as many technologies have been developed rapidly and greatly, they provide more possibilities for new business design. In this study, knowledge graph is employed to transfer traditional CRM to smart CRM in BQD, showing how IT drives the innovation of business. Recently, China's small and medium-sized banks try to implement "customer-oriented" differentiated strategies to tackle the huge challenges by Fintech innovation such as big data and AI, in which CRM has always been one of the key areas of bank industry. However, the traditional CRM is reluctant to meet the needs of their business strategies.

7.2 Contribution of this study

7.2.1 Theoretical contribution

This study provides the following theoretical contributions:

(1) This study empirically examines the factors that affect the BITA from the employee's

operational perspective. As we know, since the BITA is essential to Chinese enterprises especially in the Internet era, it has become a hot topic in information management research. Previous literatures mainly focus on the strategic level of business and IT alignment and seldom consider it from the operational level. While numerous studies have explored the aligning or conflicting activities between the CIO and CEO, few investigate the BITA from the IT users' perspective. Indeed, the employees in the first lines are the ones who can understand the needs of customers and use various IT systems in their daily work. Therefore, they know the extent of the matching between business and IT at the operation level much better than managers. Therefore, our study has filled this gap.

(2) Our study has enriched the Luftman (2000)'s BITA maturity model by empirically examining the factors that affect BITA. Taking BQD as a sample, our results show that five out of six factors in Luftman's maturity model are positively related to the BITA. The IT scope and architecture are not significantly associated with the BITA, showing that from the business employees's perspective, the change of technology or system may bring about the mismatch between business and IT strategies. In addition, this study also examines the moderating effect of service quality between the BITA and working performance of employees.

(3) In this study, a novel model termed as BIPEAM is developed to explain the process of BITA from an evolutionary perspective. BIPEAM offers some new insights into the dynamic of business-IT strategic alignment, explaining why organizations need to go through revolutionary changes every few years in order to align its IT with business strategies. Once this punctuated equilibrium could not be achieved, enterprises quickly failed as turbulent changes happen. This study contributes to a better understanding of the mechanism of business-IT strategic alignment within an enterprise.

7.2.2 Practical contribution

This study may provide several practical implications to the BITA in small and medium-sized banks:

(1) IT strategy is an overall plan related to the use of IT in an organization. Our study suggests that, in general, the misalignment between business and IT strategies is a common state. Combining with the questionnaire and high-level balanced scorecard

analyses, we may find that there are many problems needed to be addressed in small and medium-sized banks. For example, even though formal and informal communication channels have been established between business and IT departments, there is no specific person in charge of very problem, rendering the feedback process inefficient. Thus, it is necessary to consider the BITA during the whole operational process, rather than only focus on one step.

(2) For many banks in China, top managers tend to invest heavily on hardware instead of software, leading to the mismatch between the IT equipment and its applications. Therefore, it is critical to assess the performance of IT from operational perspective especially in terms of employees's satisfaction. How to balance IT hardware and software investment so as to improve the efficiency of IT strategy should be considered seriously in the BITA process.

(3) For most of small banks in China, it is a severe challenge to enhance their competitive advantages through making use of new technology. In addition, according to the empirical results, service quality positively moderates the relationship between BITA and working performance. Therefore, it is necessary for IT units to pay more attention to their service quality.

(4) The unprecedented progress of the Internet technology has made the BITA catch much more attention in management research than before. For nearly two decades, the BITA has always been a hot topic for IT practitioners and top managers. Even for the small and medium-sized banks, it is still possible to utilize some advanced technologies to develop new products, which may gain competitive advantages in the market. For example, the transformation from traditional CRM to smart CRM has provided a new competitive advantage for BQD in the Shandong province.

7.3 Recommendations for BQD

Through the empirical study and theoretical analyses of BITA in BQD, this study put forward some suggestions for BQD as well as other CCBs in China as follows:

(1) The internal tedious process should be shortened to provide efficient responses to the change of customers' demand. Currently, the competition in bank industry has changed from the initial price competition to the all-round competition of technology, brand, service, business experience and products. Compared with Internet companies, the small and medium-sized banks like BQD lack competitive advantages in financial

products and services, and the customer-oriented service model is difficult to be improved under the provisions and limitations of various risk control policies. For example, there are only several payment ways such as bankcard, online banking transfer, mobile banking transfer. In addition, compared with Internet companies like Alibaba credit, the loan process of BQD is cumbersome with the long approval procedure, making it easy to miss good customers. All these are related to the internal management mode, in which each line is relatively closed, and information is isolated, making it difficult to complete the loan issuance like the Internet financial mode. In the future, the digital transformation of BQD should depend on big data mining to form an integrated managerial model and largely develop the mobile Internet business.

(2) Although BQD has used knowledge graph technology to build smart CRM system, this is only the beginning for the IT-driven alignment. There are still a lot of problems within both business departments and the IT department. The rapid integration of emerging technologies such as Internet, big data, cloud computing and traditional finance, puts forward higher requirements for the development of IT and business units. In terms of the strategic matching of technology and business, the business and IT strategies should interact with each other and work together to achieve the aligning state. Since BQD pursues outstanding IT, business strategy is behind the IT strategy. How to transfer new technology to competitive advantage has become a key issue, which needs the cooperation and innovation of business departments. At the same time, business departments need to strengthen their demand management and improve the ability of demand integration. The BITA depends heavily on the cross department and cross line cooperation. Therefore, the integration of technological innovation and business innovation is critical for building a smart bank.

(3) The human resources and software are very important for the match between business and IT strategies. Lack of technical talents and unprofessional performance evaluation of the IT department have been the important bottleneck in the development of digital and Internet banking. Under the competition of the Internet and many technology companies, the problem of talent gap in commercial banks has become increasingly prominent, especially in small and medium-sized commercial banks. Due to the lack of talents in Fintech, BQD has made a relatively slow progress on the road of transformation. Although many digital products have been developed successfully, compared with the Internet companies like Alibaba and Tencent, large-scale joint-stock commercial banks and some urban commercial banks represented by Bank of

Nanjing and Bank of Ningbo, BQD still lags to a large extent. In addition, the traditional cost-benefit assessment system also lacks incentives for relevant departments and personnel to promote digital inclusive Finance, which is not conducive to talent training and reserve. Therefore, BQD should increase the training and introduction of digital talents and establish incentive mechanism to attract and retain talents. For some core technology, BQD may strengthen independent R&D capability and build an agile team to maintain continuous innovation.

(4) During the business-IT aligning process, it is necessary to increase information security risk management and supervision. Recently, the losses of funds have caused a great impact on the society, and with the increasing requirements of the regulatory authorities, the banking managers must put the risk in the most important position when handling businesses. Even for the Internet bank and, most of the traditional risks still exist. The risks that would have occurred offline will also occur online. For example, with the development of various commercial banks' online loan products, customers can complete the loan process only through the Internet. In this way, although the procedure of customers can be greatly shortened, the credit risk is also increased due to the asymmetric information from non-face-to-face contact. Secondly, for the Internet banks, there exists a unique risk from network security. Compared with internet financial enterprises, the CCBs have no advantage in IT. Therefore, in the process of digital transformation, the CCBs like BQD must carry out higher-level security measures such as data classification, encryption, and access authority control.

7.4 Limitations and further research

Although the BITA is very important and numerous literatures have explored it from various perspectives, few researches discuss the match between business and IT strategies from operational level. This dissertation employed BQD as sample to study the factors influencing the BITA empirically, filling the gap in terms of employee perspective as well as the BITA in Chinese banking industry. However, there are still some limitations that need to be improved in the future.

First, the cross-section data are used in this study to examine the antecedent of BITA and its impact on working performance, which may only represent the present situation. In the future, longitudinal data should be collected to further explore the complicated aligning process empirically. Time series analysis can provide a deeper understanding of BITA within an

organization.

Secondly, this study only investigates BQD, a typical CCBs in China. However, there are totally 132 CCBs in China, distributed to almost every province. Some provinces even have two or more commercial banks. In future research, the proposed theoretical framework in this study should be examined by more small and medium-sized banks to verify our results and enrich the BITA theory and practice.

Thirdly, in this thesis, we only use BSC to analyse the implementation of IT strategy in BQD. Indeed, the full extent of the BSC with strategy maps, objectives, indicators, and targets can be employed to quantify the BITA. Thus, the high-level use of the Balanced Scorecard approach can be regarded as a future direction in BITA research.

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Appendix 1: Questionnaire for Business-IT Alignment in BQD

Thank you very much for your participation in this survey! All information is anonymous and will be strictly confidential for academic research only.

Please select the number that matches you according to the following description. You can tick " √ " after the number, or change the color of the number to “4”, or make the high display to “3” .

In this questionnaire, “1” represents “Completely Disagree”; 2-“Disagree”; 3-“Hard to Say”; 4-“Agree”; and 5-“Completely Agree”.

PART I: Personal Information

(1) Gender:Male ( ); Female ( )

(2) Age:20-29( ); 30-39 ( );40-49 ( );50-59 ( )

(3) Duration in BQD: _____ years

(4) Department:(1)Headquarter _____department;Or (2)Branch _____department

PART II: Strategic Alignment Maturity (SAM)

1	**COMMUNICATIONS**	**1(Completely Disagree) 2(Disagree) 3(Hard to Say) 4(Agree) 5(Completely Agree)**
11	My requirements can be answered by the IT Department.	1 2 3 4 5
12	Our bank has a special meeting to organize us to discuss the future strategy formulation with the IT Department.	1 2 3 4 5
13	I can easily consult IT problem through the company’s internal office system or telephone (4066).	1 2 3 4 5
14	I think the communication between our department and IT unit is good.	1 2 3 4 5
15	The IT Department will actively ask for our opinions on the existing IT system.	1 2 3 4 5
2	**COMPETENCY/VALUE**	

21	IT level will affect my goal setting.	1 2 3 4 5
22	We often assess the value of IT from technical perspective (e.g. System availability, response time).	1 2 3 4 5
23	My work goal often needs new IT technical support.	1 2 3 4 5
3	**GOVERANCE**	
31	The IT Department will participate in work objectives of my department.	1 2 3 4 5
32	The application IT reduce the cost and increase the efficiency of my work.	1 2 3 4 5
33	I think the current IT software and technology are enough to support my daily work.	1 2 3 4 5
34	IT system will continue to improve according to our requirements.	1 2 3 4 5
4	**PARTNERSHIP**	
41	For most of time, IT equipment in our bank can support my work.	1 2 3 4 5
42	I Think the system provided by the IT Department is first-class.	1 2 3 4 5
43	IT is used to enable our business strategy.	1 2 3 4 5
44	IT also takes some risks.	1 2 3 4 5
5	**SCOPE & ARCHITECTURE**	
51	The business system and office software I use now are relatively convenient.	1 2 3 4 5
52	The existing business system or office software can be upgraded easily according to our needs.	1 2 3 4 5
53	Our IT system can fast respond to the changes of customer demand.	1 2 3 4 5
6	**SKILLS**	
61	My innovative ideas can be said boldly without worrying about the consequences.	1 2 3 4 5

62	I need to spend more energy and time learning new software.	1 2 3 4 5
63	The IT Department will help me learn new system or software in proper way.	1 2 3 4 5
64	The IT Department provide some technical training for us.	1 2 3 4 5

PART III: Business-IT Alignment and Performance

7	**Business-IT Alignment**	**1(Completely Disagree) 2(Disagree) 3(Hard to Say) 4(Agree) 5(Completely Agree)**
71	The business strategy and IT strategy of my department match well.	1 2 3 4 5
72	The improvement of my work performance is closely related to the progress of IT technology.	1 2 3 4 5
73	The IT Department participated in the process of strategic development of my department.	1 2 3 4 5
74	The IT Department provides the comprehensive support needed in the implementation of the strategy of my department.	1 2 3 4 5
75	In the process of performance evaluation of my department, IT technology will be used for more comprehensive and in-depth data analysis.	1 2 3 4 5
76	My department will make new strategic plans or goals based on new IT technologies.	1 2 3 4 5
8	**PERFORMANCE**	
81	My department is satisfied with my work.	1 2 3 4 5
82	I will take the initiative to learn new technology to improve my ability.	1 2 3 4 5
83	I'm able to accomplish my work objectives and tasks with high quality.	1 2 3 4 5
84	I am satisfied with the current business and workflow.	1 2 3 4 5
85	Compared with the industry, I think our bank is leading in the application	1 2 3 4 5

	of IT technology at present.	
9	**IT SERVICE QUALITY**	
91	I think the service attitude of the IT Department in dealing with problems is good	1 2 3 4 5
92	I think the IT service desk (4066) can meet my needs in terms of processing time and solutions	1 2 3 4 5
93	The any problem on IT terminal equipment can be repaired quickly	1 2 3 4 5
94	I am satisfied with the processing efficiency of existing business system faults	1 2 3 4 5
95	The IT Department often collects our opinions and suggestions	1 2 3 4 5

PART IV: Please answer the following questions

1. What do you think are the main problems in IT strategy, technology, system, software and management of the bank?

2. How to coordinate IT and business strategy better in BQD?

3. What are the main problems of IT in meeting your daily work needs?