THE PERFORMANCE IMPACT OF OPERATIONAL IMPROVEMENT COMPETENCE IN SERVICE OPERATIONS

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The Performance Impact of Operational Improvement Competence in Service Operations

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Certificate of Originality

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Abstract

This research employs two perspectives (i.e. continuous process improvement perspective and frontline employee perspective) to develop a new approach, operational improvement competence (OIC), and explores new, useful, empirically-based insights into the effectiveness of OIC in improving operational, service recovery and new service development performance. OIC is conceptualized as an operational team's ability to use a process perspective and structured methods to continuously improve operational activities and comprises three operational practices 1) continuous improvement; 2) process management; and 3) structured methods. However, the operational environment of service firms is often more dynamic and challenging than that of manufacturing firms so that the effectiveness of OIC in service operations may be affected by certain characteristics concerning service processes, employee characteristics and contextual factors. To offer useful insights into the challenges of OIC adoption in service operations, we conduct three empirical studies as follows:

Study 1, guided by the operations management (OM) literature and agency theory, proposes that the effectiveness of OIC in operational performance in service operations is contingent on two factors, namely operations control and process control formality. Specifically, we theorize that operations control enhances the effectiveness of OIC by suppressing frontline service employees' discretion in service processes and guiding them to follow proper procedures to perform OIC activities. In addition, when there are high levels of ethical risks, operations control will become particularly important.

Study 2 examines the impact of OIC on new service development (NSD) performance. Since creative ideas are crucial to NSD and it is common that service firms involve frontline employees in the process of NSD, we argue that frontline employees' creativity enhances NSD performance. In addition, since OIC pertains to making changes and solving problems regularly, we argue that OIC has a positive impact on employee creativity. Furthermore, we draw on the contingency theory to argue that the relationships between OIC, employee creativity, and NSD performance are contingent on team's characteristics and contextual environment.

Study 3 argues that OIC leads to improved service recovery performance. However, the effectiveness of OIC in enhancing service recovery performance can be hindered by one common problem in service employees, namely stress. We draw on the role stress theory and the conservation of resources theory to argue that the negative impact of stress can be alleviated by job resources, including organization inducement and psychological resilience. Thus, we propose that frontline employees' stress and two types of job resources (i.e. organization inducement and psychological resilience) can moderate the effectiveness of OIC in improving service recovery performance.

Based on data from 146 frontline teams in the banking industry of China, we empirically test the posited hypotheses of these three studies. The main contribution of this research lies in its consideration on the job characteristics of frontline service employees and use of several relevant theories to ascertain the intricacies between OIC and performance outcomes with respect to operational performance, service recovery performance and NSD performance.

Publications arising from the thesis

Yang, Y., Lee, P.K.C., Cheng, T.C.E. "Operational improvement competence and service recovery performance: The moderating effects of role stress and job resources," published by *International Journal of Production Economics.*

Yang, Y., Lee, P.K.C., Cheng, T.C.E. "Continuous improvement competence, employee creativity and new service development performance: A frontline employee perspective," *International Journal of Production Economics* in press.

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List of Abbreviations

AVE	Average Variance Extracted
CE	Communication Effectiveness
CFA	Confirmatory Factor Analysis
CI	Continuous Improvement
CR	Composite Reliability
ECE	Employee Creative Efficacy
ER	Ethical Risks
ICC	Intra-class Correlation Coefficient
LE	Leader effectiveness
NPD	New Product Development
NSD	New Service Development
NSDP	New Service Development Performance
OIC	Operational Improvement Competence
OM	Operations Management
OP	Operational Performance
PCF	Process Control Formality
PM	Process Management
PRE	Prior Related Experience
RBV	The resource-based view
RC	Risk Control

SC	Service Complexity
SM	Service Marketability
SMs	Structured Methods
SN	Service Newness
SOM	Service Operations Management

Chapter 1 Introduction

We first discuss the research background on the increasing importance of service operations management (SOM) and the extant research on SOM. From the theoretical and practical points of view, we identify three main performance issues, namely operational performance, new service development and service recovery, which need to be enhanced by using new insights into the SOM literature. Next, we discuss the development of a new approach, namely operational improvement competence (OIC), by employing two relevant perspectives, which are the continuous process improvement perspective and frontline employee perspective. We also argue that OIC has a positive influence on operational performance, new service development and service recovery. Finally, we explain the motivation of this research, develop three research questions which this research will answer and present the structure of this dissertation.

1.1 Research background

1.1.1 The increasing importance of service operations

The service sector plays an increasingly important role in a nation's gross domestic product (GDP) and employment and sustains its competitiveness in globalized economy (Heineke and Davis, 2007; Machuca et al., 2007). For example, in the USA, the service industry accounts for 70% of its GDP and more than 75% of its occupations (U.S. Bureau of Economic Analysis 2009). Also, the economic orientations of most countries also gradually have shifted from manufacturing to service (Machuca et al.,

2007). Some traditional manufacturers (e.g. IBM and other tech giants) even transform their goods-oriented view to service-oriented view and spearhead a movement known as "service science" (Huang and Rust, 2013). However, studies relevant to service operational management (SOM) are still relatively few in the OM literature. Among the limited SOM studies, the number of those using empirical methods is fewer than even half of those using models and simulations (Smith et al., 2007; Heineke and Davis, 2007; Machuca et al., 2007; Chase and Apte, 2007; Barratt et al., 2011). Also, abundant evidence indicates that the performance outcomes (e.g. operational performance and service recovery performance) of operations in service settings are still very poor (Nembhard and Tucker, 2011). For example, the National Quality Research Center (2009)'s report indicates that the American Customer Satisfaction Index fluctuates below 79%. Thus, the increasing importance of the service sector in the real world and the inadequate attention paid by OM scholars to SOM make SOM a fertile field. Consequently, new insights and knowledge are needed to supplement the current SOM literature in order to enhance the performance of firms in the service sector.

1.1.2 Three main performance issues of service operations

The current studies relevant to SOM mainly focus on strategic issues associated with structural choices (e.g. technology, capacity planning and service-process interfaces), infrastructure choices (e.g. people, policies, practices and processes) and integration choices (e.g. integration and learning mechanisms) and on tactical issues associated with execution, assessment and renewal of service delivery processes (Roth and Menor, 2003; Voss, 2005; Machuca et al., 2007; Heineke and Davis, 2007; Chen et al., 2009; Barratt et al., 2011; Ponsignon et al., 2011; Calabrese, 2012). Also, the

performance outcomes relevant to these issues are mainly concerned with operating cost, delivery effectiveness and efficiency, operational productivity, service and delivery innovation, and customer satisfaction and retention (Roth and Jackson III, 1995; Menor et al., 2002; Roth and Menor, 2003). According to Roth and Menor's (2003) organizing framework for SOM, the performance outcomes of service strategies and delivery tactics include execution-based competitive capability, renewal-based competitive capability and customer perceived service value. Specifically, execution-based competitive capability refers to a firm's ability to offer efficient and flexible service delivery to increase organization productivity. According to the OM literature, such competitive capability can be reflected by operational performance, which refers to the efficiency, flexibility and productivity of operational processes (Williams, 1991; Tsikriktsis, 2007; Peng et al., 2008). Renewal-based competitive capability refers to a firm's ability to renew service processes and concepts (Roth and Menor, 2003). Such competitive capability can be reflected by new service development (NSD) performance, which is defined as innovations in new services or service procedures that achieve efficient operations and superior performance (Agarwal et al., 2003). Customer perceived value refers to the degree of consistence between customers' expectation and realized service delivery and its main determinants are service quality, product quality and service experience (Rust et al., 2000; Roth and Menor, 2003; Helkkula and Kelleher, 2010; Yu and Fang, 2010). In the SOM literature, service experience has become one critical important factor in customer perceived value and failed service experience often causes significant damage in customer perceived value (Keaveney, 1995, Rust et al., 2000; Miller et al., 2000; Buttle and Burton, 2002; Song et al., 2013). Service recovery

is recognized as an effective approach that recovers and improves customer perceived value by adjusting the discrepancy between customer expectations and realized service delivery (Spreng et al., 1995; Jong and De Ruyter, 2004). Thus, service recovery performance partly reflects the extent to which a service firm can recover and improve customer perceived value. Consequently, we identify operational performance, NSD performance and service recovery performance as critical performance issues for operations of service firms.

However, our review of the relevant literature suggests that the current SOM literature does not offer sufficient insights into how service firms manage and improve their operational performance, NSD performance and service recovery performance effectively. Firstly, the studies on the operational performance of banks in Asia indicate that operating costs are very high among banks in developing countries in Asia, and the average efficiency of many banks in south Asia is in a downtrend (Kawn, 2003; Perera et al., 2007; Das et al., 2009). Also, a recent study benchmarking the operational performance of 51,000 branches from 12 leading retail banks across the world suggests that only 30% of the branches examined can achieve operational process effectiveness and efficiency (The Boston Consulting Group, 2011). In addition, the OM literature suggests that due to some peculiar characteristics among service firms, there is a paucity of insights into how improvement and structural practices (e.g. continuous improvement) can enhance service operational performance (Hill and Brown, 2007). All of this evidence suggests that there is ample room for service firms to improve operational performance. Secondly, new service development (NSD) in service settings often leads to small changes in service concepts and service procedures, making imitation easy for

competitors (De Jong and Vermeulen, 2003). Also, the report of Business Week (2005) shows that the success rate of service innovation in financial institutes is very low, hovering at around 3%. In addition, in the literature on service management and innovation, NSD remains one of the least explored research topics (De Jong et al., 2005, Drejer, 2004; Menor and Roth, 2007). The evidence indicates that the SOM literature is in need of new knowledge and insights on NSD. Finally, the investigations by Goodman (1999) and Economist (2000) indicate that there has been a drastic increase in the proportion of customers with failed service experiences. More recently, Gross et al.'s (2007) survey and the 2013 US National Customer Rage survey (Grainer et al., 2013) suggest that the current knowledge of service recovery is not adequate enough to help service firms to solve service failure problems effectively. In addition, Miller et al. (2000) assert that the extant works pay limited attention to the application of OM concepts for enhancement of service recovery performance. The evidence suggests that new insights are needed to supplement the current knowledge of service recovery.

Our review here indicates that the current knowledge of managing service operation performance, new service development performance and service recovery performance is still limited and needs to be supplemented. Indeed, it is consistent with Roth and Mentor's (2003) proposition that there are specific and urgent issues in the literature on SOM, including processes to achieve superior service quality and ways to sustain competitive innovation advantage and ways to address service failures. Thus, in this study, we aim at exploring new insights into how to enhance operational performance, new service development performance and service recovery performance for the operations of service firms.

1.1.3 Continuous process improvement perspective and frontline employee perspective

In the research we identify continuous process improvement perspective and frontline employee perspective as two relevant perspectives to examine three performance issues identified. Continuous process improvement is a relevant perspective because, firstly, service firms rely on effective and efficient routine service processes to achieve such benefits as cost, quality, flexibility and delivery time which are integral elements of operational performance, and continuously improving service routines and processes is a common approach service firms use to improve operational performance (Deming, 1986; Samson and Terziovski, 1999; Devaraj et al., 2007). According to the OM literature, continuous improvement is well recognized as a major factor in the operational success of many Japanese firms (Choi and Liker, 1995). Thus, continuous process improvement is highly related to service operational performance. Secondly, continuous process improvement emphasizes knowledge integration and adaptive learning which promote employees' creative thinking, and help them identify opportunities and develop new ideas (Montgomery and Woodall, 2008; Hoerl and Gardner, 2010), thereby enhancing the performance of NSD. For example, Singapore Airlines recognizes continuous process improvement as an important basis for creating innovative ideas in order to achieve excellence and low-cost services (Heracleous et al., 2004; Lovelock and Wirtz, 2007). Finally, continuous process improvement is relevant to service recovery performance because the relevant literature suggests that service recovery should be considered an important process in service operations (Miller et al., 2000), and that many process improvement techniques (e.g. sequence-orientated problem identification, fishbone diagram, and frequency-relevancy analysis of

complaints) are effective in service failure investigation (Botschen et al., 1996; Stauss and Weinlich, 1997; Stauss and Seidel, 2005; Michel et al., 2009). Thus, the continuous process improvement perspective is useful and relevant in examining issues about operational performance, NSD performance and recovery performance of service operations.

Another important perspective is frontline employees. Roth and Mentor (2003) emphasize that service encounters as a core position influence target markets, service concepts and service delivery systems, which implies that service providers (i.e. frontline employees) should determine whether service firms can effectively and efficiently deliver their right service/ products to right customers. Bowen and Ford (2002) identify frontline employees as critical resources influencing the role of service encounters, and identify managing such employees as one of the major challenges for the effective management of service firms. Furthermore, such firms' frontline employee perspective is highly relevant to service operations, service recovery and NSD. Specifically, firstly, compared with operational processes in manufacturing firms, service firms involve higher levels of customer contact, service customization and process uncertainty (Bowen and Schneider, 1988; Bowen and Ford, 2002; Safizadeh et al., 2003). Such characteristics imply that frontline service employees play an important role in the whole service delivery process and need to form an intellectually skillful workforce with a certain level of discretion and autonomy to meet different service customization requirements and cope with uncertain processes. Secondly, it is common that frontline service employees participate in NSD processes (Coelho and Augusto, 2010; Lages and Piercy, 2012). The recent literature on service innovation suggests that

innovation in NSD partly hinges on the contributions of frontline employees/teams because such members often possess specific and unique insights into the actions of service procedures and changes in customer needs (Nijssen et al., 2006; Kindström and Kowalkowsk, 2009). Most of service firms (e.g. banks, airlines) increasingly use service delivery teams to undertake NSD programs, including service processes and product innovation (Heracleous et al., 2004; Lovelock and Wirtz, 2007; Lee et al., 2013). Thirdly, frontline service employees participate in service recovery processes (Liao, 2007; Tax and Brown, 2012). Indeed, abundant evidence indicates that frontline service employees not only work with customers to create customized services, but also cope with customer complaints and recover from service failures (Wageman, 1997; Batt, 1999; Yavas et al,, 2003; Jong and De Ruyter, 2004; Lee et al., 2013). Also, when service failures occur, such employees have to participate in challenging duties, including identifying reasons for failure, determining solutions and soothing customers' emotions (Jong and De Ruyter, 2004; Smith et al., 2010). Thus, the frontline employee perspective is also important and relevant to the operational performance, NSD performance and service recovery performance of service operations.

In the service and management literature, the studies relevant to frontline employees mainly involve empowerment and recognition of service employee, employee characteristics, information sharing among service employees and role stress of service employees (Burr and Cordery, 2001; Deeter-Schmelz and Ramsey, 2003; De Jong et al., 2005; Chen et al., 2007; Coelho et al., 2011; Foster, 2013). In the field of OM, some studies propose that service employees/teams as infrastructure of service delivery are crucial to building the flexibility of service systems and achieving

operational excellence (Malhotra and Ritzman, 1994; Roth and Mentor, 2003) and these employees possess hands-on knowledge of diverse customer needs and service processes (Choo et al., 2007). Nonetheless, studies using both the process improvement perspective and employee perspective to explore the implications of service operations are relatively few. To fill this gap, this research employs these two perspectives to identify new insights into how service firms enhance their operational performance (i.e. efficient and effective delivery), new service development performance (i.e. service innovation and service process innovation) and service recovery performance (i.e. addressing service failures and customer complaints effectively).

1.1.4 Operational improvement competence

The literature on continuous process improvement has offered many useful insights into the wide range of relevant practices (e.g. structured methods, continuous improvement attitude) (Choo et al., 2007; Peng et al., 2008; Anand et al., 2009). In this study, we recognize that the effectiveness of these relevant practices is dependent on frontline service employees' participation because such employees possess hands-on knowledge of diverse customer needs and service processes, and that relevant activities (e.g. investigation into increasing customer complaints) are carried out through work-teams formed by operational employees (Choo et al., 2007). Based on the continuous process improvement perspective and frontline employee perspective, we conceptualize operational improvement competence (OIC) as an operational team's ability to use a process perspective and structured methods to continuously improve operational activities. According to the relevant literature, process improvement practices can lead to benefits including reduced operational cost and lead-time (Anand et al., 2009),

knowledge sharing, effective root-cause analysis (Taylor and Wright, 2006), and enhanced capability of making changes (Peng et al., 2008; Anand et al., 2009). It can be inferred from these benefits that OIC can help service teams to improve the efficiency of operational routines, enhance their capabilities of making service changes, identify the root causes of service failures, and encourage members to improve service recovery processes. Consequently, we argue that OIC can effectively enhance operational performance, NSD performance and service recovery of service operations.

1.2 Motivation of this research

Considerable OM research has been devoted to studying the concepts relating to continuous process improvement. For instance, Choi and Liker (1995) explore the relationship between process-oriented values and continuous improvement effectiveness. Ittner and Larcker (1997) establish the association between process improvement techniques and firm profits. Bateman and Rich (2003) and Bateman (2005) identify the inhibitors and enablers that influence the effectiveness of continuous process improvement practices. However, Hill and Brown (2007) recognize that there are some peculiar characteristics among service firms and lament the paucity of insights into continuous process improvement for enhancing service operations. Also, in the field of OM, few studies have adopted the frontline employee perspective to explore the implications of service operations. Thus, this study employs the continuous process improvement perspective and frontline employee perspective to identify new insights into service operations and defines operational improvement competence (OIC) by combining these two perspectives, which extends this body of knowledge by examining the effectiveness of OIC in service operations.

Firstly, we consider service firms have a distinct operational environment whose peculiar characteristics pose challenges to the effectiveness of OIC on operational performance. The characteristics of high-level customer contact, service customization and process uncertainty imply that frontline service employees play an important role in operational processes and need to form an intellectually skillful workforce that can have a certain level of discretion and autonomy to meet service customization and cope with process uncertainty, which creates a risk that their behaviour may deviate from the firm's expectations when there are conflicting goals between frontline employees and their firms. Specifically, OM managers are responsible for achieving operational excellence by pursuing OIC, whereas frontline employees tend to be more concerned with some important elements of an employee reward system (e.g. sales performance). With goal conflict and improvement behavior immeasurability, frontline employees consider sales performance as their top priority and pay less attention to OIC in service process improvement, leading to a reduction in OIC's effectiveness in improving operational performance. Thus, we need to be aware of such risk and consider effective mechanisms to cope with it.

Secondly, we find that the extant studies of NSD rarely use a frontline employee perspective to examine how NSD performance can be enhanced, while from theoretical and practical points of view, scholars and practitioners have long recognized that frontline employees can provide valuable contributions to new service development (Nijssen et al., 2006; Lovelock and Wirtz 2007; Kindström and Kowalkowsk, 2009). When frontline employees can positively develop OIC to achieve knowledge integration into improvement and generate creative ideas, their creativity may be improved. Also,

through applying their creativity to service procedures and coping with customer needs, they can help achieve innovation in NSD, leading to overall superior NSD performance. The practice of developing OIC and creativity in frontline teams is a novel attempt for many service firms, so it is unlikely to be universally effective in all service settings. Thus, we need to examine whether there are links among OIC, creative efficacy and NSD and further consider the circumstance under which frontline teams' OIC and creativity are particularly important.

Finally, service recovery may be improved by adopting the continuous process improvement perspective and frontline employee perspective, because the relevant literature suggests that service recovery should be considered an important process in service operations (Miller et al., 2000) and often rely on their employees to create services, improve service processes, and recover from service failures (Wageman, 1997; Batt, 1999; Yavas et al,, 2003; Jong and De Ruyter, 2004; Lee et al., 2013). Nonetheless, studies using either a continuous process improvement perspective or an employee perspective to explore service recovery are virtually unavailable in the literature. To fill this gap, this study employs these two perspectives to identify new insights for improving service recovery performance. When using an employee perspective to examine the impacts of OIC on improving service recoveries, we find that OIC's effectiveness can be impeded by one peculiar problem in service operations – employee role stress. Frontline service employees' efforts to use OIC to improve service recoveries are workloads on top of their routine service processes. In order to undertake such extra workloads (i.e. improvement efforts) effectively, frontline service employees must possess adequate levels of job accomplishment and organizational commitment.

However, the literature on role stress indicates that employees with high levels of stress tend to have a reduced sense of job accomplishment and organizational commitment (Goolsby, 1992; Nordenmark, 2004). Thus, we need to consider whether employee role stress can be a significant factor in impeding the effectiveness of OIC in improving service recovery performance and how to address its potential negative impact on OIC.

1.3 Research questions

Our discussions about operational performance in service sectors mainly include 1) ample room to enhance operational performance in service settings; 2) the paucity of insights into the continuous process improvement perspective and frontline employee perspective to improve service operations; and 3) the necessity of operations control for enhancing the effectiveness of OIC on operational performance. This conclusion leads to the first set of research questions in the thesis:

Q1: Can OIC improve operational performance in service settings? How does operations control affect the effectiveness of OIC on operational performance? Under what circumstance is the moderating effect of operations control particularly significant on OIC's effectiveness?

The above discussions relevant to NSD mainly include 1) rarely using frontline employee perspective to examine how NSD performance can be enhanced; 2) having links among employee creativity, OIC and NSD performance; and 3) the effectiveness of a management practice contingent upon the contextual environment of the organization concerned (Tosi and Slocum, 1984). Based on this conclusion, we propose the second set of research questions in the thesis:

Q2: Can OIC enhance frontline employees' creativity? Can frontline employees' creative efficacy enhance NSD performance? Under what circumstances are frontline teams' OIC and creativity particularly effective?

The above discussions relevant to service recovery mainly include 1) inadequate knowledge of service recovery for solving service failure problems effectively (Gross et al., 2007; Grainer et al., 2013); 2) recovery process improvement as an new approach to the enhancement of recovery performance; 3) the impact of employee role stress on the effectiveness of OIC in improving service recovery performance; and 4) addressing its potential negative impact on OIC by using the conservation of resource theory. According to this conclusion, we propose the third set of research questions in the thesis:

Q3: Can OIC improve service recovery performance? Can employee role stress be a significant factor in impeding the effectiveness of OIC in improving service recovery performance? If yes, how do service firms address its potential negative impact on OIC?

The three sets of research questions fall into Studies 1, 2 and 3. We posit their hypotheses respectively (see Figures 4-1, 5-1 and 6-1) in Chapters 4, 5 and 6 based on the research questions and select 146 frontline teams from the banking industry. Then we use statistical methods such as confirmatory factor analysis and hierarchical regression analysis to verify the hypotheses. The main objective of this study lies in its use of the two pertinent perspectives (i.e. process improvement and employee perspectives) to develop and empirically test theoretical models including the interactions among the abilities in process improvement, operations control, role stress, job resources, contextual factors and main performance outcomes. Our findings provide

not only new insights for the current relevant literature, but also managerial guidelines for practitioners to enhance the main performance outcomes of service operations.

Specifically, the main theoretical contributions of the research include 1) the use of two perspectives (i.e. process improvement and frontline employee perspectives) to develop operational improvement competence (OIC) and explore new, useful, empirically-based insights into the effectiveness of OIC in improving operational, service recovery and new service development performance; 2) the consideration of the peculiar characteristics of the service operational environment and frontline employees, such as ethical risk and employee role stress as moderating factors in the effectiveness of OIC, 3) the application of the agency theory to potential agency problems in service operations and enhancement of OIC's effectiveness in improving operational processes; 4) the application of the RBV theory to micro-level concepts of employees' capabilities (i.e. employees' OIC and creativity) and the link contingency theory to find out under which circumstance OIC can enhance service firms' new service development performance; and 5) the added empirical evidence to the literature on the role stress theory and conservation of resources theory.

The managerial implications of the research include several aspects. Specifically, 1) service firms need to be aware of the strategic importance of continuous improvement competence in service operations, service recovery and service innovation; 2) OM managers or frontline team leaders in service firms should understand that they manage a knowledgeable and skilled workforce that provides an important intellectual asset for their firms; 3) Managers should have operations control in place to supplement OIC relevant activities in operational processes and take steps to assess the threat of ethical

problems of their frontline employees when considering what form of control mechanisms can effectively curb the unethical behaviours of frontline employees and prod them into carrying out their duties in service processes and OIC; 4) Managers should pay more attention to contextual factors in teams and services to enhance the effectiveness of OIC on NSD performance; 5) Managers need to realize the negative impacts of role stress (i.e. role ambiguity, role overload and role conflict) on the use of OIC in service recovery processes and the importance of sufficient job resources in impelling OIC teams to carry out their OIC duties and weakening the adverse impact of role stress.

1.4 Structure of the dissertation

This dissertation includes seven chapters. In the first chapter, we discuss the research background, motivation of study, research questions, structure of the thesis built on the extant research and some surveys of the practical field. In Chapter 2, to further answer the questions, we examine the comprehensive literature relevant to frontline service employees, operational improvement competence and other relevant theories and the literature sources of the three studies, including the continuous improvement practices and operational performance, agency theory and ethical risk, new service development and creative efficacy, resource-based view theory, contingency theory, service recovery performance, role stress theory and conservation of resource theory. The review offers us theoretical foundations to develop the research models and hypotheses of our study. Chapter 3 describes the research methodology used, including research settings, samples, data collection procedures, survey instrument development and statistical tests. Chapter 4 examines in detail Study 1- the impact of

OIC on the operational performance in service settings. We introduce the research background in detail and posit the hypotheses of Study 1. Using hierarchical regression analysis, we analyze the relationships between OIC, operations control, ethical risk and operational performance, interpret the data results and present the theoretical and managerial implications of Study 1. In Chapter 5, we explore Study 2 and the relationship between OIC, frontline employee creativity, NSD performance and contextual factors. Using hierarchical regression analysis, we explore OIC and frontline employee creativity as factors indirectly or directly leading to improved NSD performance in service operations, and whether the impact of OIC on team creative efficacy and of team creative efficacy on NSD performance should be contingent on certain relevant contextual factors, discuss the data results and conclude the theoretical and managerial implications of Study 2. Chapter 6 further investigates Study 3 and the effectiveness of OIC on the service recovery performance in service sectors. We present the research background in detail and posit the hypotheses of Study 3. We use hierarchical regression analysis to analyze the relationships between OIC, employee role stress, job resources and service recovery performance, interpret the data results and present the theoretical and managerial implications of Study 3. The last chapter presents the theoretical and managerial implications of the study, limitations and future directions.

Chapter 2 Literature review

We review the current relevant knowledge of the three research questions identified in Chapter 1. First, we review the studies relevant to frontline employees regarding their characteristics, relevant general strategic guidelines and their important role in service operations. Second, we discuss the studies relevant to capability and continuous improvement and conceptualize a new approach, namely operational improvement competence (OIC). Lastly, we review important theories and the relevant literature to develop and offer theoretical support to the hypotheses of the three studies of this research.

2.1 Frontline service employee

In the literature on service operations management, one common theme among these recent studies is the management of service employees. It can be inferred from the distinct characteristics of service operations (e.g. high levels of customer contact, customized service, uncertain service processes, co-production with customers, and immeasurable outcomes) (Bowen and Schneider, 1988; Bowen and Ford, 2002; Safizadeh et al., 2003) that service employees' dynamic competence can play an important role in coping with uncertain processes and offering customized service and that such employees can have a certain level of discretion and autonomy to determine how to serve customers more efficiently and effectively. Indeed, in practice, most of service firms (e.g. banks, airlines) rely on frontline employees to create service, improve service processes and recover from service problems (Wageman, 1997; Batt, 1999;

Yavas et.al, 2003; Jong and De Ruyter, 2004; Lee et al., 2013). Also, these employees possess hands-on knowledge of diverse customer needs and service processes, and relevant activities (e.g. investigation into the increasing number of customer complaints) are carried out through service teams formed by operational employees (Choo et al., 2007). Thus, in our research, frontline service teams refer to high-contact service teams of which members need to work with customers to create customized services and to participate in activities relating to service recovery, development or improvement (e.g. Yee et al., 2008; 2013).

Current studies relevant to the frontline employee perspective mainly involve the empowerment and recognition of service employees, group/employee potency of service teams, frontline team effectiveness, team characteristics (e.g. team design and experience), information sharing among service team members, role stress of service employees and service team leadership (Burr and Cordery, 2001; Deeter-Schmelz and Ramsey, 2003; De Jong et al., 2005; Chen et al., 2007; Coelho et al., 2011; Foster, 2013). The best part of the relevant literature focuses on the characteristics of service employees and the general strategic guidelines for frontline employees. There is an apparent lack of in-depth study on how to manage frontline employees in operational processes. Furthermore, the SOM literature on customer-contact suggests that customers' participation in service creation processes can bring more challenges to frontline employee such as coping with uncertain customer demands and conflicting goals (Chase, 1981; Bowen and Ford, 2002; Yee et al., 2008), highlighting the need for extra attention and insights into practices to help frontline employees to cope with such challenges in service operations. In addition, studies on operational excellence and NSD performance

propose that service employees/teams as infrastructure of service processes are crucial to building the flexibility of service systems and achieving operational excellence (Malhotra and Ritzman, 1994; Roth and Mentor, 2003) and also demonstrate that most service firms (e.g. banks, airlines) increasingly use service delivery teams to undertake NSD programs including service processes and product innovation (Heracleous et al., 2004; Lovelock and Wirtz 2007; Lee et al., 2013). Also, studies of service recovery also demonstrate that the effectiveness of managerial practices partly hinges on the engagement of frontline employees (Wageman, 1997; Batt, 1999; Yavas et.al, 2003; Jong and De Ruyter, 2004; Lee et al., 2013). Thus, all this knowledge highlights the frontline employee perspective as an important factor in service operations.

2.2 Operational improvement competence

In the management literature, the studies relevant to capability/competence mainly focus on organizational capabilities defined as firms' collective skills, abilities, and expertise (Ulrich and Smallwood, 2004), involving some relevant interactions among organization capabilities, knowledge sharing and organizational performance (Lee, 2001; Chang et al., 2012) and the development of strategies relevant to organizational capabilities (Argyres, 2011). Schreyögg and Kliesch-Eberl (2007) also examine different conceptualizations of capabilities and summarize that such capabilities should exhibit three characteristics: Firstly, capabilities refer to the ability to solve complex tasks. Secondly, they represent not only knowledge and skills, but also practices that can lead to success. Finally, the related problem-solving processes or practices have to be reliable over time and effective across various situations. In the OM literature, the concept of capabilities is considered highly relevant to improvement

practices by a number of researchers. The review of Peng et al. (2008) of OM studies pertinent to capabilities suggests that, while those relevant studies are concerned with various forms of OM capabilities (e.g. cumulative capabilities, core manufacturing capabilities, dynamic manufacturing capabilities, production competence), they mainly investigate how operational strengths (e.g. flexibility performance) contribute to the accomplishment of corporate-level goals. Peng et al. (2008) further argue that routines relating to improvement and innovation are sources of capabilities in operational environments. Setia and Patel (2013) employ the perspective of knowledge management to contend that capabilities in operations should involve using absorptive capacity to adapt to environmental changes. Anand et al. (2009) propose that firms can apply continuous improvement practices (e.g. training, and information technology support) to develop dynamic capabilities in operations. According to these management and OM studies, capabilities are closely relevant to structured methods (e.g. problem-solving) and process perspectives (e.g. process improvement) and are reliable over time and effective across various situations. Furthermore, these relevant practices and methods (e.g., process improvement) are carried out through work-teams formed by operational employees (Choo et al., 2007). Thus, in our study, we adopt the frontline employee perspective and continuous process improvement perspective to conceptualize operational improvement competence (OIC) as frontline teams' ability to use a process perspective and a structured method to continuously improve operational activities. This conceptualization is consistent with the concepts regarding the importance of process improvement, structured methods, adaptation to environmental changes and characteristics of capability in OM and management literature (Ritchie and Dale, 2000;

Schreyögg and Kliesch-Eberl, 2007; Peng et al., 2008; Anand et al., 2009; Wu et al., 2009; Setia and Pankaj, 2013; Chavez et al., 2014).

Further, in this study, the manifestation of OIC is based on the continuous improvement infrastructure framework of Anand et al. (2009), who draw on the theories of dynamic capability and organizational learning, and on the continuous improvement practices of 17 companies to identify the core elements to develop their continuous improvement framework. Of the elements of this framework, four are classified under process improvement, namely culture of constant change, parallel participation structure, standardized processes, and standardized improvement methods. Yet the concepts of parallel participation suggest that this element pertains to using teams involving cross-functional members, suppliers, and customers. However, while suppliers are relatively irrelevant to service operations, customers are already a key concept incorporated in the definition and measurement of process management of this study (see the items of process management in Table 3-1). In addition, the current study does not intend to examine team member composition. Therefore, only the other three elements (i.e. culture of constant change, standardized processes, and standardized improvement methods) are adopted for the manifestation of OIC in this study. We propose that service teams' OIC can be manifested by their competence in three aspects – continuous improvement (i.e. attitudes of constant change), process management (i.e. standardized process management) and structured methods (i.e. standardized improvement methods). More specifically, continuous improvement pertains to ongoing activities aiming to enhance firm performance through focused incremental changes in processes (Anand et al., 2009). Process management pertains to the view that firms consist of interrelated

and repetitive processes and the application of statistical or quantitative techniques to improvement in process performance (Peng et al. 2009). Structured methods pertain to the implementation of improvement projects that follow specific steps (e.g. DMAIC, PDCA) for problem identification and diagnosis, and solution generation and implementation (Choo et al., 2007).

2.3 Relevant literature of Study 1 – OIC and operational performance

2.3.1 Continuous improvement practices and operational performance

The conceptualization of OIC involves the process improvement and structured methods and is relevant to the concepts of continuous improvement in the OM literature (Peng et al., 2008; Anand et al., 2009). Considerable OM research has been devoted to studying the concepts relating to continuous improvement and their effectiveness. For instance, Choi and Liker (1995) explore the relationship between process-oriented values and continuous improvement effectiveness. Ittner and Larcker (1997) establish the associations with firm profits and process improvement techniques. Bateman and Rich (2003) and Bateman (2005) identify the inhibitors and enablers that influence the effectiveness of continuous process improvement practices. Furthermore, the importance of continuous improvement is well recognized as it is regarded as a major factor in the operational success of many Japanese firms (Choi and Liker, 1995) and one of the cornerstones of operations strategies such as Six Sigma and Lean Manufacturing (Voss, 2005). However, Hill and Brown (2007) recognize that there are some peculiar characteristics among service firms and lament the paucity of insights into process improvement for enhancing service operations. In the recent literature, Glover et al. (2013) employ data from both manufacturing and service firms to examine continuous

improvement events' outcomes, attributes, and implementation problems. Lillis and Szwejczewski (2012) examine the use of strategic operations audit methods in service processes. Although these scholars also have explored the effectiveness of continuous improvement practices in service operations, the studies of continuous improvement from the frontline employee perspective are still few. Thus, our research needs to pay more attention to the peculiar characteristics of service operations to extend the body of knowledge on continuous improvement in service firms.

2.3.2 Agency theory and ethical risks

In the risk adverse literature, the agency theory is used to apply to two parties – principals and agents - who have some goal conflicts (Jensen and Meckling, 1976). The premise of the theory is that agents' behaviour is hard to monitor and they occupy a high degree of customized tasks (Goodale et al., 2008). Specifically, when goal conflict exists between the principal and the agent and the behaviour of the agent is not controlled and monitored, agency problems arise; for example, the agent makes dishonest gains at the expense of the principals' interest (Fama and Jensen, 1983; Goodale et al., 2011). Eisenhardt (1985) and Lovelock (1983) also demonstrate that agents are likely to take action with a risk premium when the outcomes of the task are hardly measurable, highly uncertain and intangible and relatively unique to diverse individuals. Relevant studies of the agency theory propose that agency problems among parties are comprised of two types (i.e. moral hazards and adverse selection) in service counters (Jones et al., 1998). A moral hazard is the problem when the agents conceal their behaviour sacrificing the principal's interests and organizations usually monitor and control practices to reduce any negative ramifications (Goodale et al., 2008).

Adverse selection arises from information asymmetry. When the principal may not know which agent performs the whole process (i.e. information asymmetry) better, a bad decision is likely to be made in rewards and promotion (Coff and Kryscynski, 2011). In addition, the agency theory is used to examine buyer-supplier relationships (Morgan et al., 2007), operational control and compensation (Goodale et al., 2008), and behaviour monitoring in IT applications (Bhattacherjee, 1998).

In our study, regarding the OIC pursuit in the setting of service firms, the agents are frontline members who are supposed to apply their OIC to different activities, while the principal is the OM manager (or the leader of the service team) responsible for pursuing OIC outcomes and guiding frontline team members to carry out related activities. Yet goal conflict occurs between the agents and the principal as the agents tend to be concerned with their sales performance because many service firms develop employee reward systems where sales performance is an important element for frontline employees (Kurland, 1991), whereas the principal is concerned with operational performance. Under such a circumstance, agency problems, (i.e. moral hazards) arise, when team members are more focused on how to achieve better market performance (e.g. introducing highly profitable products) and reduce their efforts to improve delivery processes and, make customers more satisfied, which partly explains why OIC may lack support from frontline service employees. In addition, because employees' behaviour is hard to monitor, it is difficult for OM mangers (or leaders of service teams) to evaluate which teams or team members use OIC to perform activities better and make service processes more efficiently, thus causing another agency problem of adverse selection in rewards and promotion. The two agency problems increasingly curb the support of

frontline team members to apply OIC to related activities. In this study, using the agency theory as a theoretical lens, we adopt operations control to lower frontline team members' sense of discretion and provide behavioural information to enhance task programmability regarding frontline service employees' participation in OIC, thus reducing the threat of agency problems relating to moral hazards and adverse selection (Eisenhardt, 1989).

2.4 Relevant literature of Study 2 – OIC and NSD performance

2.4.1 New service development and creative efficacy

Current NSD studies mainly focus on offering insights into 1) NSD processes and stages (Kindström and Kowalkowski, 2009); 2) differences between NSD and NPD (i.e. new product development) (Nijssen et al., 2006; Schleimer and Shulman, 2011); 3) key elements of NSD (e.g. customers involvement) (Lundkvist and Yakhlef, 2004; Carbonell et al., 2009); and 4) outcomes of NSD (e.g. sales and cost performance) (Melton and Hartline, 2010). Yet such extant research works pay little attention to the importance of frontline employees to NSD performance. NSD in service firms is often very different from new product development (NPD) in manufacturing firms. Specifically, manufacturing firms tend to rely on R&D departments in NPD, whereas service firms involve frontline employees in NSD and recognize that the success of NSD is related to the skills of such employees (Nijssen et. al, 2006). In the literature, the resource-based view (RBV) suggests that employee competence is a crucial form of resource for firms to build and maintain their competitive advantages (Colbert, 2004). This view is likely valid for not only managerial employees, but also operational

employees in service operations. Take banking operations as an example. Technologies such as ATM machines or e-banking systems automate many operational processes (e.g. fund transfer, stock purchase etc). Thus, the role of frontline employees becomes more important in that they have to deal with more complicated tasks such as delivering customized services or improving service processes. Through undertaking such complicated tasks, frontline employees acquire the knowledge of customers' changing needs and the skills of developing new service processes, making them more competent in enhancing NSD performance (Johnson et al. 2000, Ordanini and Parasuraman, 2010). Also, these insights imply that when frontline employees participate in NSD activities, they undertake challenging tasks such as understanding customer needs, analyzing service problems, developing new service processes, and learning new skills. To undertake such challenging tasks effectively, the literature on employee performance suggests that employee creativity can be highly relevant in that creative employees are prone to pursue innovation and excellence in their duties (Somech and Drach-Zahavy, 2013) and perform well in dynamic environments (Baer and Oldham, 2006).

The literature on employee creativity provides knowledge of creative outcomes (e.g. Gong et al, 2009) and antecedents with respect to individuals (e.g. Tierney and Farmer, 2002; Zhou and Shalley, 2003), organizations (e.g. Choi, 2007) and social environments (e.g. Shalley and Gilson, 2004). This body of knowledge also indicates that creative efficacy (*aka* creative self-efficacy) is an accurate measure to reflect creativity in organizations, which refers to employees' view of their ability to produce creative outcomes (Tierney and Farmer, 2002). The relevant studies have identified a number of antecedents of creative efficacy such as educational levels, job characteristics

(complexity, heterogeneity and efficacy), learning orientation, role identity and role requirements (Tierney and Farmer, 2004 & 2011). Yet studies attempting to examine if a certain OM-related practice can facilitate the development of creative efficacy in operational employees are virtually not available. In the OM literature, continuous improvement is a common approach to representing organizations' constant efforts to explore and apply new ways to improve operations (Anand et al., 2009). Frontline employees who are competent in implementing continuous improvement practices should be skillful in seeking out and applying new ways to perform operational activities. We argue that frontline employees' competence in continuous improvement activities is relevant to the development of their creative efficacy.

2.4.2 The resource-based view theory and the contingency theory

The resource-based view (RBV) theory suggests that the competitive advantage of a firm lies primarily in the application of a bundle of valuable resources at its disposal (Barney, 1991). The RBV offers two guidelines on the identification of valuable resources. Specifically, firstly, valuable resources should be heterogeneous in nature and not perfectly mobile (Barney, 1991). Secondly, valuable resources should be valuable, rare, inimitable, and non-substitutable (Crook et al., 2008). Current empirical studies relevant to the resource-based view (RBV) theory mainly focus on the relationship between key resources (e.g. capabilities) and sustainable competitive advantages (e.g. performance outcomes) (Van de Ven and Polley, 1992; Van de Ven, 2007; Kraaijenbrink et al., 2010). However, it remains an operational process underlying the capabilities or resources as a black box (Kraaijenbrink et al., 2010). Thus, in our study, we involve competence in implementing process improvement practices (i.e. operational

improvement competence). Through applying OIC to relevant activities, frontline employees are aware that initiating and implementing new or creative ideas is part of their job, thereby developing their creativity. Viewed from the theoretical lens of RBV, OIC and team creativity are congruent with the guidelines on the identification of valuable resources, because they both are complicated and latent in nature and are unlikely to be transferable easily between firms. Also, they are unlikely to be common among service firms and other competitors are unable to imitate them easily or substitute them by using other employee competences or attributes, which suggests that OIC and team creativity should be valuable resources for firms to achieve competitive advantage, supporting our efforts to investigate their impacts on one relevant competitive advantage (i.e. NSD performance) and help some firms have a good understanding of employee capabilities and perform better than other companies.

The contingency theory indicates that there is no ideal way to manage an organization, and that the effectiveness of a management practice is contingent upon the contextual environment of the organization concerned (Tosi and Slocum, 1984). These concepts suggest that the impact of OIC on employee creative efficacy and the impact of employee creative efficacy on NSD performance should be contingent on certain relevant contextual factors. Based on the review of the literature on service innovation and employee creativity, we identify two sets of contextual factors in a team's characteristics and contextual environment. These factors have significant impacts on the cooperation among team members, integration of team members' abilities, and team members' performance regarding product development and innovation (Sethi, 2000; Akgün et al., 2007; Hoegl and Parboteeah, 2007). Team characteristics generally

comprise team members' experience, team members' relationships, and leader behaviour (Hirst et al., 2011; Revilla and Rodríguez, 2011; Zhang et al., 2011). Therefore, we adopt three relevant factors, namely prior related experience, member communication effectiveness and leader effectiveness, as relevant team characteristics (i.e. team-based factors) that may moderate the posited effectiveness of OIC and employee creative efficacy of this study. With regard to factors in the contextual environment of a team, they refer to the contingencies of a team's daily work environment (Doolen et al., 2003) and are often associated with task-related characteristics (Farh et al., 2010; De Wit et al., 2012). The major tasks of frontline service employees are service creation, and the major contingencies in the work environment of such employees are likely the changes in the services they have to create. Thus, we employ three major service variables, namely service marketability, service complexity and service newness, as the other group of factors (i.e. service-related characteristics) that may moderate the posited effectiveness of OIC and employee creative efficacy of this study. Similar team-related factors and service-related factors are also considered validly moderating in prior contingency-theory based studies (e.g. Beersma et al., 2003; Sousa and Voss, 2008).

2.5 Relevant literature of Study 3 – OIC and service recovery performance

2.5.1 Service recovery performance

Service recovery refers to service providers' actions to properly manage and adjust their behaviour to handle customers' complaints and recover customers' loyalty and satisfaction (Spreng et al., 1995; Miller et al., 2000; Jong and De Ruyter, 2004). In the operations management (OM) and marketing literature, current studies on service

recovery concern: 1) recovery outcomes (e.g. satisfaction, loyalty and customer retention) (Spreng et al., 1995; Swanson et al., 2001; Kau et al., 2006); 2) key elements of effective service recovery (e.g. customer commitment, service quality and guarantee, and failure severity) (Halstead et al., 1993; Kelley, 1994; Weun et al., 2004); and 3) service recovery processes (Hart et al., 1990; Miller et al., 2000). However, the extant research works pay little attention to the process improvement approach to the enhancement of service recovery performance. Many firms design standard routines and procedures to cope with customers' complaints to reduce the cost and time of complaint handling (Jong and De Ruyter, 2004), so continuous improvement in these routines and procedures (i.e. process improvement) can make recovery processes more efficient and reliable (e.g. reducing repetitive processes). In a service setting, the responsibility for service operations mainly lies with frontline teams (Tax and Brown, 2012; Jong and De Ruyter, 2004). Effectively improving recovery processes may partly rely on the ability and willingness of frontline teams to participate in process improvement. Thus, our study aims to contribute to the knowledge of service recovery by examining service recovery from a process improvement perspective.

2.5.2 Role stress theory

In Study 2, we also draw on the role stress theory and conservation of resources theory to consider factors that moderate the effectiveness of OIC in improving service recovery. The role stress theory suggests that high and dynamic job demand (e.g. physical overload, time pressure, diversity demand, unclear policies and inconsistent requirements) can lead to role stress. Role stress comprises three dimensions, namely role ambiguity, defined as a lack of clear information on task duties; role conflict,

defined as role expectations inconsistent with each other; and role overload, defined as too many activities required to be completed (Rizzo et al., 1970; Beehr et al., 1976; Goolsby, 1992). Current studies on role stress suggest that employees suffering from role stress are inclined to burnout, which is characterized by emotional exhaustion, apathetic responses to customers, and a reduced sense of personal accomplishment (Nordenmark, 2004; Jaramillo et al., 2006), thereby reducing their job satisfaction, organizational commitment, and job performance (Nordenmark, 2004). Furthermore, the recovery activities often entail higher levels of job requirements, which may compound the negative effect of role stress on service recovery (Xie and Johns, 1995; Singh, 1998; Wetzels et al., 1999; Maxham III and Netemeyer, 2003; Homburg and Fürst, 2005).

2.5.3 The conservation of resource theory

The conservation of resources theory suggests that job resources should protect employees against a dysfunctional psychological state, help them recover from resource losses, and gain other resources (Hobfoll, 2001; Demerouti et al., 2001). Based on this theory, Shin et al. (2012) examines the role of two critical job resources, namely contextual resource (aka organizational inducements) and psychological resource (aka psychological resilience), when enhancing employees' commitment to organizational change. Organizational inducement, which comprises developmental rewards (e.g. career development, open communication with top management, and participation in decision making) and materialistic rewards (e.g. competitive salaries, bonuses, promotion opportunities, and good health plans), provides organizational support that enhances supportive behaviour and attitudes towards the implementation of differing managerial practices (Hobfoll, 2001; Shin et al., 2012). Psychological resilience is

described as an individual psychological characteristic by which individuals use a proactive form to prevent resource loss (e.g. positive emotion) and quickly recover from past loss (e.g. time and energy) (Hobfoll, 2001; Block and Kremen, 1996; Hobfoll and Shirom, 2001). Thus, when role stress is present in service teams, organizational inducement offers teams organizational support to recover from lost resources, gain new resources, and cope with other problems caused by role stress, whereas psychological resilience protects teams against a dysfunctional psychological state and alleviates other related negative effects.

Chapter 3 Methodology

We consider different commonly used research methodologies and examine which of them offers results with high levels of generalizability. Also, we consider the time and funding constraints of this research to ensure that the chosen methodology is feasible and economical. Laboratory experiments and mathematical modeling are inappropriate for studying the multivariate circumstances of real-life field (Baskerville and Wood-harper 1996). Thus, we adopt the quantitative survey research design to measure research variables and obtain data from real-life settings. In this chapter, we present the research setting, sample, data collection procedures and measurement items, and the results of a number of statistical tests for validating the constructs of this research.

3.1 Setting, sample, and procedure

3.1.1 Research setting

The sample of this study is frontline teams in the Chinese banking industry. We select this industry as our research setting for several reasons. Firstly, in response to a highly competitive market environment, the banks of China not only pay more attention to operational performance, but also realize the importance of service recovery and service innovation (Li and Feng, 2007; Chang, 2007; Li, 2010). Secondly, Chinese banks have evolved constantly in recent years in order to cope with various changes pertinent to financial regulations, organizational restructuring, innovative financial products and services, and updated management practices and technologies (Guo and

Lin, 2008). For instance, the successful experience of China Construction Bank in adopting Lean Six Sigma (Zhang, 2011) implies that improvement practices are relevant to banks in this context. Thirdly, the Chinese banking industry realizes the increasing importance of operations control. The China Banking Regulatory Commission (2005) and the major policy bank of China, The Peoples' Bank of China (2002), regularly issue documents to highlight the increasing importance of risk control and offer guidelines to commercial banks on the implementation of internal control. Also, employees' unethical behaviours are a potential threat to the Chinese banking industry as employees' malfeasance, misfeasance, and nonfeasance have caused losses more than US$2.8 billion annually since 2000 (Zhang et al., 2009; Zhou 2006), and this kind of behaviour is expected to continue together with China's rapid economic development (Cheng and Ma, 2009). Fourthly, employee role stress may become a typical characteristic of the banking industry. For instance, frontline employees need to offer heterogenic, intangible, inseparable and perishable services and play multiple roles (e.g. marketer, operational practitioner and customer service representative) (Li, 2010), which may lead to high levels of role stress. Lastly, frontline teams of banks in China are crucial to recovery activities (Chang, 2007; Li, 2010), service development and innovation projects (Li, 2010; Yan, 2004). Consequently, the Chinese banking industry is an appropriate context for studying the interactions among improvement practices, relevant performances and the peculiar characteristics of service operations.

3.1.2 Samples

The unit of analysis of this study is team. We collected survey data from the frontline teams of nine major banks in China. These banks included five state-owned

commercial banks (ICBC, China Construction Bank, Agricultural Bank of China, Bank of China, and Bank of Communications), three second-tier nationwide commercial banks (China Merchants Banks, China Minsheng Bank, and China CITIC Bank), and one city-based commercial bank (Bank of Beijing). Our sample consisted of 146 frontline teams collected from the operations of these nine banks in seven economically developed cities of China, namely Beijing (n = 44), Shenzhen (n = 26), Guangzhou (n = 20), Shanghai (n = 19), Hangzhou (n = 15), Chengdu (n = 14), and Taiyuan (n = 8). Also, it comprises 282 female (48.3%) and 302 male (51.7%) informants. The age of 93.7% of informants is below 45 years old. The educational levels of 91.2% of informants are bachelor's degree or above, while 84.2% of informants possess relevant professional qualifications (e.g., Certification of China Banking Professional). In addition, 96.7% of the informants reported that their banks regularly provided them with different forms of training. In terms of functional duties, 89.7% of informants worked in three functions, namely investment department, loan department, and retail and integrated services department, consistent with our intent to focus on examining frontline service employees involving complicated service processes. The descriptive statistics of our sample are consistent with similar studies in the literature (Cui et al., 2011; Lin, 2013). The information on our informants also indicates that our sample teams have all the characteristics of a typical frontline team of the Chinese banking industry.

3.1.3 Data collection procedures

To develop our sampling frame, we first examined those target banks' Internet web-pages to search for the contact information of their frontline departments. Through making calls to those departments, we identified the team leaders and explained to them the theme of this study. We specifically emphasized the contributions of this study to frontline operations of banks in China, assured them the confidentiality of their information, and made sure that the teams participating in the study should meet three requirements – first, their major members have pro-longed and interactive communication with customers on a daily basis; second, they need to customize their service to meet the diverse customer needs; and finally, they need participate in projects relating to service development or improvements. These requirements assure that the respondents indeed participate in routine activities, problem-solving, process improvement and non-routine activities e.g. new service launch. With this approach, we came up with a sampling frame comprising 400 frontline teams among those target banks. We adopted a multiple-informant method to collect data from one leader and three randomly-selected members in each team. We required team leader to distribute the team member questionnaire randomly based on the employee ID, finally reducing the systematic error. The leader of each team was an informant and survey administrator as well. After receiving the survey packages from us, the leader had to fill in the leader questionnaire, and distribute the member questionnaires to three members. All the completed questionnaires returned to one of the authors of this study directly. After receiving the completed questionnaires, we sent the informants concerned supermarket coupons (about US$15 for members, US$30 for leaders) as a token of appreciation for their support for this study.

The constructs of our survey were originally in English. As our informants were frontline employees of banks in China, we employed Mullen's (1995) method to translate our construct items from English to Chinese, and then back-translated them to English for further evaluation in order to make sure that the Chinese version should be clear to the Chinese informants and can accurately reflect the intended meanings of the original constructs in English. Then we conducted a pilot study with ten frontline banking teams to further identify the relevant items for measuring ethical risks and prior related experience, which are new constructs in this Study 1 and 2 and ascertain the content validity of our Chinese-version constructs. Also, based on the results of the pilot test, we made minor revision to a few construct items to improve their readability and followed the information about the extent to which leader and members are familiar with these constructs to further decide what constructs leaders or members have to fill in respectively. Specifically, the pilot test participants commented that team leaders should be more knowledgeable about addressing the constructs relevant to operational performance, NSD performance, management and control, and service characteristics and also advised that the constructs concerning specific operational activities (e.g. structured method) and employee characteristics and attitudes (e.g. employee role stress and continuous improvement) should be filled by the members. Thus, the constructs in Study 1 pertinent to operational performance, risk control, and process control formality were filled by team leader and the construct pertinent to ethical risks was filled by team member. In Study 2, the constructs pertinent to role stress (e.g. role conflict, role overload and role ambiguity), job resources (e.g. organizational inducements and psychological resilience) and service recovery performance were filled by team

members. In Study 3, the constructs relevant with performance (i.e. NSD performance), communication effectiveness and service characteristics (i.e. service marketability, service complexity and service newness) were filled by team leaders, whereas the constructs pertinent to creative efficacy, leader effectiveness, and prior related experience were filled by team members. For the OIC constructs, the construct of process management was filled by team leader, whereas other two constructs (i.e. continuous improvement and structured method) were filled by team members.

We sent the final questionnaires to the 400 frontline banking teams in our sampling frame. By employing Dillman's (2007) method, clear instructions were provided in the questionnaires to describe the background of the study, ensure data confidentiality, and the requirements pertinent to the sample teams' frontline job nature. The informants were also requested to provide details such as gender, functional duties, educational levels, and professional qualifications. Three rounds of remainders were issued to enhance the response rate. At the end, we received completed team-level data (i.e., one leader questionnaire and three member questionnaires per team) from 146 teams, resulting in a response rate of 36.5%. Note that questionnaires with missing data and responses from teams with less than three completed member questionnaires were excluded from our data-set.

3.2 Measures

We used multi-item, seven-point Likert scale anchored at 1 = "totally disagree" and 7 = "totally agree" to measure the constructs of the research. In Studies 1, 2 and 3, prior related experience and ethical risks are new constructs, but other all constructs

were adopted from the existing literature. The construct items are shown in the Tables 3-1, 3-2 and 3-3 and briefly discussed below.

Operational improvement capability (OIC). This is a multi-dimensional construct reflecting firms' abilities to use systematic efforts to improve operational-level activities. As this study intends to focus on practices that rely highly on the contributions from operational employees, OIC is composed of process management, structured methods, and continuous improvement. The constructs of process management and continuous improvement were adopted from Peng et al. (2008), while that of structured method was adopted from Choo et al. (2007).

3.2.1 The construct items of Study 1

Risk control. It reflects the risk-taking propensity of frontline service employees in this study. We adopted the construct items of Das and Joshi (2007) and Goodale et al. (2011) to measure this concept.

Process control formality. It reflects the extent to which frontline service employees need to follow formal and structured processes in executing operations. The construct was adopted from Das and Joshi (2007) and Goodale et al. (2011).

Ethical risks. It reflects the possibility that frontline service employees may undertake unethical behaviours in the operations. This is a new construct, which was developed based on the numerous unethical selling behaviours identified by Lee et.al (2009). With the insights we gathered from the pilot test, we selected four representative unethical selling behaviours to form this construct. This scale is anchored at 1 = "the lowest risk" to 7 = "the highest risk" to reflect the level of this construct.

Operational performance. We assessed frontline service employees' flexibility and performance in respect to their job description to reflect this construct. The original version of this construct comprises various items relating to on-time delivery, unit cost etc. Based on the pilot test results, we selected the current three items from Peng et al. (2008) and Williams (1991).

Control variables. We employed informants' ages and education levels, functional departments (investment department, load department, retail and integrated services, and others), and the ownership of their banks (state-owned commercial banks, national joint-stock commercial banks, city-based joint-stock commercial banks, and others) as the control variables of this study. By involving control variables at different levels in our analysis, we are able to more accurately test our hypotheses.

3.2.2 The construct items of Study 2

Team creative efficacy. It refers to employees' self-assessment for their ability to achieve creative outcomes. We adopted the items developed by Tierney and Farmer (2002).

Leader effectiveness. It reflects the team members' perception on the leaders' abilities to improve performance and relationship between leaders and members. This construct was adopted from van Knippenberg (2005).

Communication effectiveness. It reflects the effectiveness of communication within a team. The items of this construct were adopted from Sharma and Patterson (1999).

Prior related experience. It is a new construct and refers to the extent to which employees perceive their prior knowledge and skills are useful for their current tasks

and problems. According to Dokko et al. (2009)'s definition and relevant concepts, we developed the items of this construct.

Service marketability. It reflects the extents to which the new service satisfies customer needs and is accepted and evaluated by the customers. We adopted the items developed by the Melton and Hartline (2013).

Service complexity. It reflects the extents to which the process and methods of developing the new service are difficulty and complicated. The items were adopted from Sarin and McDermott (2003).

Service newness. It reflects the extents to which the new service is innovated totally. The items of construct were adopted from Swink (2003).

NSD performance. It assesses the introduction and delivery speed, and marketing performance of the new service. The original version of this construct comprises various items relating to different aspects of NSD performance (Menor and Roth, 2007). Based on the pilot test results, we adopted five items from the original construct.

Control variables. We employed informants' ages, education levels, functional departments (investment department, load department, retail and integrated services, and others), the position of team leaders (Teller, Retail and Integrated Service Manager, Financial Manager, Account Manager and Credit Manager), and the time that informants work in their current teams as the control variables of this study. By removing the effects from these control variables in our analysis, we were able to test our hypotheses more accurately.

3.2.3 The construct items of Study 3

Role stress. It comprises three dimensions- role ambiguity, role conflict and role overload. We adopted the items developed by Rizzo et al. (1970) and Beehr et al. (1976).

Organizational inducements. It is a two-dimensional construct reflecting social attachment (e.g. rewards, support from supervisors, and participation in decision making) (Demerouti et al., 2001; Shin et al., 2012). It comprises developmental rewards and materialistic rewards. The items of the construct were adopted from Shin et al. (2012).

Psychological resilience. It refers to psychological resources to help employees to cope with hardships and minimize the negative influence of stressful events (Shin et al., 2012). We adopted the construct items from Shin et al. (2012).

Service recovery performance. It refers to recovery outcomes when service requests and failures occur (Boshoff & Allen, 2000). The items of the construct were adopted from Boshoff and Allen (2000).

Control variables. We employ informants' ages and education levels, functional departments (e.g. investment department, load department, retail and integrated services), the position of a team leader in every team (e.g. teller, retail and integrated service manager, financial manager, account manager and credit manager) and the time when informants work in this team as control variables of this study. By removing the effects from these control variables in our analysis, we were able to test our hypotheses more accurately.

3.3 Reliability and validity

3.3.1 Scale reliability and interrater reliability

Scale reliability is a statistical measure that suggests the extent to which an item or multiple items of a latent variable is consistent; that is, it reflects the internal

consistency of a scale (Hair et al. 1998). The value of the coefficient alpha test is above the suggested 0.70 threshold (Nunnally, 1994), indicating the scale reliability of a construct is acceptable. For the unit of analysis of this study is team, we need to analyze the variation of individual-level constructs from the team member questionnaire in the same team to ensure whether these individual-level data can be aggregated at team-level. We adopted intra-class correlation coefficient (ICC) statistics (i.e. ICC (1) and ICC (2)) to assess the consistency of variance among raters. ICC(1) can indicate the degree to which an individual's perception can reflect a reliable estimate of the perception of aggregated level and a large ICC (1) value can show that individual-level responses from the team provide a reliable estimate of the team mean value (James, 1998). ICC (2) reflects the reliability of average ratings of team members from each team (Bartko, 1976; James, 1998). This method of aggregating individual-level data to form team-level data has been widely used in team-based studies on management. For instance, Marrone et al. (2007) and Felps et al. (2009) adopt this method to form team-based data for reflecting similar concepts such as role overload, boundary spanning behaviour, and job embeddedness in work teams. In our research, we adopted this method to combine the data from three members as one observation and followed the formulas of ICC (1) and ICC (2) to get the results and Cronbach's coefficient alpha as shown in Tables 3-1, 3-2 and 3-3. Using multiple-informant methods can reduce the common method bias and assure the regress model validity.

As all the α-values (see Table 3-1, 3-2 and 3-3) are above the suggested 0.70 threshold (Nunnally, 1994), the reliability is acceptable for all the constructs of our study. All the individual-level data in the three studies including continuous

improvement, structured method, ethical risks, creative efficacy, prior related experience, leader effectiveness, role stress (i.e. role ambiguity, role overload and role conflict), organization inducements, psychological resilience and service recovery performance can be aggregated to form team-level data based on the suggestions of James (1982) that the value of ICC (1) should be above 0.12 and on those of Boyer and Verma (2000) that the generally acceptable level of ICC (2) in the field of OM should be above 0.60.

3.3.2 Validity

Validity comprises by content validity, convergent validity and discriminant validity. Content validity assesses the extent to which the perceptions of individuals filling questionnaires are reflected by the contents and variables designed in the questionnaires (Hair et al. 1998). It can be justified by experienced employees, experts or existing studies. Thus, in this study, we firstly conducted preliminary pilot test to interview some experienced practitioners from the banking industry and researchers from the field of operational management. After then, we made a revision based on their comments and use revised questionnaires to conduct a large-scale data collection. Hence, the content validity is acceptable.

Convergent validity refers to the degree to which different indicators of the same construct are correlated (Chau, 1997). We adopted the value of composite reliability (CR) and average variance extracted (AVE) to access the convergent validity (Fornell and Larcker 1981, Chau 1997). In Study 1, the results of composite reliability (CR) and average variance extracted (AVE) range from 0.828 to 0.964 and from 0.547 to 0.869 respectively (see Table 3-1), exceeding the recommended AVE value of 0.50 (Fornell

and Larcker, 1981) and CR value of 0.80 (Nunnally, 1978). The standardized factor loading of each construct is above 0.6 (see Appendix) and highly significant at $p < 0.01$ (Bagozzi and Yi, 1988). Taken together, these results indicate adequate convergent validity of the constructs in Study 1. In Study 2, the results of composite reliability (CR) and average variance extracted (AVE) range from 0.889 to 0.986 and from 0.514 to 0.907 respectively (see Table 3-2), exceeding the recommended CR value of 0.80 (Nunnally, 1994) and AVE value of 0.50 (Fornell and Larcker, 1981). The standardized factor loading of all the construct items are above 0.5 (see Appendix) and are highly significant at $p < 0.01$ (Bagozzi and Yi, 1988). Taken together, these results indicate adequate convergent validity in the constructs relevant to Study 2. In Study 3, the results of composite reliability (CR) and average variance extracted (AVE) range from 0.889 to 0.976 and from 0.616 to 0.900 respectively (see Table 3-3), exceeding the recommended CR value of 0.80 (Nunnally, 1994) and the recommended AVE value of 0.50 (Fornell & Larcker, 1981). The standardized factor loading of each construct is above 0.7 (see Appendix) and highly significant at $p < 0.01$ (Bagozzi and Yi, 1988). These results indicate that the convergent validity of the constructs relevant to Study 3 is acceptable.

Discriminant validity assesses the extent to which items of latent variables correlate with other items from different constructs (Chau, 1997). Fornell and Larcker (1981) and Chau (1997) provide some methods to assess discriminant validity. To assess discriminant validity for the constructs relevant to Studies 1, 2 and 3, we made a constrained confirmatory factor analysis (CFA) model for every possible pair of constructs and fixed the correlations between the paired-constructs at 1.0. In the three studies, the least χ^2 difference of 20.53 with a *p*-value less than 0.001 indicates adequate

discriminant validity (Bagozzi et al., 1991). We also compare the constructs' AVE values with the relevant squared correlations in Studies 1, 2 and 3, and find the AVE value of each construct exceeds the squared correlations between that construct and any other constructs (Fornell and Larcker, 1981). Thus, these results show adequate discriminant validity of the constructs examined.

The measured constructs in Study 3 are all validated, while, there are two new constructs like ethical risk and prior related experience in Studies 1 and 2. Thus, we need to examine the constructs of Studies 1 and 2 by applying exploratory factor analysis with the principal components method and varimax rotation. The results of these analyses conducted are presented in Table 3-4, Table 3-5, Table 3-6 and Table 3-7 respectively. In Study 1, the three constructs (i.e. continuous improvement, structured method and ethical risks) of the team member data account for 87.03% of the total variance in this data-set, while the four constructs (i.e. process management, risk control, process control formality and operational performance) of the team leader data account for 77.17% of the total variance in this data set. In Study 2, the five constructs (i.e. continuous improvement, structured method, prior related experience, creative efficacy and leader effectiveness) of the team member data account for 89.25% of the total variance in this data-set, while the six constructs (i.e. process management, communication effectiveness, service marketability, service complexity, service newness and NSD performance) of the team leader data account for 78.07% of the total variance in that data-set. These results suggest that all the items are loaded significantly onto their corresponding constructs.

Table 3-1: Measurement items, Reliability, AVE, Composite Reliability and Factor Loading of Study 1

Please indicate to what extend you agree with the following the statements (1 = totally disagree to 7 = totally agree).	**Loading**
Continuous Improvement (α = 0.918, AVE = 0.869, CR = 0.964, ICC (1) = 0.648, ICC (2) = 0.847)	
CI1: I strive to continually improve all the aspects of service products and operational processes, rather than taking a static approach.	0.930
CI2: I strive for continued learning and improvement, after introduction of new products.	0.956
CI3: Continuous improvement makes our performance a moving target, which is difficult for competitors to match.	0.892
CI4: Our team is not a static entity, but engages in dynamically changing itself to better serve its customers.	0.901
Structured Methods (α = 0.900, AVE = 0.842, CR = 0.955, ICC (1) = 0.610, ICC (2) = 0.824)	
SMs1: I have specific problem-solving steps with recommended statistics and non-statistical tools in each step.	0.923
SMs2: Operational service process follows a structured method – we follow a standard set of analysis and problem-solving steps strictly.	0.940
SMs3: I feel that following the structured steps is not important. (*reversed*)	0.846
SMs4: Each structured step is faithfully completed.	0.914
Process Management (α = 0.908, AVE = 0.616, CR = 0.889)	
PM1: A large percentage of the service processes for customers is currently under service quality control.	0.785
PM2: My team can find operational mistakes before customers find them.	0.787
PM3: My team always meets different kinds of customer needs.	0.774
PM4: My team has local ability and knowledge that are essential to day-to-day problem solving.	0.895
PM5: My team has the capability to perform a task or activity in an integrated manner.	0.831
Risk control (α = 0.840, AVE = 0.547, CR = 0.828)	
RC1: My team adopts a cautious posture in order to minimize the probability of making costly decisions in the operation process.	0.807
RC2: My team explores some knowledge from the internal and external environments via cautious and incremental behaviour.	0.809

RC3: My team often has a strong proclivity for selling low-risk projects.	0.718
RC4: My team often emphasizes the marketing of tried and true products and services rather than research and development, and innovations.	0.657
Process control formality (α = 0.915, AVE = 0.680, CR = 0.884)	
PCF1: My team follows the formally laid-down procedures.	0.915
PCF2: There are sophisticated control and information system control of most operations.	0.880
PCF3: My team gets in line and adheres closely to the formal job descriptions.	0.912
PCF4: My team allows operating styles to range from the very formal to the very informal. (*reversed*)	0.719
Operational performance (α = 0.921, AVE = 0.760, CR = 0.904)	
OP1: My team fulfills the operational responsibilities specified in the job description.	0.870
OP2: My team meets formal operational performance requirements of the job.	0.943
OP3: My team gradually improves the flexibility of the service process.	0.866
Please tell us the extent to which the risk that the following behaviours in your work environment brings from "1 - lowest risk" to "7 - highest risk".	**Loading**
Ethical risks (α = 0.904, AVE = 0.866, CR = 0.963, ICC (1) = 0.583, ICC (2) = 0.807)	
ER1: Agreeing to customer requests that are impossible to deliver	0.870
ER2: Allowing or encouraging customers to order some high risk products that are inconsistent with assessment of their financial sustainability	0.928
ER3: Overstating the popularity of the product	0.897
ER4: Lying to customers about product specifications	0.906

Notes: the loadings of items are results from confirmatory factor analysis and estimated using maximum likelihood

Table 3-2: Measurement items, Reliability, AVE, Composite Reliability and Factor Loading of Study 2

Please indicate to what extend you agree with the following the statements (1 = totally disagree to 7 = totally agree).	**Loading**
Continuous Improvement (α = 0.918, AVE = 0.869, CR = 0.964, ICC (1) = 0.648, ICC (2) = 0.847)	
CI1: I strive to continually improve all the aspects of service products and operational processes, rather than taking a static approach.	0.930
CI2: I strive for continued learning and improvement, after introduction of new products.	0.956
CI3: Continuous improvement makes our performance a moving target, which is difficult for competitors to match.	0.892
CI4: Our team is not a static entity, but engages in dynamically changing itself to better serve its customers.	0.901
Structured Methods (α = 0.900, AVE = 0.842, CR = 0.955, ICC (1) = 0.610, ICC (2) = 0.824)	
SMs1: I have specific problem-solving steps with recommended statistics and non-statistical tools in each step.	0.923
SMs2: Operational service process follows a structured method – we follow a standard set of analysis and problem-solving steps strictly.	0.940
SMs3: I feel that following the structured steps is not important. (*reversed*)	0.846
SMs4: Each structured step is faithfully completed.	0.914
Process Management (α = 0.908, AVE = 0.616, CR = 0.889)	
PM1: A large percentage of the service processes for customers is currently under service quality control.	0.785
PM2: My team can find operational mistakes before customers find them.	0.787
PM3: My team always meets different kinds of customer needs.	0.774
PM4: My team has local ability and knowledge that are essential to day-to-day problem solving.	0.895
PM5: My team has the capability to perform a task or activity in an integrated manner.	0.831
Employee creative efficacy (α = 0.909, AVE = 0.881, CR = 0.974, ICC (1) = 0.578, ICC (2) = 0.804)	
ECE1: I have confidence in my ability to solve problems creatively.	0.910
ECE2: I feel that I am good at generating novel ideas.	0.917

ECE3: I have a knack for further developing the ideas of others.	0.895
ECE4: I am good at finding creative ways to solve problems.	0.928
Leader effectiveness (α = 0.962, AVE = 0.907, CR = 0.986, ICC (1) = 0.580, ICC (2) = 0.805)	
LE1: This team leader is a good leader.	0.932
LE2: This team leader is very effective.	0.947
LE3: This team leader leads the team in a way which motivates the team members.	0.954
LE4: I like working together with this leader.	0.948
LE5: This team leader was very successful.	0.940
LE6: This team leader will be very successful in future tasks.	0.951
Communication effectiveness (α = 0.926, AVE = 0.680, CR = 0.954)	
CE1: Colleagues between the teams keeps each other very well informed about what's going on with their own task.	0.770
CE2: Colleagues between the teams explain some problems and recommendation in a meaningful way.	0.865
CE3: The member in one team never hesitates to give as much information as the member in another team wants to have.	0.846
CE4: Colleagues between teams never hesitate to give some cons and pros of decision making.	0.855
CE5: Colleagues between teams always share some successful experience and enlightenment.	0.889
Prior related experience (α = 0.925, AVE = 0.876, CR = 0.973, ICC (1) = 0.584, ICC (2) = 0.808)	
PRE1: The knowledge and skills I have learnt from prior jobs can apply and transfer to this current job.	0.937
PRE2: Prior related experience can help solve some problems.	0.953
PRE3: Prior related experience can make me perform my tasks properly.	0.949
PRE4: Prior related experience is no use for current job. *(reversed)*	0.870
Service marketability (α = 0.941, AVE = 0.712, CR = 0.958)	
SM1: The new service satisfies clearly identified customer needs.	0.822
SM2: The new service provides faster or more efficient service relative to the previous services in the category.	0.882

SM3: The new service concept is easy for customer to understand and evaluation.	0.879
SM4: Customers prefer the new service.	0.903
SM5: The new service provides more reliable service to the previous service in the category.	0.881
Service complexity (α = 0.857, AVE = 0.514, CR = 0.927)	
SC1: The new service developed by our team was technically complex to develop.	0.852
SC2: Our team had to use non-routine method to develop a new service.	0.874
SC3: The development process associated with new service was relatively simple. *(Reversed)*	0.579
SC4: Development of new service required pioneering innovation.	0.813
Service newness (α = 0.848, AVE = 0.660, CR = 0.921)	
SN1: The new service is according to improvement of existing service. *(Reversed)*	0.870
SN2: The new service always borrows from some service in other firms. *(Reversed)*	0.828
SN3: The new service is totally innovated according to customer requirement.	0.732
New service development Performance (α = 0.947, AVE = 0.755, CR = 0.962)	
NSDP1: Overall speed of new service development projects introduced has been very fast.	0.870
NSDP2: Company's new service development program has been very successful in meeting customer requirement.	0.929
NSDP3: Company's new service development program has been very successful in meeting corporate profit objectives.	0.914
NSDP4: New service development program has better performance than competitor.	0.896
NSDP5: New service development program leads to future opportunities.	0.813

Notes: the loadings of items are results from confirmatory factor analysis and estimated using maximum likelihood.

Table 3-3: Measurement items, Reliability, AVE, Composite Reliability and Factor Loading of Study 3

Please indicate to what extend you agree with the following the statements (1 = totally disagree to 7 = totally agree).	**Loading**
Continuous Improvement (α = 0.918, AVE = 0.869, CR = 0.964, ICC (1) = 0.648, ICC (2) = 0.847)	
CI1: I strive to continually improve all the aspects of service products and operational processes, rather than taking a static approach.	0.930
CI2: I strive for continued learning and improvement, after introduction of new products.	0.956
CI3: Continuous improvement makes our performance a moving target, which is difficult for competitors to match.	0.892
CI4: Our team is not a static entity, but engages in dynamically changing itself to better serve its customers.	0.901
Structured Methods (α = 0.900, AVE = 0.842, CR = 0.955, ICC (1) = 0.610, ICC (2) = 0.824)	
SMs1: I have specific problem-solving steps with recommended statistics and non-statistical tools in each step.	0.923
SMs2: Operational service process follows a structured method – we follow a standard set of analysis and problem-solving steps strictly.	0.940
SMs3: I feel that following the structured steps is not important. (*reversed*)	0.846
SMs4: Each structured step is faithfully completed.	0.914
Process Management (α = 0.908, AVE = 0.616, CR = 0.889)	
PM1: A large percentage of the service processes for customers is currently under service quality control.	0.785
PM2: My team can find operational mistakes before customers find them.	0.787
PM3: My team always meets different kinds of customer needs.	0.774
PM4: My team has local ability and knowledge that are essential to day-to-day problem solving.	0.895
PM5: My team has the capability to perform a task or activity in an integrated manner.	0.831
Role Conflict (α = 0.932, AVE = 0.854, CR = 0.946, ICC (1) = 0.738, ICC (2) = 0.894)	
RC1: I receive incompatible requests from our customers and our organization.	0.971
RC2: I receive an assignment without adequate resources to execute it.	0.971

RC3: I serve our organization and customers whose expectations are quite different.	0.937
Role Overload (α = 0.936, AVE = 0.900, CR = 0.964, ICC (1) = 0.790, ICC (2) = 0.919)	
RO1: I am given enough time to do what is expected of me on my job.*(reversed)*	0.973
RO2: It often seems like I have too much work for one person to do.	0.983
RO3: The performance standards on my job are too high.	0.976
Role Ambiguity (α = 0.960, AVE = 0.872, CR = 0.964, ICC (1) = 0.516, ICC (2) = 0.762)	
RA1: I have no clear, planned goals and objectives for my job.	0.901
RA2: I know exactly what is expected of me. *(reversed)*	0.946
RA3: I know what my responsibilities are. *(reversed)*	0.933
RA4: I feel uncertain about the level of authority I have.	0.915
Organizational Inducements (α = 0.899, AVE = 0.833, CR = 0.968, ICC (1) =.652, ICC (2) =.849)	
Developmental Rewards	
DR1: My organization trains me in operational knowledge and skills for job and career development.	0.853
DR2: My organization treats me very fairly.	0.876
DR3: My organization creates opportunities for me to fully express my goal conflict and role stress.	0.870
Materialistic Rewards	
MR1: I who desire promotion have more than one potential position to which I can be promoted.	0.932
MR2: My organization provides higher salaries and more bonuses to encourage us to make fewer mistakes.	0.927
MR3: I expected to stay in the organization for as long as I wish.	0.876
Psychological Resilience (α = 0.922, AVE = 0.889, CR = 0.976, ICC (1) =.569, ICC (2) =.799)	
PR1: I always quickly get over and recover from psychology stress.	0.917
PR2: I enjoy dealing with new and unusual situations.	0.920
PR3: I usually think carefully about something before taking action.	0.915

PR4: I get over my anger at someone reasonably quickly.	0.907
PR5: My daily life is full of things that keep me interested.	0.924
Service Recovery Performance (α = 0.915, AVE = 0.668, CR = 0.889, ICC (1) =.577, ICC (2) =.804)	
SRP1: Considering all the things I do, I handle dissatisfied customers quite well.	0.911
SRP2: I don't mind dealing with complaining customers.	0.908
SRP3: No customer I deal with leaves with problems unresolved.	0.897
SRP4: Complaining customers I have dealt with in the past are among today's most loyal customers.	0.825

Notes: the loadings of items are results from confirmatory factor analysis and estimated using maximum likelihood.

Table 3-4: Exploratory factor analysis results of Study 1 – Team member data

The variables from team-member data set	Factor 1 Continuous improvement	Factor 2 Structured method	Factor 3 Ethical risks
CI1	0.858		
CI2	0.875		
CI3	0.809		
CI4	0.840		
SMs1		0.824	
SMs2		0.825	
SMs3®		0.833	
SMs4		0.851	
ER1			0.872
ER2			0.919
ER3			0.881
ER4			0.894

Note: All loading in excess of 0.50 are shown.

Table 3-5: Exploratory factor analysis results of Study 1 – Team Leader data

The variables from team-leader data set	Factor 1 Process management	Factor 2 Risk control	Factor 3 Process control formality	Factor 4 Operational performance
PM1	0.800			
PM2	0.820			
PM3	0.819			
PM4	0.871			
PM5	0.820			
RC1		0.718		
RC2		0.751		
RC3		0.826		
RC4		0.794		
PCF1			0.876	
PCF2			0.883	
PCF3			0.883	
PCF4			0.821	
OP1				0.912
OP2				0.900
OP3				0.887

Note: All loading in excess of 0.50 are shown.

Table 3-6: Exploratory factor analysis results of Study 2 – Team Member data

The variables from team-member data set	Factor 1 Continuous improvement	Factor 2 Structured method	Factor 3 Prior related experience	Factor 4 employee creative efficacy	Factor 5 Leader effectiveness
CI1	0.793				
CI2	0.818				
CI3	0.768				
CI4	0.765				
SMs1		0.802			
SMs2		0.800			
SMs3®		0.779			
SMs4		0.802			
PRE1			0.864		
PRE2			0.873		
PRE3			0.859		
PRE4®			0.884		
ECE1				0.847	
ECE2				0.820	
ECE3				0.812	
ECE4				0.821	
LE1					0.870
LE2					0.877
LE3					0.893
LE4					0.877
LE5					0.871
LE6					0.882

Note: All loading in excess of 0.50 are shown.

Table 3-7: Exploratory factor analysis results of Study 2 – Team Leader data

The variables from team-leader data set	Factor 1 Process management	Factor 2 Communication effectiveness	Factor 3 Service marketability	Factor 4 Service complexity	Factor 5 Service newness	Factor 6 New service development performance
PM1	0.808					
PM2	0.814					
PM3	0.811					
PM4	0.870					
PM5	0.815					
CE1		0.799				
CE2		0.805				
CE3		0.841				
CE4		0.795				
CE5		0.844				
SM1			0.767			
SM2			0.816			
SM3			0.823			
SM4			0.825			
SM5			0.802			
SC1				0.772		
SC2				0.810		
SC3®				0.612		
SC4				0.811		
SN1®					0.860	
SN2®					0.820	
SN3					0.692	
NSDP1						0.821
NSDP2						0.849
NSDP3						0.872
NSDP4						0.846
NSDP5						0.792

Note: All loading in excess of 0.50 are shown.

3.3.3 Measurement model fit

We then performed confirmatory factor analysis (CFA) with the full-information maximum likelihood (FIML) method using AMOS 20 (Byrne, 2013) to assess the quality of the constructs. We first examined the CFA of the second-order factors for the OIC constructs. Based on the recommendation of Venkatraman (1990), we evaluated the first-order factor CFA model of OIC against its second-order CFA model. The fit indices of the second-order CFA model (GFI = 0.907; AGFI = 0.863; CFI = 0.982;

RMR = 0.049; RMSEA = 0.063) are better than the fit indices of the first order CFA model (GFI = 0.562; AGFI = 0.387; CFI = 0.784; RMSEA = 0.216). In addition, in the second-order model of OIC, all the factors loadings are significant at $p < 0.001$. These results indicate that the second-order model is significantly better than the first-order model, supporting the use of process management, structured method, and continuous improvement to reflect OIC in our sample.

Sequentially, we examined the constructs' measurement model fit of every study using CFA. The fit indices of the model in Study 1 (CFI = 0.979; AGFI = 0.812; NFI = 0.901; RMR = 0.065; RMSEA = 0.040), the fit indices of the model in Study 2 (CFI = 0.952; TLI = 0.948; IFI=0.952; RMR = 0.059; RMSEA = 0.049) and the fit indices of the model in Study 3 (CFI = 0.981; TLI=0.979; NFI = 0.903; RMR = 0.050; RMSEA = 0.038) are above the suggested threshold values (Byrne, 2013), indicating that the constructs are good-fit to their respective models in every study.

3.3.4 Common method bias

To address the potential impact of common method bias, we employed two approaches recommended by Podsakoff et.al (2003) and Williams et al. (2003). First, we paid attention to the design of the questionnaires. The independent variables and dependent variables of our hypotheses are mainly obtained from two different sources (i.e. team leaders and members) and involved positive and reversed items. Second, we conducted statistical analyses to assess its severity. In Study 1, we conducted Harman's one-factor test including the data of all the constructs in one factor analysis to examine whether a substantial amount of the variance can be explained by one general factor. The results indicate that only 39.2% of the common method variance can be explained,

less than half of all the variance explained, which implies common method bias is not a serious problem in Study 1. In study 2, we conducted Harman's one-factor test and the results indicate that only 37.2% of the variance in our data can be explained by the general factor. Consequently, we obtained adequate evidence that common method bias in Study 2 is unlikely a significant concern in our data. In Study 3, we also conducted Harman's one-factor test and the results indicate that nearly half of the variance can be explained. We adopted the single factor approach to further examine whether common method bias is a significant problem. Specifically, firstly we added the latent method factor whose indicators included all the principal constructs' indicators and then calculated the average explained variances by principal constructs and signal method factor. The results show that the average indicator variance explained by the signal method factor is 0.039, while the average variance explained by the model constructs is 0.783. The ratio of substantive variance to method variance is about 20:1. Consequently, common method bias in Study 2 is not a serious problem.

Chapter 4 Study 1- OIC and operational performance

Operational improvement competence (OIC) is important for service firms to achieve operational excellence. However, its effectiveness may be adversely affected by frontline service employees that exercise self-interested discretion and curtail their contributions to related activities. In this chapter, guided by the OM literature and agency theory, we propose that the effectiveness of OIC in service firms is contingent on two factors, namely operations control and ethical risks. Specifically, we theorize that operations control enhances the effectiveness of OIC by suppressing frontline service employees' discretion and prodding them into following guidelines on the performance of OIC activities. In addition, operations control becomes particularly important to OIC when there are high-level ethical risks because the resultant unethical selling practices and personal benefits in such an environment can make frontline service employees focus on selling activities and ignore their OIC duties. Study 1 empirically confirms these posited hypotheses. The main contribution of this study lies in its use of a micro-level perspective to ascertain the intricacies between OIC and the peculiar characteristics of service employees and operations in service firms.

4.1 Introduction

In response to the increasingly complicated and fast-changing business environment, firms have to pay more attention to their process performance and their abilities to continuously improve their processes (Teece, 2007). The importance of continuous improvement is well recognized in the operations management (OM)

literature as it is regarded as a major factor in the operational success of many Japanese firms (Choi and Liker, 1995) and one of the cornerstones of operations strategies such as Six Sigma and Lean Manufacturing (Voss, 2005). The relevant literature suggests that, through implementing process improvement practices such as process management, structured methods and continuous improvement, firms can reap such benefits as efficiency gains, cost reduction, a change-oriented culture, efficient project management, and competitive advantage (Womack et al., 1990; Sitkin et al., 1994; Benner and Tushman, 2003; Choo et al., 2007; Peng et al., 2008; Anand et al., 2009). The approaches to process improvement are highly relevant to service firms as well. For example, many service firms have adopted six sigma, such as Bank of America, Citibank, GE Capital Corp and China Construction Bank (Carlivati, 2007; Nakhai and Neves, 2009; Zhang, 2011). However, these approaches to process improvement have not adequately addressed the service specifications, reduced operational costs and contributed to the improvement of service quality (Kwak and Anbari, 2006; Nakhai and Neves, 2009), implying that there is ample room for service firms to improve their operational performance and that they can employ a new perspective relevant to process improvement as the source of competitive advantage. Also, there has been evidence indicating that there are some peculiar characteristics among service firms and the paucity of insights into continuous improvement developed for enhancing service operations (Hill and Brown, 2007). The effectiveness of process improvement practices can partly depend on frontline employees' ability and willingness and the peculiar characteristics among service operations. Thus, Study 1 extends this body of knowledge

by examining interactions among operational improvement competence (OIC), operational performance and peculiar characteristics of service operations.

Bowen and Ford (2002) examine the differences between service and manufacturing firms and identify managing service employees as one of the major challenges for the effective management of service firms. Many relevant studies of service operations suggest the characteristics of operations in this setting include 1) a board range of service demands (Bowen and Schneider, 1988); 2) high levels of customer-contact (Safizadeh et al., 2003); and 3) uncertain processes (Bowen and Ford, 2002). These characteristics imply that frontline employee cannot have enough or clear guidelines and regulations to cope with such a board range of customized demands and uncertain processes, leading them to have certain discretion about how they serve customers and carry out related duties. While frontline service employees' discretion (or autonomy) is what differentiates them from their back-office counterparts (Safizadeh et al., 2003) and their behavior cannot be monitored, it creates a risk that their behaviour may deviate from the firm's expectations when there are conflicting goals between frontline employees and their firms.

The improvement efforts or resulting changes of OIC emphasize improving operational performance with respect to cost, quality, flexibility, etc. (Peng et al., 2008). Nonetheless, frontline service employees have to be responsible for not only operational performance, but also marketing performance. Indeed, they often play the role of the part-time marketer as they have to explain to customers the attributes of services and to get customers enthused about the firm and its services (Bowen and Ford, 2002). Compared with operational performance, marketing performance often plays a dominant

role in top-management's decisions in service firms (Webster, 1981). To achieve better marketing performance, many service firms develop employee reward systems where sales performance is an important element for frontline employees (Kurland, 1991), thereby causing frontline service employees to be highly concerned with their sales performance. In contrast, OIC is concerned with improving operational performance, and its related activities (e.g. improvement projects) may absorb resources (e.g., manpower, time, etc.) that can otherwise be used for serving customers and achieving sales results. Consequently, as frontline service employees' personal goals and those of OIC can be in conflict, such employees are less likely to use OIC to improve operational performance when they have certain discretion to decide what to do.

Study 1 focuses on examining the performance implications of OIC in service firms by using data from frontline employees of banks in China. Firstly, we test the association between OIC and operational performance. Secondly, we draw on the recent OM literature and agency theory to argue that operations control can enhance the effectiveness of OIC in service firms. Operations control is about moderating and restricting employee behaviours through exercising mechanisms such as organizational culture, structure, systems, policies, and procedures (Abernethy and Stoelwinder, 1995). Using agency theory as the theoretical lens, we propose that operations control helps provide behavioural information and enhance task programmability regarding frontline service employees' participation in applying OIC, thereby reducing the threat of agency problems of moral hazards and adverse selection (Eisenhardt, 1989). Therefore, operations control can lead frontline service employees to lower their discretion levels and follow guidelines to perform OIC activities, thereby improving the effectiveness of

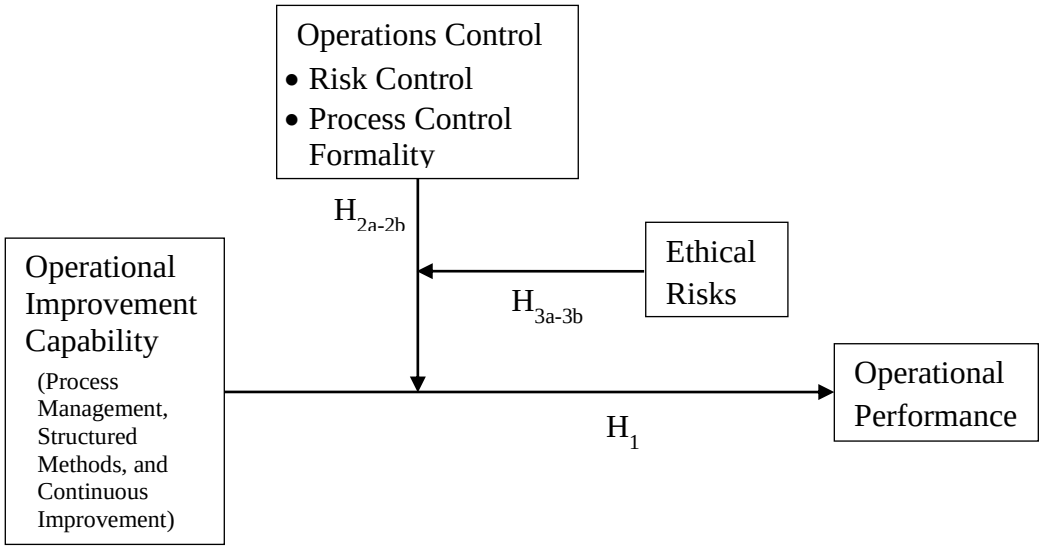
OIC in service firms. However, operations control has potentially negative impacts on firms because it makes firms bureaucratic and inflexible, and restricts employees' innovative and entrepreneurial behaviour (Goodale et al., 2011). Thus, firms have to take extra caution when imposing operations control. To offer additional insights in this respect, we argue that the moderating effect of operations control on OIC effectiveness is particularly significant when ethical risk is a threat in the environment. Ethical risks refer to the possibility that individual behaviour deviates from generally accepted moral norms (Treviño et al., 2006). When ethical risks are perceived significant in a service firm, some frontline employees may achieve extraordinary sales results by undertaking unethical selling practices (e.g. misrepresenting investment products). According to the agency theory, such extraordinary sales results aggravate the goal conflict between frontline service employees and OIC (Eisenhardt, 1989), leading professionals to make minimal contribution to OIC application. Thus, high level of ethical risks are the circumstance under which operations control must be in place to reduce behavioural deviation in employees and facilitate OIC to achieve improved operational performance.

The objectives of this study are to examine 1) whether or not OIC is positively associated with operational performance; 2) whether or not operations control positively moderates the association between OIC and operational performance; and 3) whether or not the moderating effect of operations control on the association between OIC and operational performance is particularly significant when there are significant ethical risks in service firms. Using the data collected from 146 frontline teams in the banking industry of China, we test our posited hypotheses (see Figure 4-1) by using statistical methods such as confirmatory factor analysis and hierarchical regression analysis. The

central contribution of this study lies in its use of a micro-level perspective to examine the intricacies among a management approach (i.e. OIC) relevant to service firms, service employees (i.e. frontline employees) who need to implement activities with the approach, and the peculiar characteristics of this type of employees (e.g. knowledge intensity, discretion). Specifically, our findings are helpful to practitioners by offering specific guidelines on how they can capitalize on their investments in OIC more effectively through paying attention to operations control and ethical risks. We contribute to the literature on service operations management by providing evidence to support the assumption that the implementation of OM practices in service operations may require extra consideration when addressing the possible contradiction between the practice concerned and the peculiar characteristics of this operational context.

Figure 4-1

The Conceptual Model of Study 1



4.2 Hypothesis development

4.2.1 Operational improvement competence and operational performance

The internal and external environments of service firms are rapidly changing. The major reasons behind the changes include advancement in the knowledge of service operations, evolving of Internet-based business models, complicated service products and processes, globalization of services, heterogeneity and complexity of customer demands in multiple channels, and entry of non-traditional competitors (Roth and Menor, 2003). As such, the research framework of Roth and Menor (2003) suggests that one key element in service firms should be about learning and adaptive mechanisms. OIC as frontline teams' ability to apply systematic improvement methods can help service firms identify inefficient operational routines, cope with complicated customized requirements and uncertain operational environment, which enhances the adaptive mechanisms and organization learning of service firms (Choo et al., 2007). Through skilled and well-educated frontline teams applying OIC to relevant activities such as customer interviews or improvement projects, they can achieve a higher level of mastery of their operations, thereby enhancing their ability to effectively carry out daily duties and cope with changes. Specifically, the three aspects of OIC (i.e. continuous improvement, process management and structured methods) can improve the effectiveness and efficiency of operational processes. Continuous improvement helps employees have positive improvement attitudes towards adaptation to the constantly changing environment. Process management offers some statistical or quantitative techniques to identify interrelated and repetitive processes, thereby achieving low-cost service operations. Structured methods guide employees to follow specific steps to

identify and diagnose problems, and generate and implement solutions. In addition, processes related to frontline service operations are not only about production processes, but products as well. Consider a consultation session involving a financial advisor of a bank. The session is a service process and involves products as well. Therefore, while OIC mainly improves production processes for manufacturing firms, it improves both production processes and products for service firms. Finally, we propose the following hypothesis:

H1: Operational improvement capability is positively associated with the operational performance of frontline teams in service firms.

4.2.2 Operations control with moderating effects

As discussed before, frontline service employees often have discretion in their daily activities, implying that such employees have the power to decide and act according to their own judgment in carrying out their duties (e.g. customer services and process improvement activities). Furthermore, while OIC focuses primarily on improving operational performance, frontline service employees' personal reward systems tend to place a limited emphasis on operational performance but partly depend on their sales performance. The use of OIC in service operational processes may be limited, if relevant control to suppress frontline employees' discretion is absent. Organizational control refers to mechanisms or processes designed to regulate and supervise an organization's employee activities and outputs, and its typical mechanisms include authority structures, rules, policies, standard operating procedures, budgets, and reward and incentive systems (Abernethy and Stoelwinder, 1995). Operations control refers to the use of some such mechanisms to moderate and restrict employee activities

in operations (Goodale et al., 2011). When operations control is in place in a service firm, frontline employees' discretionary behaviour is likely be suppressed. Thus, they are more likely to follow guidelines from their superiors on process improvement, thereby using OIC more effectively.

Employing the agency theory as the theoretical lens, we can gain a deeper understanding of why operations control enhances OIC's effectiveness. Goodale et al. (2008) offer evidence for the relevance and validity of the agency theory to service firms. In the setting of a service firm with regard to the OIC pursuit, goal conflict occurs between frontline employees as the agents and the OM manager (or the leader of a service team) as the principal, because employees tend to be concerned with their sales performance, whereas OM manger is concerned with operational performance. Also, because of intangible and complicated service processes, immeasurable service outcomes and unmonitored employee behaviour, it is difficult for the principal to determine if the agents perform their best in carrying out the OIC relevant activities. Under the circumstance with goal conflict and information asymmetry, agency problems arise (i.e. moral hazards with the agent focusing on only self-interest and adverse selection with the principal rewarding employees without OIC contribution), which can lead to frontline employees' reduction in their support for OIC activities. According to Eisenhardt (1989), agency problems can be addressed by aligning the contract of the agent (i.e. behaviour-based vs. outcome-based contracts) with certain variables appropriately. In the setting of service firms, frontline professionals' performance with regard to OIC is likely to be assessed based on their behaviour in related activities, implying the use of a behaviour-based contract for them. When operations control is in

place, there are likely some control mechanisms leading to clearer guidelines on performing OIC activities and more information on employees' behaviour, which changes two relevant variables, namely task programmability and information systems. These relevant control mechanisms result in a better alignment with the use of behaviour-based contracts and alleviate possible agency problems (Eisenhardt, 1989), which partly explains why operations control can enhance the effectiveness of OIC in service firms.

To more precisely manifest operations control in firms, we follow the approach of Goodale et al., (2011) by involving two constructs, namely risk control and process control formality. Risk control means a proclivity for making low-risk changes and decisions, while process control formality means a structured work environment that focuses on following formally prescribed processes to reduce uncertainty in the performance of tasks in the operational environment. Goodale et al. (2011) argue that operations control, comprising risk control and process control formality, can facilitate entrepreneurship to achieve innovation performance. Risk control is considered one of the major factors in the differences between conservative and entrepreneurial firms (Miller and Friesen, 1982). The notion of process control formality is based on Khandwalla (1976 & 1977), which explores the differences between organic and mechanistic structures. In fact, the concepts of risk control and process control formality imply that they are pertinent to control effects resulting from mechanisms influencing the attitudes of employees and the influencing actions of processes. By considering the complexity of frontline employees and processes of service firms, operations control consisting of risk control and process control formality is relevant in this context.

Taking together with the argument that operations control can enhance the effectiveness of OIC among frontline service professionals, we propose the following hypotheses:

H2a: Risk control positively moderates the association between OIC and the operational performance of frontline teams in service firms.

H2b: Process control formality positively moderates the association between OIC and the operational performance of frontline teams in service firms.

4.2.3 The interaction among OIC, operations control and ethical risk

Operations control restricts employees' innovative and entrepreneurial behaviour and it can be costly for firms to build control mechanisms (Goodale et al., 2011). We intend to offer insights into the circumstances under which operations control is particularly important for OIC to achieve its expected outcomes. Ethical risks refer to the possibility that individual behaviour deviates from generally accepted moral norms (Treviño et al., 2006). Frontline service employees can be expected to be part-time marketers in that they participate in selling activities on a daily basis (Bowen and Ford, 2002). Wood (1995) argues that many service employees serve customers under little supervision and substantial financial rewards are often given for their sales performance, thereby tempting them to achieve superior sales performance by behaving unethically. Lee et al. (2009) offer detailed insights into a wide range of unethical practices that sales employees may commit. Watson (2011) suggests that it can be particularly problematic when the products involved are complicated (e.g. investment and insurance products). In order to achieve sales performance, service employees may sell unsuitable amounts of financial products by exploiting customers' lack of financial knowledge. He argues that the absence of customer complaints, ease of imitation of mis-selling practices, and

competitive pressure in the industry cause such practices to spread rapidly among teams and firms in the industry. Consequently, it poses a significant threat to service firms whose frontline employees may undertake unethical practices.

When some frontline service employees can gain exceptionally high levels of personal benefit through undertaking unethical selling practices (e.g. misrepresenting financial products), they may exercise discretion to ignore OIC duties and concentrate their efforts on selling activities. According to the agency theory, the conflicting goal between the agent and the principal is one root cause leading to the agency problem of moral hazards (Eisenhardt, 1989). Exceptional levels of sales performance may aggravate the goal conflict between OIC and frontline service professionals, leading the latter to make minimal contribution to the pursuit of OIC. Therefore, when there is a significant threat of frontline service employees' committing unethical practices, operations control is particularly important for firms to heighten task programmability and gather more behaviour information in order to suppress service employees' discretion and enhance the effectiveness of OIC (Eisenhardt, 1989). Taking together with the argument that operations control is manifested through risk control and process control formality, we propose the following hypotheses:

H3a: Ethical risks positively moderate the relationship between OIC, risk control, and the operational performance of frontline teams in service firms. The positive interaction between OIC and risk control is more highly significant when there are high levels of ethical risks in this context.

H3b: Ethical risks positively moderate the relationship between OIC, process control formality, and the operational performance of frontline teams in service firms. The positive interaction between OIC and process control formality is more highly significant when there are high levels of ethical risks in this context.

4.3 Data analysis and results

Table 4-1 shows the means, standard deviations, and correlations of all the variables. Operational improvement competence is significantly correlated with the operational performance ($r = 0.39$, $p < 0.01$). Thus Hypothesis 1 is supported.

Table 4-1

Means, Standard Deviations, and Correlations among Variables in Study 1

Variables	Mean	S.d.	1	2	3	4	5	6	7	8
1.Education	2.11	.37								
2.Age	1.36	.34	- .04							
3.Ownership	1.45	.89	.04	- .01						
4.Department	2.88	.80	-1.11	.19*	.09					
5.Operational improvement capability	5.43	.81	.01	.17*	- .12	.10				
6. Risk control	5.44	.87	- .10	.06	- .15	.01	.35**			
7.Process control formality	5.68	1.09	- .17*	.09	- .19*	. 23**	.19*	.44**		
8.Ethical risk	5.98	.76	.01	.22**	.05	.05	.47**	.16	.08	
9.Operational performance	5.48	1.04	- .02	.13	- .15	-.01	.39**	.24**	.25**	.27**

*p<0.05 **p<0.01

Before employing hierarchical regression analysis to test our hypotheses, we conducted several analyses to ensure the assumptions of this technique are met. First, we examined the multicollinearity level. Table 4-1 shows that all the coefficients of the correlations between any two variables are much less than 0.80 and the variance inflation factors (VIF) of all our regression models (see Table 4-2) are less than 10. These results meet the requirements recommended by Belsley et al. (1980) and Hair et al. (1998). Second, we examined three general regression assumptions, namely normality, outliers and dependency, by using Q-Q plots. We followed the guidelines of

Neter et al. (2004) to inspect the results and found that all the constructs examined are normally distributed and have no obvious outliers. Finally, we calculated the cook distance values for all our regression models. The results suggest that all the values computed are below 1, suggesting that our regression results are not significantly impacted by multivariate outliers (Cohen et.al, 2003). Taken together, the results suggest that when using regression models to analyze our data, no major assumptions of this technique are violated. In Hypotheses 2a and 2b, we stipulated that risk control and process control formality moderate the relationship between OIC and operational performance. We estimated interaction effects in the regression model by using cross-product terms and they were entered separately to avoid multicollinearity (Gopal et al., 2013). Table 4-2 shows the regression results where the *F* values in all the six models are highly significant ($p < .01$). To test Hypothesis 1, we regressed the independent variable (OIC) on the dependent variable (operational performance) in Step 2 after entering all the control variables in Step 1 in Model 2 (see Table 4-2). The results indicate that OIC is positively and significantly associated with operational performance ($\beta = 0.368$, $p < .01$), supporting Hypothesis 1.

Table 4-2

Hierarchical Regression Results for Hypotheses 1-3 in Study 1

Dependent variable Operational performance	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Step 1: Control variables						
Education	-.007	-.016	-.001	.016	- .008	.002
Age	.136	.081	.075	.060	.068	.041
Ownership	.142^{+}	-.096	-.096	-. 072	- .097	- .063
Department	-.024	-.055	-.045	- .068	- .044	- .066
Step 2: Independent variable						
Operational improvement capability		.368**	.334**	.335**	.271**	.331**
Moderating variables						
Risk control			.137		.046	
Process control formality				.203*		.135
Ethical risk					.096	.097
Step 3: Two-way moderator effect						
Operational improvement capability*risk control			.099		.124	
Operational improvement capability* process control formality				.160*		.219*
Operational improvement capability*ethical risk					.100	.020
Risk control* ethical risk					.128	
Process control formality*ethical risk						- .046
Step 4: Three-way interaction						
improvement capability*risk control*ethical risk					.300*	
improvement capability*process control formality*ethical risk						.191^{+}
F	1.437	5.657**	4.530**	5.689**	3.785**	4.481**
R^2	.039	.168	.187	.224	.237	.269
ΔR^2	…	.129	.019	.037	.013	.032

$+p < 0.1$. $*p < 0.05$ $** p < 0.01$

Adding the interaction term of OIC and risk control to Model 3 in Step 3, we obtained a non-significant coefficient of the interaction term, which does not support Hypothesis 2a, indicating that risk control does not moderate the relationship between OIC and operational performance. In Model 4 we added the interaction term of OIC and

process control formality. The standardized β coefficient of the interaction term is significant (β = 0.160, $p < 0.05$), indicating that process control formality significantly and positively moderates the positive relationship between OIC and operational performance. In addition, there is a significant increment in R^2 (0.056) in Model 4 versus Model 2. Thus, Hypothesis 2b is supported.

In Models 5 and 6, we tested Hypotheses 3a and 3b by using hierarchical moderated regression analysis in which we entered predictor variables in the following steps: (1) control variables; (2) independent variables and moderator variables; (3) three two-way interaction terms; and (4) three-way interaction terms. As shown in Table 4-2, in Step 4, the three-way interaction coefficients (β = 0.300, $p < .05$; β = 0.191, $p < 0.1$) are significant and positive. In addition, Models 5 and 6 account for a significant amount of variance in the dependent variable (R^2= 0.237; R^2 = 0.269) that are above the amount explained by the two-way interactions in Models 3 and 4 (R^2 = 0.187; R^2 = 0.224). Thus, the results support Hypotheses 3a and 3b.

We used the procedures of Aiken and West (1991) and Dawson and Richter (2006) to further examine the significant three-way moderating effects in our analyses. Figure 4-2 shows the effectiveness of OIC in four scenarios pertinent to high and low levels of risk control and ethical risks, respectively. It is evident that when both ethical risks and risk control are at high levels, OIC is particularly effective in improving operational performance. A slop difference test between the slops of Line 1 and Line 3 in Figure 4-2 (Dawson and Richter, 2006) also indicates that OIC has a significantly greater positive impact on operational performance when it is in a high ethical-risk environment and risk control changes from low to high levels (t = 2.288; $p < 0.05$).

Similarly, Figure 4-3 depicts that OIC is most effective in improving operational performance when both process control formality and ethical risks are at high levels. The slop different test between Line 1 and Line 3 in Figure 4-3 also suggests that OIC has a greater influence on operational performance when it is in a high ethical risk environment and process control formality changes from low to high levels ($t = 3.068$; $p < .01$). These results provide extra evidence to support Hypotheses 3a and 3b.

Figure 4-2

Effects of Three-Way Interaction of Risk Control and Ethical Risks on the Relationship between Operational Improvement Competence and Operational Performance

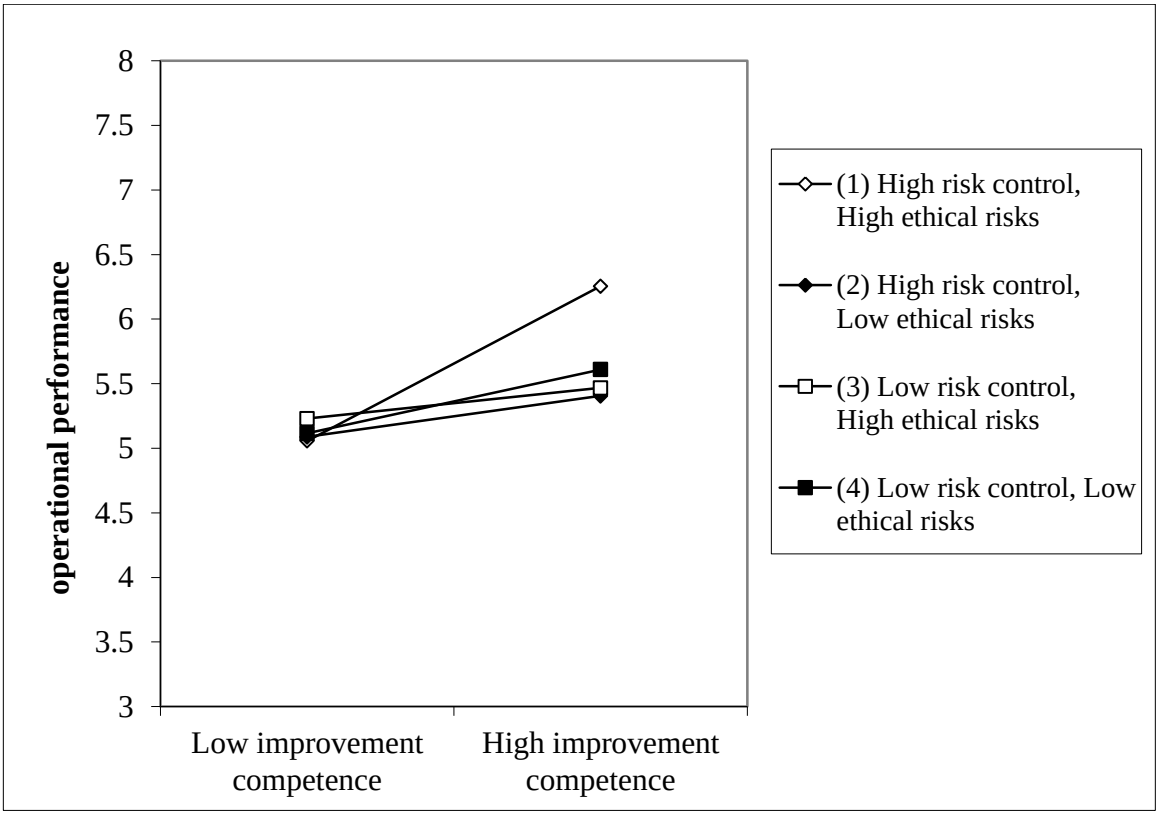
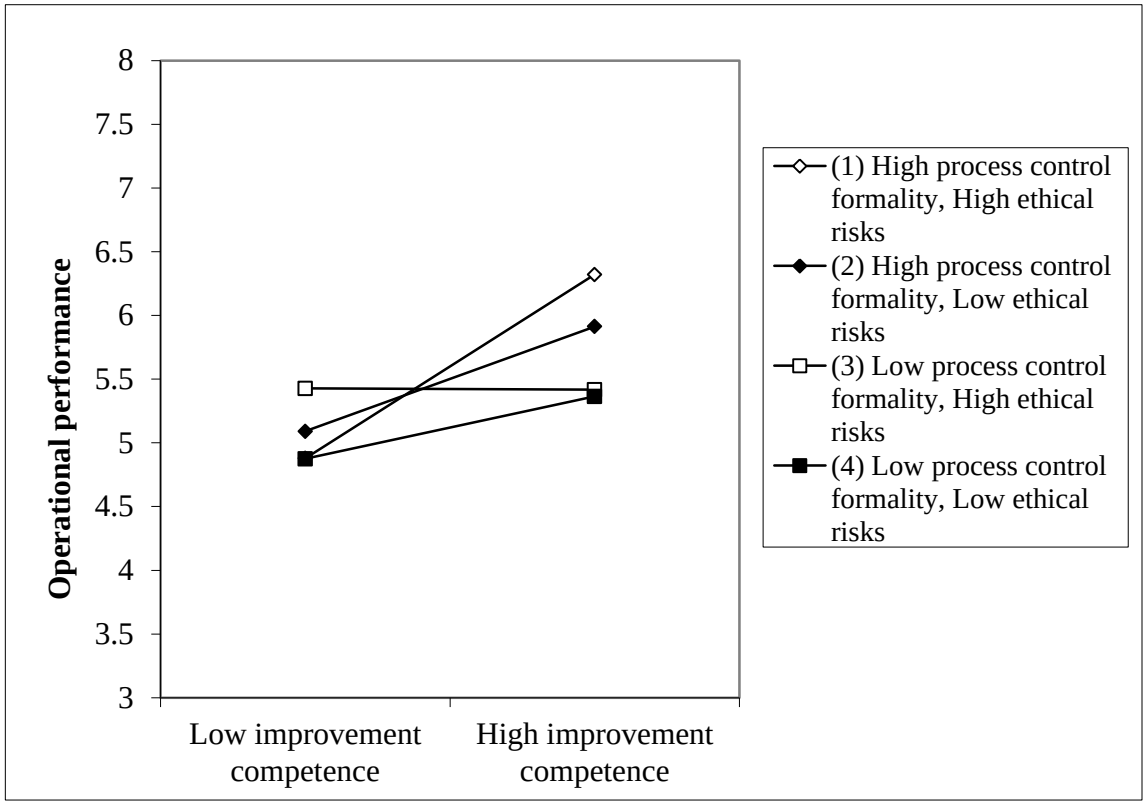


Figure 4-3

Effects of Three-Way Interaction of Process Control Formality and Ethical Risks on the Relationship between Operational Improvement Capability and Operational Performance



4.4 Discussion and conclusion

4.4.1 Discussion and theoretical implication

This study examines the effectiveness of operational improvement competence (OIC) on operational performance in service firms from a frontline employee perspective. OIC is a crucial resource and reflects frontline teams' abilities to use bundles of systematic practices to improve operational activities incrementally. To date, the literature on operational capability has only offered insights into the constituent continuous improvement practices and infrastructural elements (Choo et al., 2007; Peng

et al., 2008; Anand et al., 2009), while the literature on service firms has only examined the distinct characteristics of this context and the challenges to the operations management of such firms (Von Nordenflycht, 2010; Lewis and Brown, 2012). While the research framework of Roth and Menor (2003) highlights learning and adaption mechanisms are as a core element for service firms, research offering insights into studying the effectiveness of continuous improvement in service firms from a frontline employee perspective is scant. In this study we argue that, to leverage OIC to achieve operational excellence in service firms, extra attention should be paid to frontline employees. A number of relevant and inter-related characteristics, such as complicated services, goal conflict, monitoring difficulty, information asymmetry and job autonomy, can cause such employees to offer limited contribution to OIC activities. Excluding strategic-level practices (e.g. leadership) and technology-related practices (e.g. equipment development) from operational capability in this study, we are concerned with three operational-level practices (i.e. process management, structured methods, and continuous improvement) whose effectiveness hinges on the contribution of operational-level employees. Using data collected from 146 frontline teams in the banking industry of China, we examine if OIC positively impacts the operational performance of our sample teams. We also examine if the effectiveness of OIC significantly enhances when operations control is in place. Finally, we test if high levels of ethical risks represent a circumstance under which operations control is particularly effective in enhancing the effectiveness of OIC. The findings suggest that, except for one hypothesis about the moderating effect of one of the constructs of operations control (i.e. H2a), all the hypotheses are supported.

Our findings support Hypothesis 1, which confirms that OIC improves the operational performance of service firms. This result supports the assumption that, while there are challenges in the implementation of systematic improvement efforts (e.g. Six Sigma) in service operations, such efforts can improve service operations effectiveness (Antony et al., 2007). We may partly attribute the effectiveness of OIC in service firms to the professional skills of frontline employees who participate in OIC activities. Through the systematic methods of OIC (e.g. a DMAIC project or a fish-bone diagram), such employees can be more effective in spotting critical operational problems or figuring out their root causes. They can also be more efficient in adapting to changes in procedures and technologies than manufacturing operational employees (Lee et al., 2010). However, the current knowledge of improvement practices in the OM literature tends to assume that the participants of improvement practices are workers in manufacturing operations. Thus, to unleash the intellectual powers of frontline service professionals, some new improvement methods that fit the dynamic service environment and the knowledge intensity in the workforce should be developed.

Hypotheses 2a and 2b are concerned with the moderating effect of operations control on the association between OIC and operational performance. Operations control is manifested by two constructs in this study, namely risk control and process control formality. Our results of H2a and H2b suggest that while process control formality significantly and positively moderate the positive relationship between OIC and operational performance, such a moderating effect in risk control is not significant. In this study, risk control reflects our sample teams' risk proclivity in making changes and decisions, which should be moulded by mechanisms (e.g. missions) that control the soft

aspects (e.g. employee attitudes) of firms. On the other hand, process control formality has a clear focus on nurturing structured behaviours in processes, which are likely the results of mechanisms such as standard operating procedures. Thus, our findings imply that when control mechanisms relating to process implementation are in place, frontline service employees perform better in discharging their OIC duties. Nonetheless, such employees do not respond well to control mechanisms relating to the soft aspects of their firms when participating in OIC activities. One plausible reason for such findings is the self-regulation (or professional control) feature of employees in the banking industry. According to Von Nordenflycht (2010), self-regulation is an institutional feature of professionalization, which means that a professionalized occupation has strong control over the practice of the occupation. It is an external form of control because it stems from the social environment imposed by peers of the same professional group (Orlikowski, 1991). External professional groups use their codes of ethics, as well as less explicit norms, to define appropriate behaviours for their professionals (Von Nordenflycht, 2010). For instance, in the banking industry of China, the China Banking Regulatory Commission has formal administrative control over bank professionals and influences their behaviours. In this study, risk control is the consequence of control mechanisms relating to the soft aspects of the firm. Since the effect of such soft-aspect control mechanisms inside the firm may overlap with that of the professionals' self-regulation imposed from the institutional environment, risk control has little impact on the behaviours of frontline service professionals, which explains the rejection of H2a. Finally, the finding of a significant and positive moderating effect of process control formality on OIC's effectiveness implies that more nuanced insights into the effects of

various process-oriented control mechanisms (e.g. standard operating procedures, incentive schemes, monitoring and report system) on frontline service employees' participation in OIC are needed.

The results of our hypotheses relating to ethical risks (i.e. H3a and H3b) suggest that when ethical risks are high, the moderating effects of operations control on both risk control (H3a) and process control formality (H3b) become more effective in enhancing the association between OIC and operational performance. Figure 4-2 presents more evidence by showing that Line 1 and Line 3 are situations with high levels of ethical risks. When risk control increases from low levels in Line 3 to high levels in Line1, OIC's effectiveness in improving operational performance increases as well, as shown by the steeper slope of Line 1. Figure 4-3 provides similar evidence by showing that Line 1 and Line 3 are situations with high levels of ethical risks. When process control formality increases, the effectiveness of OIC in improving operational performance increases as well. These figures imply that, when ethical risks are a significant threat to service firms, operations control with respect to both risk control and process control formality must be in place to curb the potential unethical behaviours of service employees and prod them into carrying out their duties in processes and OIC. The major implication is that since there are service firms facing the threat that their frontline employees may pursue unethical behaviours, researchers should offer more detailed insights into the types of control mechanisms that can curb the unethical behaviours of frontline employees in this context. The current literature on business ethics has amassed a significant body of knowledge on employees' ethical behaviours in general organizations (e.g. Treviño, et al., 2006). However, future relevant research on service

operations should pay extra attention to these firms' peculiar characteristics in order to generate more insights.

4.4.2 Managerial implication

First, OM managers in service firms need to be aware of the strategic importance of operational improvement competence in operational performance. While their service processes may not be as certain as those of manufacturing firms, they can still apply some relevant practices (e.g. Antony et al., 2007) to their particular environments for enhancing operational performance. Furthermore, OM managers or frontline managers of service firms should understand that they manage a knowledgeable and skilled workforce that provides an important intellectual asset for their firms. These frontline employees have expertise in procedures they implement and customers they serve. Managers should not waste such a valuable asset, but try using different means to gather, share, and utilize employees' knowledge for achieving improved operational performance and customer services. Second, operations control should be in place to supplement OIC activities. When designing operations control, managers in service firms may pay attention to their frontline employees who may or may not be influenced by their profession's institutional environment. If there is a professional body that uses the codes of conduct and widely accepted norms to regulate the behaviour of its members, service firms can focus on developing mechanisms that control frontline employees' work procedures within their firms. Third, managers have to take steps to assess the threat of ethical problems with their frontline employees. Then they can consider what forms of control mechanisms can effectively curb the unethical behaviour of frontline employees and prod them into carrying out their duties in service processes

and OIC. Finally, the conflict between the goal of OIC and the personal goal of frontline professionals is a likely root cause for a lack of effectiveness of OIC in service firms. Therefore, managers may need to resort to human resources policies (e.g. balanced appraisal systems) to partly address this root cause.

Chapter 5 Study 2- OIC, employee creativity and new service development performance

In this chapter, we mainly focus on new service development (NSD), an importance source of competitive advantage, which is widely used by service firms to develop new services. Since creative ideas are crucial to NSD and it is common that service firms involve frontline employees in the process of NSD, we argue that frontline employees' creativity enhances NSD performance. In addition, since the implementation of continuous improvement practices necessitates frontline employees to make changes and solve problems constantly, we argue that frontline employees' operational improvement competence (OIC) (i.e. skills in implementing continuous improvement practices) enhances their creativity. Furthermore, we draw on the contingency theory to argue that the relationships between OIC, employee creativity, and NSD performance are contingent on six relevant contextual factors. Our findings advance the knowledge of multiple disciplines by showing the linkages among their core concepts (i.e. OIC, employee creativity, and NSD performance) and also contribute to managerial practices by ascertaining the factors (i.e. OIC and employee creativity) that enhance NSD performance and the circumstances under which these factors are particularly effective.

5.1 Introduction

New service development (NSD) is defined as innovations in new services or service procedures that achieve efficient operations and superior performance (Agarwal et al., 2003). In response to the challenges posed by service globalization, intense

market competition, and heightened customer expectations, service firms increasingly employ NSD as a competitive driver to enhance profits, attract new customers, open new market opportunities, and improve customer loyalty (Storey and Easingwood, 1999; Menor et.al, 2002; Agarwal et al., 2003). However, the current literature suggests that NSD often leads to small changes in services and procedures, making imitation easy for competitors (De Jong and Vermeulen, 2003). In the literature, service scholars long recognize that frontline employees can provide valuable contributions to NSD because they often possess specific and hands-on knowledge of complicated service procedures and ever-changing customer needs (Kindström and Kowalkowsk, 2009; Nijssen et al., 2006). In practice, more and more service firms (e.g. banks, airline companies etc) involve frontline employees in NSD-related programmes (Lee et al., 2013; Heracleous et al., 2004; Lovelock and Wirtz 2007). For example, Singapore Airlines rely on their frontline employees to develop a series of successful service innovation initiatives such as the Short Message Service (SMS) check-in, "Outstanding service on the ground" programme and "Book the cook", which are important service elements supporting the airline to consistently outperform its competitors (Heracleous et al., 2004; Lovelock and Wirtz 2007). However, the extant studies of NSD rarely use a frontline employee perspective to examine how NSD performance can be enhanced. In this study, we use a frontline employee perspective to argue that creativity in frontline employees helps enhancing NSD performance. Specifically, if frontline employees can creatively apply their knowledge to the service procedures and customer needs in the NSD process, they can help achieve innovation in NSD, leading to overall superior NSD performance.

Thus, one major aim of this study is to examine if there is a link between frontline service employees' creativity and NSD performance.

Although employee creativity may help achieve better NSD performance, the current research on employee creativity primarily focuses on psychological factors or HRM practices (e.g., Tierney and Farmer, 2004 & 2011; Lopez-Cabrales et al., 2009). In the literature on operations management (OM), while frontline employees have been recognized as a crucial element of service operations (Wageman, 1997; Batt, 1999; Lee et al., 2013), there is an apparent lack of in-depth study on the development of creativity in such employees. In this study, we argue that continuous improvement is a relevant OM approach conducive to creativity development in frontline employees of service operations because it emphasizes making constant enhancements in operations. There is evidence that the experience of making changes and improvements promotes employees' creative thinking, and helps them identify opportunities and create new ideas (Montgomery and Woodall, 2008; Hoerl and Gardner, 2010). Therefore, we predict that when frontline service employees are competent in implementing continuous improvement practices, they are likely to be more creative. Operational improvement competence (OIC) as service employees' abilities to use relevant improvement practices (i.e. process management and structured method) may improve operations continuously. Consequently, we examine if OIC has a positive impact on the creativity of frontline service employees.

The above discussion argues that OIC and frontline employee creativity are factors indirectly or directly leading to improved NSD performance in service operations. These arguments are consistent with the resource-based view (RBV) theory.

The RBV suggests that the competitive advantage of a firm lies primarily in the application of a bundle of valuable resources at the firm's disposal (Barney, 1991). Viewed from the theoretical lens of RBV, OIC and employee creativity should be valuable resources, because they are congruent with the guidelines that valuable resources should be rare, in-imitable, uncommon, non-transferable and non-substitutable (Crook et al., 2008). Also, such valuable resources (aka OIC and employee creativity) should help a service firm to offer better values (e.g. efficient and innovative services) to its customers and achieve a specific form of competitive advantage, namely NSD performance, which also suggests that our efforts to investigate OIC and employee creativity impact on one relevant competitive advantage – NSD performance.

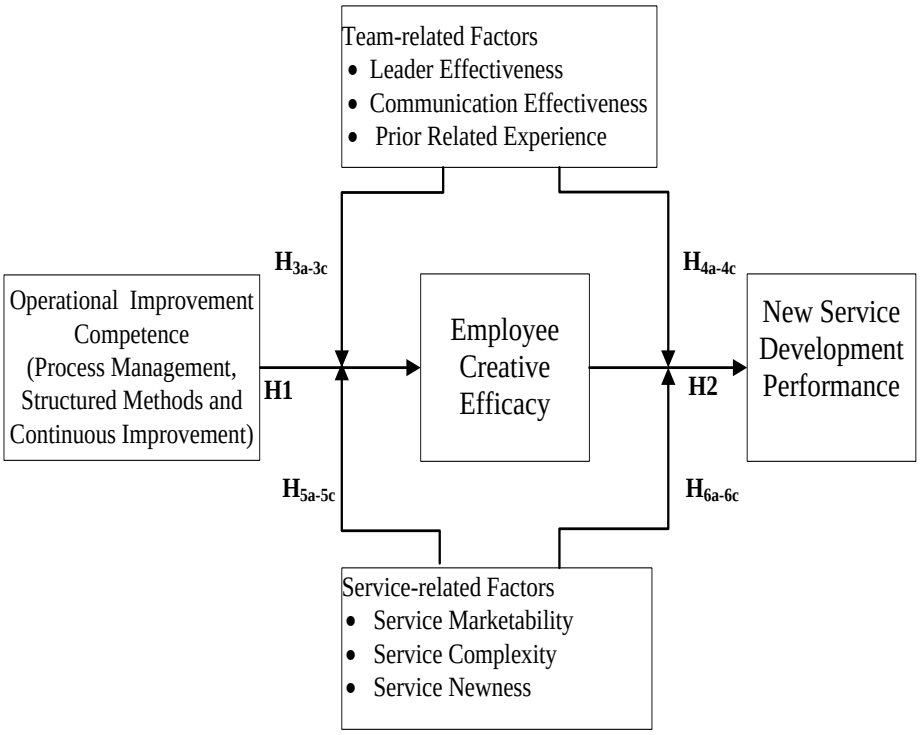
Although OIC and creativity in frontline service employees are important for service firms to achieve superior NSD performance, developing OIC and creativity in frontline employees are a novel attempt for many service firms. Indeed, OIC and employee creativity are unlikely to be universally effective in all service settings. To offer service firms relevant insights, we further examine the circumstances under which frontline employees' OIC and creativity are particularly important. We draw on the contingency theory to identify two groups of factors, namely team-related factors and service-related factors (Tosi and Slocum, 1984). Specifically, team-related factors comprise leadership effectiveness, communication effectiveness, and prior related experience, whereas service-related factors embrace service marketability, service complexity, and service newness. Through examining the moderating effects of these factors, we are able to identify the favorable circumstances under which OIC is

particularly effective in enhancing employee creativity, and employee creativity is particularly effective in enhancing NSD performance.

The objectives of this study are to examine whether or not 1) OIC enhances employee creativity (i.e. employee creative efficacy); 2) employee creative efficacy enhances NSD performance; 3) team-related factors positively moderate the relationships between OIC, employee creative efficacy, and NSD performance; and 4) service-related factors positively moderate the relationships between OIC, employee creative efficacy, and NSD performance in frontline service teams. In this study, frontline service teams refer to high-contact service teams with their members working with customers to create customized services and participating in activities of service development or improvement (e.g. Yee et al., 2008; 2013). Using data collected from 146 frontline teams in the banking industry of China, we statistically test our posited hypotheses (see Figure 5-1). Integrating the concepts of NSD, employee creativity, and continuous improvement from multiple disciplines, this study contributes to knowledge advancement by establishing the links among the core concepts from different disciplines (i.e. OIC, employee creativity, and NSD performance). This study also contributes to practice by providing service firms with managerial insights into the factors (i.e. OIC, employee creativity) that enhance NSD performance and ascertaining the circumstances under which these factors are particularly effective.

Figure 5-1

Conceptual model



5.2 Hypothesis development

5.2.1 Relationships between OIC, creative efficacy, and NSD performance

According to the literature on creativity, there are three main determinants to the development of creative efficacy, which are 1) creative role identity; 2) creative requirement; and 3) creative expectation (Tierney and Farmer, 2011). This study is concerned with high-contact frontline employees who participate in service improvement or design activities. Thus, when a firm is committed to developing OIC in frontline employees, employees have to regularly participate in improvement activities (e.g. quality meetings, improvement projects). Through such activities, frontline employees are aware that initiating and implementing new or creative ideas is part of

their job, thereby generating creative role identity among them. Also, two of the major aspects of OIC are process management and structured methods. When frontline employees apply process management techniques or structured methods to the improvement in services, they may have to resolve some unprecedented problems (e.g. an increasing number of customer complaints) and use specialized techniques (e.g. analyzing interview results by a fish-bone diagram) to identify the root causes behind problems. To complete such challenging tasks effectively, frontline employees may need using their creativity to find new ways of examining problems, thereby generating creative requirement. Finally, the third aspect of OIC is a continuous attitude, meaning that frontline employees with high levels of OIC should understand that initiating and implementing new ideas is not short-term, but part of their daily duty, thereby generating creative expectation among them. Therefore, we propose that through generating the three main determinants of creative efficacy (i.e. creative role identity, creative requirement, and creative expectation), OIC has a positive impact on the development of creative efficacy in frontline service employees. Consequently, we postulate the following hypothesis:

H1: Operational improvement competence (OIC) is positively related to employee creative efficacy in frontline service teams.

NSD performance comprises two elements, namely marketing performance and operational efficiency (Melton and Hartline, 2013). The element of marketing performance partly depends on frontline employees' creative thinking and novel ideas to propose new service concepts to meet customer requirements and build customers' trust and confidence in new services (Zeithaml et.al, 1990). Also, some researchers have

criticized that NSD often leads to small changes in services and procedures, inducing competitors to imitate new services (De Jong and Vermeulen, 2003). With creative inputs from frontline teams, service firms should be able to develop more innovative new services, thereby reducing imitation by competitors and enhancing marketing performance. Operational efficiency partly depends on how frontline teams use their creativity to come up with new and efficient service procedures (Zhou and Shalley, 2003). In addition, frontline teams' creativity has a positive influence on the ways they deal with changes (Baer and Oldham, 2006) and learn necessary new skills (Gibson and Vermeulen, 2003), thereby helping frontline teams to implement new service procedures more efficiently. Since frontline service teams' creativity can enhance the two elements of NSD performance (i.e. marketing performance and operational efficiency), we propose the following hypothesis:

H2: Team creative efficacy is positively related to new service development (NSD) performance in frontline service teams.

5.2.2 Team-related moderating factors

We identify leader effectiveness, communication effectiveness, and prior related experience as the potential team-related moderating factors in this study. Effective team leaders set clear goals and envision a promising future to motivate members to develop inspirations, enhance their commitment, generate new ideas, explore new directions, and change the status quo (Cheung and Wong, 2011). So, when a service team has members with high levels of OIC, an effective leader can influence members to be more committed to initiating and making changes to improve operations. Because of increased improvement activities, members should have more opportunities to develop

their creativity, which implies that leader effectiveness has a positive moderating effect on the relationship between OIC and creative efficacy among frontline service employees. Nonetheless, creative frontline employees may not be willing to use their creativity in NSD activities. However, if a team leader is effective, he should be able to recognize the importance of creativity in NSD and motivate team members to apply their creativity to NSD activities. Because their team leader's motivation, members are more likely to apply their creativity to NSD activities, thereby enhancing the NSD performance. Consequently, we argue that leader effectiveness has a positive moderating effect on the relationship between creative efficacy and NSD performance among frontline service employees.

Communication effectiveness refers to the formal and informal sharing of meaningful and new information among team members (Sharma and Patterson 1999). Members of teams with strong communication skills can learn relevant information more timely, understand their goals and tasks clearly, be confident of dealing with complicated problems, use different angles in problem examination, and have more trust in each other (Sharma and Patterson, 1999), which implies that communication effectiveness can support frontline service employees to explore and experiment with new ideas. Thus, when such employees have high levels of OIC and effective communication among them, they are likely to explore and experiment with more new ideas during improvement processes. Through their experience in exploring and experimenting with new ideas, frontline employees can develop better creativity, implying the presence of a positive moderating effect from communication effectiveness on the relationship between OIC and creative efficacy among frontline service

employees. Furthermore, through communication effectiveness, frontline service employees share market insights more effectively, supporting them to achieve accurate market selection and effective new service launches (Melton and Hartline, 2013). Therefore, while we expect creative frontline employees can achieve good NSD performance, communication effectiveness helps such employees to obtain better insights into the market, thereby further enhancing their capability of achieving superior NSD performance, which implies the presence of a positive moderating effect from communication effectiveness on the relationship between creative efficacy and NSD performance among frontline service employees.

Prior related experience refers to the extent to which the prior experience of team members is useful for their current duties and problems (Dokko et al. 2009). When frontline service employees with high levels of OIC have to participate in improvement activities, their prior related experience can help them generate relevant ideas and learn necessary new skills more effectively, thereby making improvement efforts more effective. This enhanced improvement effectiveness encourages frontline employees to initiate and make more changes. Through increased changes, employees have more opportunities to develop their creativity, implying the presence of a moderating effect from prior related experience on the relationship between OIC and creative efficacy in frontline service employees. Furthermore, while creative frontline employees are able to come up with many novel ideas, not all their novel ideas are highly relevant to NSD. When such employees have adequate prior related experience, their experience can guide them to select relevant ideas and apply them to the NSD process, thereby achieving a better NSD performance, which implies that prior related experience can

have a positive moderating effect on the relationship between creative efficacy and NSD performance among frontline service employees. Consequently, we propose the following hypotheses:

H3: Team-related factors, namely a) leader effectiveness; b) communication effectiveness; and c) prior related experience can positively moderate the relationship between operational improvement competence (OIC) and creative efficacy in frontline service teams.

H4: Team-related factors, namely a) leader effectiveness; b) communication effectiveness; and c) prior related experience can positively moderate the relationship between creative efficacy and NSD performance in frontline service teams.

5.2.3 Service-related moderating factors

We identify service marketability, service complexity, and service newness as potential service-related moderating factors in this study. Service marketability refers to the extent to which new services meet customer needs and respond to service market effectively (De Brentani, 1991; Melton and Hartline, 2013). Frontline service employees uniquely hold the position that they can have a good understanding of customers' requirements and orientations regarding the services desired. When such employees have high levels of OIC and service marketability, team members' knowledge of customer needs helps them identify more improvement opportunities. Through the increased opportunities of making changes, employees can have their creativity enhanced, implying the presence of a moderating effect from service marketability on the relationship between OIC and creative efficacy among frontline service employees.

Similarly, while creative frontline service employees are able to come up with many novel ideas, they need knowledge of customer needs to guide them to select relevant ideas for the NSD process. In other words, by using the improved customer knowledge resulted from service marketability, creative frontline employees can provide more relevant ideas of NSD activities, thereby achieving better NSD performance, which implies that service marketability has a positive moderating effect on the relationship between creative efficacy and NSD performance in frontline service employees.

Service complexity refers to the extent of difficulty in generating and developing new services (Sarin and Mcdermott, 2003). The relevant literature suggests that complexity in service tasks can develop employees' intrinsic motivation, thereby raising their enthusiasm and creativity (Oldham and Cummings, 1996). Thus, service complexity can influence frontline service employees with high levels of OIC to be more enthusiastic about improving service operations. In order to develop better improvement ideas, such employees should be committed to improving their creativity, implying that service complexity has a positive moderating effect on the relationship between OIC and creative efficacy in frontline service employees. Furthermore, firms with complex existing services tend to develop complex new services. As service complexity can generate intrinsic motivation in employees, NSD involving complex services may induce employees to be more enthusiastic about NSD. As discussed before, creative frontline employees may not be willing to apply their creativity to the NSD process. However, when such creative frontline employees are enthusiastic about NSD, they will be more willing to apply their creativity to NSD activities, thereby improving the NSD performance, which implies that service complexity has a moderating effect on

the relationship between creative efficacy and NSD performance among frontline service employees.

Service newness refers to the extent of innovation in new services (Sarin and Mcdermott, 2003; Swink, 2003). In other words, when a service firm has high levels of service newness, it is under pressure to innovate its services frequently. Thus, when frontline employees have high levels of OIC and their firm has high levels of service newness, they will be expected to make innovative improvements frequently. Under such a circumstance, frontline employees are likely under pressure to develop better creativity in order to achieve the desired innovative outcomes, implying that service newness has a positive moderating effect on the relationship between OIC and creative efficacy in frontline service employees. Furthermore, when better employee creativity is in place and employees are under pressure to innovate services, employees will use their creativity to develop more new ideas in order to achieve the required innovation in services, thereby enhancing the overall NSD performance, which implies that service newness has a moderating effect on the relationship between creative efficacy and NSD performance in frontline service employees. Consequently, we propose the following hypotheses:

H5: Service-related factors, namely a) service marketability; b) service complexity; and c) service newness can positively moderate the relationship between operational improvement competence (OIC) and creative efficacy in frontline service teams.

H6: Service-related factors, namely a) service marketability; b) service complexity; and c) service newness can positively moderate the relationship between creative efficacy and NSD performance in frontline service teams.

5.3 Data analysis and results

The technique employed to test our hypothesis is hierarchical regression analysis. Before application of this technique, we conducted several analyses to ensure the assumptions of this technique are met. We examined the multicollinearity levels and three general regression assumptions, namely normality, outliers and dependency, by variance inflation factors (VIF) and Q-Q plots. The analysis results meet the requirements (i.e. VIF less than 10) recommended by Belsley et al. (1980) and Hair et al. (1998) and show that all the constructs examined are normally distributed and have no obvious outliers. In addition, we also calculated cook distance values for all our regression models. The results suggest that all the values computed are below 1, suggesting that our regression results are not significantly impacted by multivariate outliers (Cohen et.al, 2003). Taken together, the results suggest that when using regression models to analyze our data, no major assumptions of this technique are violated. Table 5-1 provides the means, standard deviations, and correlations of all the variables.

Table 5-2 shows the regression results where the *F* values indicate all sixteen regression models are highly significant ($p < .01$). To test Hypotheses 1 and 2, after entering all the control variables in Step 1, we regressed OIC on employee creative efficacy and also employee creative efficacy on NSD performance in Step 2 (see Models 2 and 10 in Table 6-2). The results indicate that OIC is positively and significantly

associated with employee creative efficacy (β = 0.569, $p < .01$) and employee team creative efficacy is positively and significantly associated with NSD performance (β= 0.388, $p < .01$), supporting Hypotheses 1 and 2.

Additionally, we examined the extent to which employee creative efficacy mediates the relationship between OIC and NSD performance. Baron and Kenny (1986) suggest that the necessary condition of establishing mediation is to test the significance of the indirect path from the independent variable through the mediator to the dependent variable by using Sobel z-test. Also, recent relevant studies demonstrate that the bootstrap test is always more powerful to test the significance of the indirect effect than Sobel z-test (Preacher and Hayes, 2008). Thus, we conducted the bootstrap procedures in Amos to test the mediation effect following Ledermann et al.'s (2011) technique. The number of bootstrap samples was set to 2,000 and the confidence level was set at 95%. The results suggest that a significant indirect effect is found from OIC to NSD performance: regression coefficient = 0.285, lower bound = 0.178, upper bound = 0.390 and p value = 0.001. As we also find support for Hypotheses 1 and 2, we can conclude that employee creative efficacy mediates the relationship between OIC and NSD performance (i.e., H1 and H2).

To test Hypotheses 3a-3c and 4a-4c, we estimated interaction effects in the regression models by using cross-product terms and each cross-product term was entered separately to avoid multicollinearity (Gopal et al., 2013). In Models 3-5 and 11-13, we added different interaction terms in Step 3. The results regarding those significant interaction terms (β = .143, $p < 0.05$; β = .121, $p < 0.1$; β = .221, $p < 0.01$) suggest that Hypotheses 3a, 3b, and 3c are supported. So, our findings indicate that

leader effectiveness, communication effectiveness, prior related experience can strengthen the relationship between OIC and team creative efficacy. In addition, the significant increments in R^2 in Models 3, 4, and 5 over Model 2 (0.100, 0.027, and 0.079, respectively) offer further evidence to support Hypotheses 3a, 3b, and 3c. However, the results of Models 11 to 13 indicate that because of insignificant interaction terms, Hypotheses 4a, 4b, and 4c are not supported.

In Models 6-8 and 14-16, we tested Hypotheses 5a-5c and 6a-6c. In Model 6, we obtained a significant interaction term ($\beta = .116$, $p < 0.1$), supporting Hypothesis 5a and indicating that service marketability can significantly strengthen the impact of OIC on team creative efficacy. In Models 14-16, the significant interaction terms ($\beta = .158$, $p < 0.05$; $\beta = .162$, $p < 0.05$; $\beta = .152$, $p < 0.05$) indicate that service marketability, service complexity, and service newness can significantly strengthen the effect of team creative efficacy on NSD performance. Models 14, 15, and 16 also have significant increments in R^2 over Model 10 (0.172, 0.090, and 0.218, respectively), indicating Hypotheses 6a, 6b, and 6c are supported.

Table 5-1

Means, standard deviations, and correlations among Variables in Study 2

Variables	Mean	S.d.	1	2	3	4	5	6	7	8	9	10	11	12	13
1.Education	2.11	.37													
2.Age	1.36	.34	- .04												
3.Position of team leader	2.04	.99	- .19*	.07											
4.Operational function	2.88	.80	- .11	.19*	.05										
5.Time of working in team	3.59	.53	- .13	.17*	- .13	.26**									
6.Operational improvement capability	5.43	.81	.01	.17*	- .11	. 10	.24**								
7. Leader effectiveness	5.70	.89	- .01	.15	- .14	-. 02	.16*	.57**							
8.Communication effectiveness	5.69	.96	- .15	.10	- .10	.06	.11	.47**	.37**						
9. Prior related experience	5.60	.88	.04	.18	- .15	-.05	.14	.57**	.44**	.31**					
10.Employee creative efficacy	5.32	.77	- .02	.11	-.24**	.04	.20*	.60**	.59**	.40**	.52**				
11.Service marketability	5.30	1.04	- .16	.04	.06	.05	.12	.20*	. 19*	.44**	.24**	.25**			
12.Service complexity	4.93	1.03	- .20*	.12	.05	.13	.18*	.14	. 15	.31**	.10	.27**	.65**		
13.Service newness	5.62	.87	- .10	.04	.16	.03	-.01	.23**	. 20*	.39**	.16*	.16	.47**	.47**	
14.New service development performance	5.35	1.00	- .08	.06	-.10	.14	.28**	.35**	.29**	.43**	.30**	.42**	.50**	.39**	.49**

*p<0.05 **p<0.01

Table 5-2

Hierarchical regression results for Hypotheses 1-6.

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
				Team creative efficacy						New service development performance						
Step1: Control variables																
Education	- .043	-.055	-.026	-.024	-.047	-.039	-.023	-.057	- .057	- .040	-.047	.002	-.046	-.009	-.030	-.004
Age	.096	.021	-.004	.032	.007	.035	.009	.023	.002	- .035	-.037	-.022	-.046	-.027	-.050	-.040
Position of team leader	-.234**	-.180*	-.156*	-.173*	-.212**	-.219**	-.192**	-.199**	- .083	.007	-.005	.034	.001	- .079	-.064	-.086
Operational functions	-.009	-.025	.011	-.010	.001	-.021	-.031	-.032	.077	.080	.089	.066	.090	.081	.068	.073
Time of working in the team	.150^{+}	.033	.006	.026	.064	.011	.012	.041	.243**	.184*	.172*	.184*	.179*	.162*	.146^{+}	.203**
Step2: Independent variable																
Operational improvement capability (OIC)		.569**	.422**	.516**	.456**	.528**	.521**	.564**								
Mediating variable																
Employee creative efficacy (ECE)										.388**	.351**	.273**	.324**	.271**	.299**	.298**
Moderating variables																
Leader effectiveness (LE)			.373**								.098					

Table 5-2 (Continued)

Communication effectiveness (CE)				.177*								.269**				
Prior related experience (PRE)					.305**								.128			
Service marketability (SM)						.158*								.426**		
Service complexity (SC)							0.202**					.			305**	
Service newness (SN)								0.057								.456**
Step 3: Two-way moderator effect																
OIC *LE			.143*													
OIC *CE				.121^{+}												
OIC *PRE					.221**											
OIC *SM						.116^{+}										
OIC *SC							0.064									
OIC*SN								-0.070								
ECE*LE											.082					
ECE*CE												-.079				
ECE*PRE													.038			
ECE*SM														.158*		
ECE*SC															.162*	
ECE*SN																.152*
F	2.97**	14.95**	16.58**	12.34**	15.25**	12.66**	13.04**	11.40**	2.83**	6.84**	5.28**	7.53**	5.36**	11.43**	7.99**	13.80**
R^2	0.096	.392	.492	.419	.471	.425	.432	.400	.092	.228	.236	.305	.238	.400	.318	.446
ΔR^2	…	.296	.100	-.073	.052	-.046	.007	-.032	….	.136	.008	.069	.067	.162	.082	.128

+ p <0.1 *p<0.05 **p<0.01

5.4 Discussion and conclusion

5.4.1 Discussion and theoretical implication

Study 2 examines the relationships between operational improvement competence (OIC), employee creativity (i.e. creative efficacy) and NSD performance in frontline service teams. The relevant studies have argued that frontline employees can play key roles in the NSD process (Brentani, 2001; Martin Jr and Horne, 1995; Ottenbacher et al., 2006). Yet the empirical evidence supporting this argument or indicating what relevant employee or service attributes can impact on the NSD performance is scant in the literature. With the data from 146 frontline teams collected from the banking industry of China, we find that employee creative efficacy helps achieve superior performance in NSD in our sample teams. Our findings suggest that OIC helps the development of employee creative efficacy in our sample. These findings are consistent with the concepts of RBV that OIC and employee creativity are important resources for firms to achieve competitive advantages. In addition, we identify and examine three team-related and three service-related contextual factors that may positively moderate the relationships between OIC, employee creative efficacy and NSD performance. These findings offer precise insights into how to enhance the effectiveness of OIC and employee creativity, and the circumstances in which OIC and employee creativity are particularly important. Overall, our findings offer new and useful insights to the literature on NSD, employee creativity, and continuous improvement.

Our analysis results on Hypothesis 1 indicate that OIC enhances employee creative efficacy in frontline service teams. In the OM literature, the importance of frontline service employees is well recognized because they have to undertake more

complicated and uncertain tasks than their counterparts (i.e. operational staff) in manufacturing firms (Yee et. al, 2008; 2013). When such frontline employees have adequate creativity, they are able to come up with more new and useful ideas to deal with challenges in their complicated and uncertain tasks. Yet the current OM literature offers scant insights into what OM practices can help frontline employees to develop creativity. In this study, we contribute to the literature by asserting that the practices of continuous improvement should be relevant to employee creativity and offering evidence that OIC, which is the corresponding form of employee competence in service operations, has positive influences on employee creativity.

Our analysis results on Hypothesis 2 indicate that employee creative efficacy enhances NSD performance in our sample. While the NSD literature suggests that NSD is crucial to service firms to achieve competitive advantages in a competitive business environment (Agarwal et al., 2003), and that frontline employees' participation in NSD is essential for satisfactory NSD performance (Ordanini and Parasuraman, 2010), there is limited insights into whether certain individual attributes of such employees are related to NSD performance. Our findings extend the literature by offering evidence that frontline employees' creativity is positively related to NSD performance. One obvious reason for this finding is the importance of innovation in NSD. Because of intense market competition, service firms strive to innovate their services constantly in order to maintain competitiveness. Thus, frontline employees are under pressure from their team leaders or top management to give creative inputs in NSD activities. Furthermore, when considering the findings of Hypotheses 1 and 2, our results suggest that employee creative efficacy is the mediating factor between OIC and NSD performance. The

literature on organizational capability suggests that the relationship between organizational capability and a firm's performance is mediated by internal resources (Wang and Ahmed, 2007). Our findings are consistent with this notion in that OIC is a form of organizational capability which, through employee creativity as a relevant internal resource, contributes to superior NSD performance.

Hypotheses 3a-3c and 4a-4c are concerned with the effect of team-related moderating factors (e.g. leader effectiveness, communication effectiveness, and prior related experience) on the relationships between OIC, employee creative efficacy and NSD performance. The analysis results on Hypotheses 3a-3c suggest that all the three posited team-related factors can significantly moderate the relationship between OIC and frontline employees' creative efficacy. Such findings suggest that effective leaders, effective communication and prior related experience can strengthen the impact of OIC on creative efficacy in our sample teams. One plausible reason is that since these three factors should facilitate OIC to achieve improvements in operations, relevant change experience may have a positive effect on creativity development in employees. However, our findings do not support Hypotheses 4a-4c, suggesting that effective leadership, effective communication, and prior related experience do not strengthen the impact of employee creativity on NSD performance. Thus, our findings suggest that while frontline employee creativity improves NSD performance (i.e. the results of H2), effective leadership, effective communication and prior related experience do not supplement the effectiveness of employee creativity in this respect. Future work on employee creativity and NSD may offer insights into these interesting findings.

The results of our hypotheses relating to service-related moderating factors (i.e., Hypotheses 5a-5c and Hypotheses 6a-6c) suggest that service marketing is an important service-related factor as it positively moderates the relationships between OIC, employee creative efficacy and NSD performance. The results also suggest that service complexity and service newness positively moderate the relationship between employee creativity and NSD performance, but have no effects on the relationship between OIC and employee creativity. When considering all the three service-related moderating factors, we find that they may represent different forms of external market pressures. Service marketability represents a total market pressure. When it is at high levels, service employees are likely under an enormous pressure to exactly meet market demand. Thus, it gives pressure to frontline employees to better capitalize on their OIC and creativity to achieve higher levels of expected outcomes. As for service complexity and service newness, they represent more specific market pressure demanding complicated services and innovative services respectively. Our findings imply that these two forms of market pressures do not have impact on OIC, but may encourage frontline employees to apply their creativity to more complicated or innovative services, thereby enhancing the performance of NSD. Future work can offer insights into the supplementary effects of different forms of market pressures on OIC and employee creativity.

5.4.2 Managerial implication

First, frontline employees' continuous improvement competence needs to be recognized as a critical factor in service innovation. New service development (NSD) performance comprises marketing performance and operational efficiency (Melton and

Hartline, 2013), which depend on the extent to which new service concepts meet customer requirements and improved service processes achieve better efficiency. Frontline service employees are close to actual service delivery processes and in a unique position to understand customer requirements. If frontline employees fail to improve service processes or grab useful market information through customer contact, the efficiency of service delivery processes, marketing performance and NSD performance will be all at stake. Our findings indicate that frontline employees' continuous improvement competence improves NSD performance through employees' creativity. To develop this form of competence in frontline employees, service firms should pay sufficient attention to the three practices of OIC of this study, namely process management, structured methods and continuous improvement. By using the definitions, concepts and construct items of these three practices, service firms can have detailed guidelines on development of continuous improvement competence in their frontline employees.

Second, frontline employees' creativity is important because it has positive impacts on NSD performance. Indeed, it is common that frontline employees are involved in NSD activities, and their creative ideas are useful inputs for innovation in new services. In the literature on employee creativity, there exists a significant body of knowledge on antecedents leading to employee creativity (e.g. Gong et al, 2009; Zhou and Shalley, 2003; Tierney and Farmer, 2002; Choi, 2007). Therefore, service firms intending to incorporate more creative ideas into their new services can examine the literature on employee creativity in order to obtain relevant insights into nurturing creativity in the frontline employees.

Finally, our findings also suggest that the relationships between OIC, employee creativity and NSD performance are contingent on contextual factors relating to teams (i.e. team-related moderating factors) and services (i.e. service-related moderating factors). Indeed, the nature of these two groups of factors are different in the sense that while team-related moderating factors tend to be under the control of service firms, service-related moderating factors tend to be dominated by the external environment. Specifically, our findings pertinent to team-related moderating factors indicate that OIC among frontline employees with an effective leader, effective communication, and adequate prior related experience is particularly effective in enhancing employee creativity. Thus, those service firms which have OIC in place and intend to nurture creativity in frontline employees need to develop effective leadership skills in their frontline team leaders, create an atmosphere that encourages open communication among frontline employees and recruit employees with adequate and relevant prior-related experience. On the other hand, service-related moderating factors (i.e. service marketability, complexity and newness) are likely characteristics influenced by the external environment. Thus, our findings indicate the circumstances under which OIC and employee creativity are particularly important. Specifically, our findings indicate that when a firm's services are marketable, OIC is particularly effective in enhancing employee creativity. Our findings also indicate that when a firm's services are marketable, complex or new, employee creativity is particularly effective in enhancing NSD performance. Therefore, we offer service firms very useful and precise insights into the circumstances under which they should invest more resources in developing OIC and creativity in their frontline employees.

Chapter 6 Study 3- OIC and service recovery performance

Many scholars and service practitioners perceive service recovery as an important means to retain customer after service failures, but in practice many service recovery efforts are unsuccessful. Studies on service recovery suggest that recovery activities are the core process of service operations and frontline teams play an important role in performing such activities. In this chapter, we propose operational improvement competence (OIC) as a new approach that is highly relevant to process improvement and frontline teams for improving service recovery performance. We also draw on role stress theory and conservation of resources theory to argue that frontline teams' peculiar characteristic (i.e., role stress) and two types of important resources (i.e., organization inducement and psychological resilience) moderate the effectiveness of OIC in improving service recovery performance. Our study advances knowledge on service operations by establishing a link between OIC and service recovery performance. Our findings also contribute to the literature by showing that the process improvement approach can enhance service recovery performance, and ascertaining the intricacies among OIC, the peculiar characteristic pertinent to frontline teams, and service recovery in service firms.

6.1 Introduction

Because of the complexity and uncertainty in service environments, service failures are often inevitable and can pose serious threats to customer satisfaction and retention (Miller et al., 2000; Song et al., 2013). To reduce customer loss in failure

events, the approach of service recovery has been recognized as an effective means that can not only remedy problems relating to customer discontent, but also improve customer loyalty and company profitability afterwards (Hart et al., 1990). By using HRM and marketing perspectives, the current literature on service recovery have offered numerous managerial guidelines such as empowering frontline employees and offering monetary and nonmonetary remedies to customers (Bowen and Johnson, 1999; Sergeant and Frenkel, 2000; Mattila, 2001; McColl-Kennedy, 2003). However, Gross et al. (2007) surveyed 4,000 employees from nearly 600 US companies and found that 56% of the respondents perceived that their companies could not respond to and fix service failures promptly. Also, the 2013 US National Customer Rage survey indicated that only 21% of complaining customers were satisfied with recovery results, which suggested a downward trend compared to the 1976 US Consumer Affairs survey (Grainer et al., 2013). This implies that more new insights are needed to supplement the current knowledge on service recovery. To this end, we find that using a process improvement perspective could help identify new insights because the relevant literature suggests that service recovery should be considered an important process in service operations (Miller et al., 2000) and that many process improvement techniques (e.g., sequence-orientated problem identification, fishbone diagram, and frequency-relevancy analysis of complaints) are effective in service failure investigations (Botschen et al., 1996; Stauss and Weinlich, 1997; Stauss and Seidel, 2005; Michel et al., 2009). We also find that an employee perspective is highly relevant as well as service firms (e.g., banks, airline companies etc) often rely on their employees to create services, improve the service process, and recover from service failures (Wageman, 1997; Batt, 1999; Yavas et al,,

2003; Jong and De Ruyter, 2004; Lee et al., 2013). Nonetheless, studies using a process improvement perspective or an employee perspective to explore service recovery are virtually unavailable in the literature. To fill this gap in the literature, this study employs these two perspectives to identify new insights for improving service recovery performance.

The literature pertinent to process improvement has offered many useful insights into the wide range of relevant practices (e.g., structured methods, continuous improvement attitude) (Peng et al., 2008; Anand et al., 2009; Choo et al., 2007). In this study we recognize that process improvement practices' effectiveness is dependent on frontline service employees' participation because these employees possess hands-on knowledge on the diverse customer needs and service processes, and that relevant activities (e.g., an investigation into increasing customer complaints) are carried out through work-teams formed by operational employees (Choo et al., 2007). Also, according to the relevant literature, process improvement practices could lead to benefits including reduced operational cost and lead-time (Anand et al., 2009), knowledge sharing, effective root-cause analysis (Taylor and Wright, 2006), and enhanced capability in making changes (Peng et al., 2008; Anand et al., 2009). It can be inferred from these benefits that operational improvement competence - operational team's continuous improvement ability could help service teams to improve the efficiency of recovery activities, identify the root causes of service failures, encourage members to share service recovery experience, and enhance their capabilities in making service changes. Consequently, we argue that OIC can effectively improve service recovery performance.

When using an employee perspective to examine the effectiveness of OIC in improving service recoveries, we find that OIC's effectiveness could be impeded by one peculiar problem in service operations – employee role stress. Compared with their counterparts in manufacturing firms, operational employees of service firms (i.e., frontline service employees) often suffer from higher levels of stress because of the complexity and uncertainty in their jobs (Maslach, 1982; Boles and Babin, 1997). More specifically, frontline service employees have to work with customers to co-produce services, and display high-energy and positive emotion to customers during the co-production process (Boshoff and Allen, 2000; Metters and Vargas, 2000; Bowen and Ford, 2002). The literature of role stress indicates that employees with high levels of stress tend to have reduced job accomplishment and organizational commitment (Goolsby, 1992; Nordenmark, 2004). However, frontline service employees' efforts to apply OIC to improve service recoveries are workload on top of their routine service processes. In order to undertake such extra workload (i.e., the improvement efforts) effectively, frontline service employees must possess adequate levels of job accomplishment and organizational commitment. Consequently, since role stress results in reduced job accomplishment and organizational commitment, this could be a significant factor impeding the effectiveness of OIC in improving service recovery performance.

To address the potential negative impact of role stress on OIC, we draw on conservation of resources theory to identify the possible solutions. Conservation of resources theory suggests that job resources refer to differing forms of resources (e.g., rewards, support from supervisor, participation in decision making, psychological

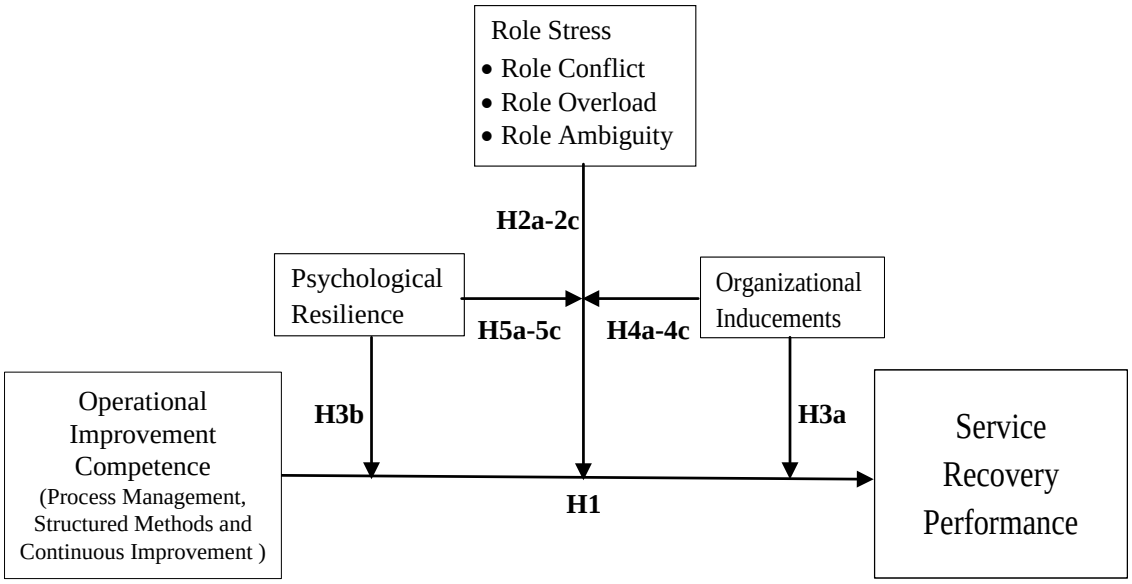
resources), and that providing such job resources to employees could lead to benefits such as increases in job engagement, positives attitudes, organizational commitment, informational resources, and job satisfaction (Hobfoll, 2001; Demerouti et al., 2001). Considering the complexity and uncertainty in the service recovery process, job resources could have a motivational effect on service teams when relying on their OIC to improve service recoveries. Also, while OIC's effectiveness in improving service recoveries could be impeded by role stress in service employees, job resources could alleviate the negative impacts of role stress (e.g., reduced job accomplishment and organizational commitment). Consequently, we argue that job resources could improve OIC's effectiveness in improving service recoveries directly and indirectly through reduced impacts of role stress.

The objectives of this study are to examine whether or not 1) OIC improves service recovery performance; 2) role stress negatively impacts the effectiveness of OIC in improving service recovery performance; and 3) job resources improves the effectiveness of OIC in improving service recovery performance and reducing the negative impact of role stress on the association between OIC and service recovery performance. Using the data collected from 146 frontline teams in the banking industry of China, we test our posited hypotheses (Figure 6-1) using statistical methods such as confirmatory factor analysis and hierarchical regression analysis. The central contribution of this study lies in its use of two pertinent perspectives, i.e., the process improvement and employee perspectives, to examine service recovery. By employing these two perspectives, this study links the literature of process improvement, role stress, and conservation of resources to develop new insights on achieving superior service

recovery performance. Our findings provide not only new insights to the relevant literature, but also managerial guidelines for practitioners to enhance the service recovery performance of their frontline teams.

Figure 6-1

The Conceptual Model



6.2 Hypothesis development

6.2.1 Relationship between OIC and service recovery performance

With three constituent practices (i.e., process management, structured method, continuous improvement), OIC is related to problem-solving skills, actions for enhancing performance, and reliable methods, and also displays the common characteristics of other capabilities such as knowledge and skills (Schreyögg and Kliesch-Eberl, 2007). In service recovery activities, frontline teams are required to follow structured and standard routines (e.g., analyzing customers' complaints to identify the possible reasons for service failures, giving material and spiritual

compensations, and adjusting the existing recovery activities based on customers' responses) to resolve service failures (Jong and De Ruyter, 2004). Two of the major aspects of OIC are process management and structured methods. Frontline service teams adopt process management techniques and standard recovery routines, which render the recovery efforts more effective by reducing their repetitive and ineffective processes. Furthermore, systematic methods can offer employees a process perspective and problem-solving methods to identify possible failures and adopt available methods to cope with complicated recovery tasks. For instance, when service firms receive large-scale customer complaints regarding investment products, employees need to adopt structured methods (e.g., structured interviews with consumers) to identify the root causes and propose compensation measures. The third aspect of OIC is continuous improvement, meaning that frontline service employees with high levels of OIC should have better knowledge and ability to adjust their behaviour to constantly changing recovery tasks and understand that their responsibility to initiate and implement operational processes is not short-term, but is part of their daily duty that actively influences improvement attitudes and willingness. Thus, OIC can improve the efficiency and reliability of service recovery processes and also impact frontline employees' improvement attitudes. Consequently, we propose the following hypothesis:

H1: OIC is positively related to the service recovery performance of frontline service teams.

6.2.2 Role stress with moderating effects

In service firms, the arrival time of customers and their service durations are hard to predict, causing service employees difficulties in preparing and controlling the

whole service process (Bowen and Ford, 2002). In spite of such difficulties, service teams need to manage their emotion in order to display good attitudes and high energy during the service process (Wharton and Erickson, 1993; Schmenner, 2004). Also, due to the broad range of customer demands, service teams often do not have enough or clear guidelines and regulations to follow (Bowen and Schneider, 1988; Kurata and Nam, 2013). These characteristics lead to a peculiar problem in service teams – role stress. Role stress theory suggests that role stress is composed of dimensions including role conflict, role overload, and role ambiguity, and that employees suffering from role stress can be emotionally exhausted, unwilling to respond to customers, feeling detached from their jobs, and having reduced job satisfaction and performance (Goolsby, 1992; Nordenmark, 2004). In extreme cases prolonged and severe role stress causes employees to suffer more serious consequences such as job burnout, leading to turnover intentions (Boles et al., 1997).

While we propose that service teams possessing OIC are more likely to improve their service recoveries effectively, such teams would not be immune from the problem of role stress. When a service team employs OIC to improve service recoveries, the improvement activities involved are likely more complicated than the routine service activities. For instance, the team members may have to identify the causes of service failures and develop effective remedies to resolve customer complaints, where the activities involved could be beyond the major organizational guidelines or the operational instructions given by the team leader (Wetzels, 1999; Maxham III and Netemeyer, 2003; Homburg and Fürst, 2005; Jong and De Ruyter, 2004). Such challenging improvement activities necessitate higher levels of job commitment and

positive attitudes in the team. Although service teams could capitalize on their OIC to improve service recoveries, the presence of role stress and the resultant consequences (e.g., emotional exhaustion, slow response to customers, job dissatisfaction, job burnout etc.) can reduce job commitment and positive attitudes among the team members, weakening the effectiveness of OIC in improving service recoveries. We propose the following hypothesis:

H2: Role stress with respect to a) role conflict, b) role overload, and c) role ambiguity of frontline teams in service firms has a negative impact on the relationship between OIC and service recovery performance.

6.2.3 Job resources with moderating effects

Drawing on conservation of resources theory (Hobfoll, 2001; Hobfoll and Shirom, 2001), we argue that the two critical job resources, namely organizational inducements and psychological resilience, can enhance the effectiveness of OIC in improving service recovery performance through increased positive attitudes and organizational commitment in service employees. Organizational inducements including developmental rewards (e.g., career development and participation in decision making) and materialistic rewards (e.g., salaries and bonus) can encourage employees to participate in activities with positive attitudes and offer valuable resources such as problem-solving skills, information about top management's decision making, and knowledge of complicated tasks (Hobfoll, 2001; Hobfoll and Shirom, 2001; Hom et al., 2009; Shin et.al., 2012). Such positive attitudes can motivate the members of a service team to tackle differing challenges during the service recovery processes, while those valuable resources provide the members with useful knowledge and skills to analyze

failure causes and come up with new service processes. Thus, when a service team with OIC in place is supplemented by adequate levels of organizational inducements, it could more effectively improve its service recovery performance.

According to the conservation of resources theory, individuals with high psychological resilience are inclined to have positive work attitudes and optimistic thinking and adjust their emotional exhaustion (Kumpfer, 2002; Youssef and Luthans, 2007; Utsey et al., 2008; Shin et.al. 2012). This form of job resource is particularly important in uncertain environments, because employees with psychological resilience can develop effective relaxation skills to remain calm and positive, thereby making right and timely decisions (Fredrickson et al., 2008). Indeed, while service recoveries involve many changes and decisions, the employees concerned often have to deal with uncertain and problematic service failures that may lead to emotional exhaustion in them. When a service team employs OIC to improve service recoveries, the presence of psychological resilience can have a positive supplementary impact on the effectiveness of OIC by helping the team to remove emotional exhaustion and stay calm and positive in decision making. We propose the following hypothesis.

H3: Job resources with respect to a) organizational inducements and b) psychological resilience of frontline teams in service firms have a positive impact on the relation between OIC and service recovery performance.

6.2.4 The three-way interaction among job resources, role stress, OIC and service recovery performance

We argue that the two types of job resources (i.e., organizational inducements and psychological resilience) can offset the negative impact of role stress on the effectiveness of OIC in improving service recovery performance. According to the literature on role stress, the job characteristics of service employees lead to role stress, causing consequences such as emotional exhaustion, detachment from jobs, job dissatisfaction, and job burnout (Goolsby, 1992; Nordenmark, 2004; Boles et al., 1997). Since improving service recoveries is challenging and on top of the routine service process for service employees, the consequences of role stress make the employees difficult to improve service recoveries effectively. According to conservation of resources theory, job resources are effective for organizations to address problems relating to inadequate physical resources or employee motivation (Hobfoll, 2001; Demerouti et al., 2001). And of the two major job resources, organizational inducements provide employees with positive attitudes and informational resources (Hom et al., 2009; Hobfoll, 2001; Shin et al., 2012; Hobfoll and Shirom, 2001) to help OIC teams solve conflicts of expectation between customers and organization (e.g. customer personal attention and organization benefit maximization), clarify their job duties and re-establish their confidence in improving recovery process, whereas psychological resilience helps employees to reduce their emotional exhaustion (Utsey et al., 2008; Shin et al., 2012) and stay calm and positive in highly demanding situations (Fredrickson et al., 2008). These benefits imply that these two forms of job resources can alleviate the negative impact of role stress on service teams. When the negative impact of role stress in service

teams can be reduced significantly, OIC is likely more effective in improving service recovery performance. We propose the follow hypothesis.

H4: Organizational inducements weaken the moderating effect of role stress with respect to a) role conflict, b) role overload, and c) role ambiguity on the association between OIC and service recovery performance.

H5: Psychological resilience weakens the moderating effect of role stress with respect to a) role conflict, b) role overload, and c) role ambiguity on the association between OIC and service recovery performance.

6.3 Data analysis and results

We employed hierarchical regression analysis to test our hypotheses. We also conducted several analyses to assure the assumptions of this technique are met. We examined the multicollinearity levels and three general regression assumptions, namely normality, outliers and dependency by using Q-Q plots. Table 6-1 shows that all the coefficients of correlations between any two variables are much less than 0.80 and the variance inflation factors (VIF) of all our regression models (see Table 5-2) are less than 10. These results meet the requirements recommended by Belsley et al. (1980) and Hair et al. (1998). Also, we followed the guidelines of Neter et al. (2004) to inspect the results and found that all constructs examined are normally distributed and have no obvious outliers. Finally, we calculated cook distance values for all our regression models. The results suggest that all values computed are below 1, suggesting that our regression results are not significant impacted by multivariate outliers (Cohen et.al, 2003). Taken together, the results suggest that when using regression models to analyze our data, no major assumptions of this technique are violated.

Table 6-1

Means, Standard Deviations and Correlations among Variables in Study 3

Variables	Mean	S.d.	1	2	3	4	5	6	7	8	9	10	11
1.Education	2.11	.37											
2.Age	1.36	.34	- .04										
3.Position of team leader	2.04	.99	- .19*	.07									
4.Operational function	2.88	.80	- .11	.19*	.05								
5.Time of working in team	3.59	.53	- .13	.17*	- .13	.26**							
6.Operational improvement competence	5.43	.81	.01	.17*	- .11	.10	.24**						
7.Role ambiguity	2.37	.88	- .05	- .12	- .04	-.06	-.16	-.58**					
8.Role conflict	4.03	1.39	- .10	.02	-.14*	.02	-.15	-.36**	-.47**				
9.Role overload	3.88	1.55	.17*	- . 07	-.28**	- .02	-.21*	-.27**	.40**	.70**			
10.Organizational inducements	5.41	.80	.05	.13	- .13	.05	.20*	.73**	-.61**	-.41**	-.32**		
11.Psychological resilience	5.48	.76	.02	0.12	-.14	.00	.14	.72**	-.65**	-.39**	-.26**	.85**	
12.Service recovery performance	5.21	.86	-0.01	0.11	-.23	.05	.29**	.67**	-.52**	-.28**	-.26**	.58**	.56**

*p<0.05

**p<0.01

Table 6- 2 shows the regression results where the *F* values in all the models are highly significant ($p < .01$). To test Hypothesis 1, after entering all the control variables in Step 1, we regressed the independent variable (OIC) on the dependent variable (service recovery performance) in Step 2 (see Model 2 in Table 6-2). The results indicate that OIC is positively and significantly associated with service recovery performance ($\beta = 0.628$, $p < .01$), supporting Hypothesis 1.

To test Hypotheses 2a-2c and 3a-3b, we estimated interaction effects in the regression model using cross-product terms and each cross-product term was entered separately to avoid multi-collinearity (Gopal et al., 2013). In Models 3-5 and 6-7, we added the relevant interaction term in Step 3. The results regarding these significant coefficients of the interaction terms ($\beta = -.110$, $p < 0.1$; $\beta = -.184$, $p < 0.01$; $\beta = -.116$, $p < 0.1$; $\beta = 0.174$, $p < 0.05$; $\beta = 0.186$, $p < 0.01$) support Hypotheses 2a-2c and 3a-3b, indicating that role conflict, role overload and role ambiguity can weaken the association between OIC and service recovery performance, whereas organizational inducements and psychological resilience can strengthen the relationship between OIC and service recovery performance. In addition, these significant increments in R^2 in Models 3-7 over Model 2 (0.014, 0.042, 0.040, 0.035, and 0.033 respectively) further support Hypotheses 2a-2c and 3a-3b.

In Models 8-13, we added the relevant three-way interaction terms in Step 4 to test Hypotheses 4a-4c and Hypotheses 5a-5c. The results regarding these three-way interaction coefficients in Models 8, 9 and 11 ($\beta = -.220$, $p < .05$; $\beta = -.139$, $p < 0.1$; $\beta = -.167$, $p < 0.1$) are significant and negative, suggesting that Hypotheses 4a, 4b and 5a are supported. In addition, Models 8, 9 and 11 account for a large amount of variance in the

dependent variable (R^2= 0.551; R^2 = 0.566; R^2= 0.548) and are well above and beyond the amount explained by their corresponding main effect and two-way interactions in Models 2, 3 and 4 (R^2 = 0.494, R^2 = 0.508; R^2 = 0.536), which offers further evidence to support Hypotheses 4a, 4b and 5a. However, the coefficients of the three-way interaction terms in Models 10, 12 and 13 are not significant, which do not support Hypotheses 4c, 5b and 5c.

Table 6-2

Hierarchical Regression Results for Hypotheses 1-5

Dependent variable Service recovery performance	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Step 1: Control variables													
Education	-.020	-.033	-.020	-.017	- .008	- .019	-.005	-.025	-.028	-.020	-.007	-.006	-.014
Age	.089	.006	.013	.008	- .002	.013	.009	.037	.026	.028	.049	.026	.027
Position of team leader	-.209*	-.149*	-.156*	-.169*	- .166**	- .161*	-.162*	-.181**	- .182**	-.186**	-.181**	-.188**	-.189**
Operational functions	-.028	-.046	-.040	-.031	- .040	- .049	-.041	-.049	- .040	-.028	-.037	-.019	-.026
Time of working in the team	.257**	.128^{+}	.102	.085	.133*	.118	.142*	.113	.106	.118*	.126^{+}	.119	.129*
Step 2: Independent variable													
Operational improvement competence (OIC)		.628**	.623**	.598**	.530**	.549**	.558**	.494**	.489**	.493**	.528**	.518**	.530**
Moderating variables													
Role conflict (RC)			-.047					.090			.046		
Role overload (RO)				-.063					.026			-.023	
Role ambiguity (RA)					- .219**					-.090			-.105
Organizational inducements(OI)						.218*		.213*	.160^{+}	.115			
Psychological resilience (PR)							.205*				.165*	.134	.076
Step 3: Two-way moderator effect													
OIC*RC			- .110^{+}					-.093			-0.160		
OIC*RO				-.184**					-.247**			-.311**	
OIC*RA					- .116^{+}					-.212*			-.196^{+}

Table 6-2

(Continued)

OIC*OI						.174*		.213*	.105	.151^{+}			
OIC*PR							.186**				.201*	.106	.158^{+}
Three-way moderator effect													
RC*OI								-.038					
RC*PR											.074		
RO*OI									-.076				
RO*PR												.194*	
RA*OI										.134			
RA*PR													.139
Step 4:													
OIC*RC*OI								-.220*					
OIC*RC*PR											-.167^{+}		
OIC*RO*OI									-.139^{+}				
OIC*RO*PR												-.099	
OIC*RA*OI										-.139			
OIC*RA*PR													-.106
F	4.28**	22.60**	17.72**	19.77**	19.60**	19.26**	19.12**	13.58**	14.43**	13.89**	13.31**	14.80**	13.65**
R^2	.133	.494	.508	.536	.534	.529	.527	.551	.566	.556	.548	.572	.552
ΔR^2	…	.361	.014	.028	-0.002	-0.005	-0.002	.024	.015	-.010	-.008	.024	.020

$^{+}$ $P < 0.1$.
* $p < 0.05$
** $p < 0.01$

We used the procedures by Aiken and West (1991) and Dawson and Richter (2006) to further examine the significant three-way moderating effects in our analyses. Figures 6-2, 6-3 and 6-4 show the effectiveness of OIC on service recovery performance in four scenarios pertinent to high and low levels of role stress (i.e., role conflict and role overload), and high and low levels of job resources (i.e., organizational inducements and psychological resilience). Figure 6-2 shows that Line 1 is always above Line 2, indicating that OIC teams suffering from high levels of role conflict have high organizational inducements to achieve better service recovery performance than those with low organizational inducements. Figures 6-3 and 6-4 provide similar evidence to show that Line 1 is above Line 2. Figure 6-3 indicates that in a high role overload situation, frontline teams with high organizational inducements use OIC more effectively than those with low organizational inducements. Figure 6-4 also demonstrates that in a high role conflict situation, OIC teams with high psychological resilience can lead to better service recovery than those with low psychological resilience. These results provide extra evidence to support Hypotheses 4a, 4b, and 5a.

Figure 6-2

Effects of Three-Way Interaction of Role Conflict and Organizational Inducements on the Relationship between Operational Improvement Competence and Service Recovery Performance

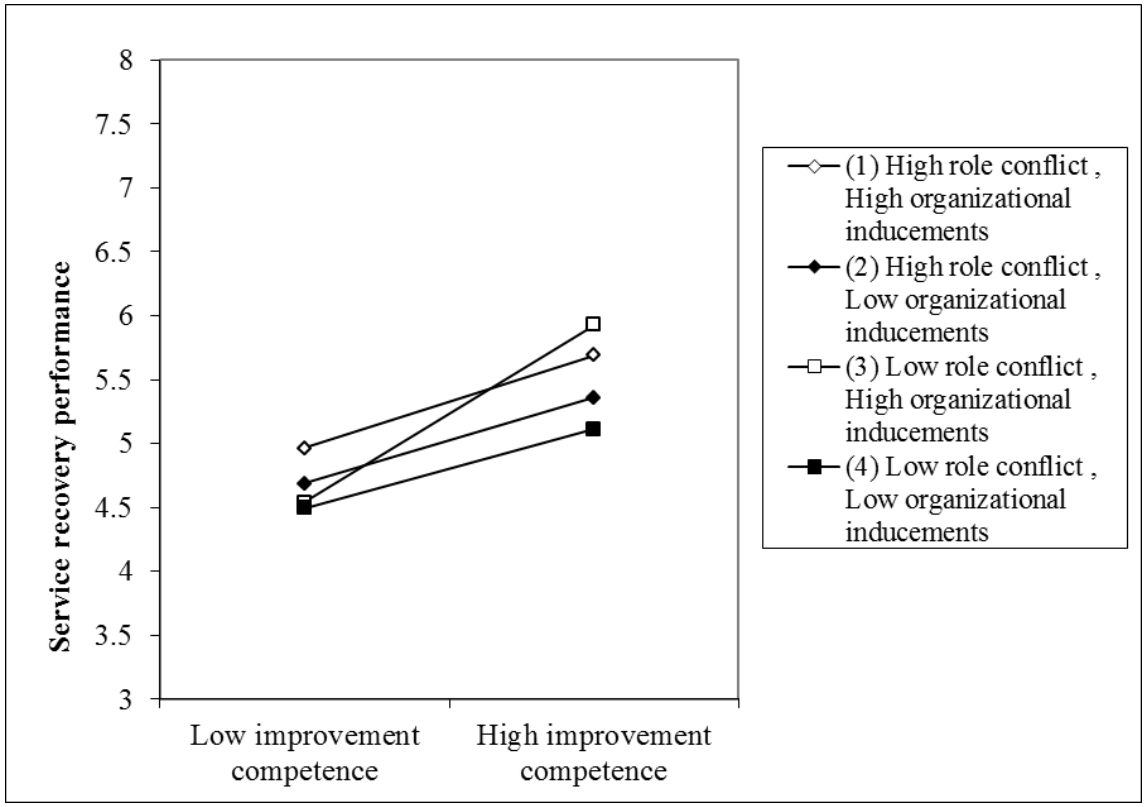


Figure 6-3

Effects of Three-Way Interaction of Role Overload and Organizational Inducements on the Relationship between Operational Improvement Competence and Service Recovery Performance

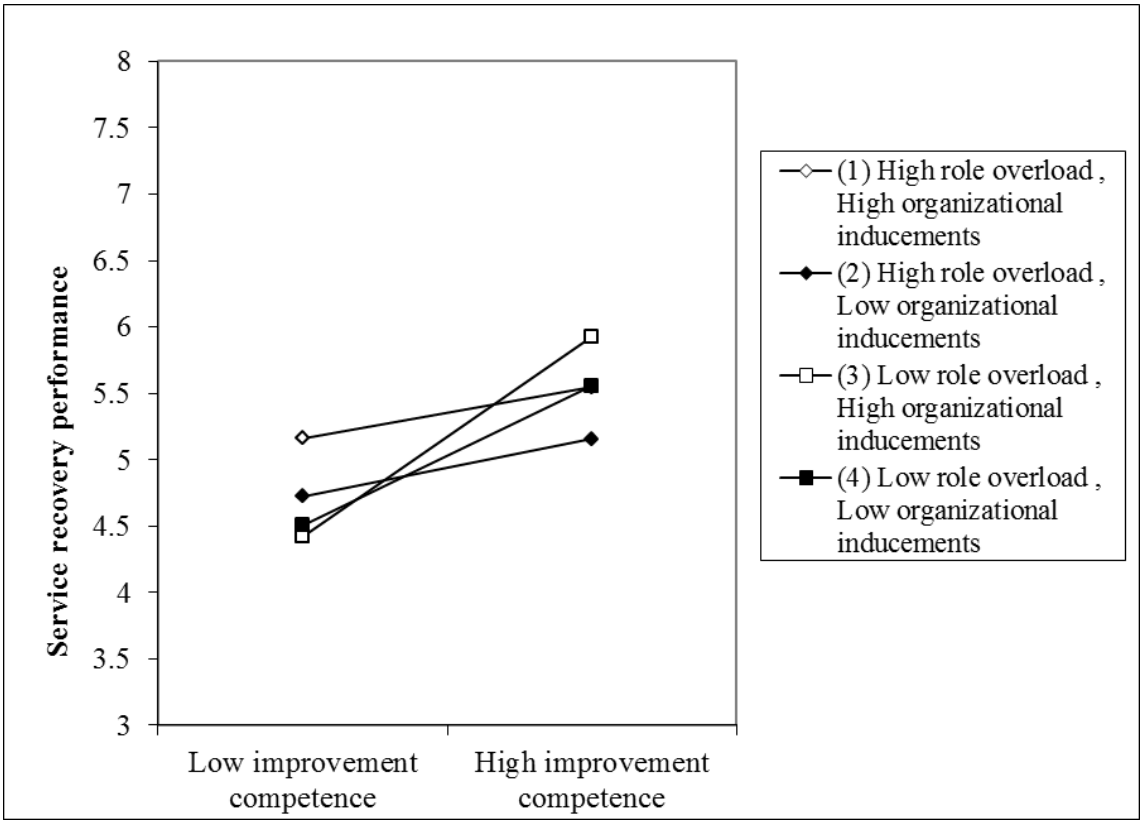
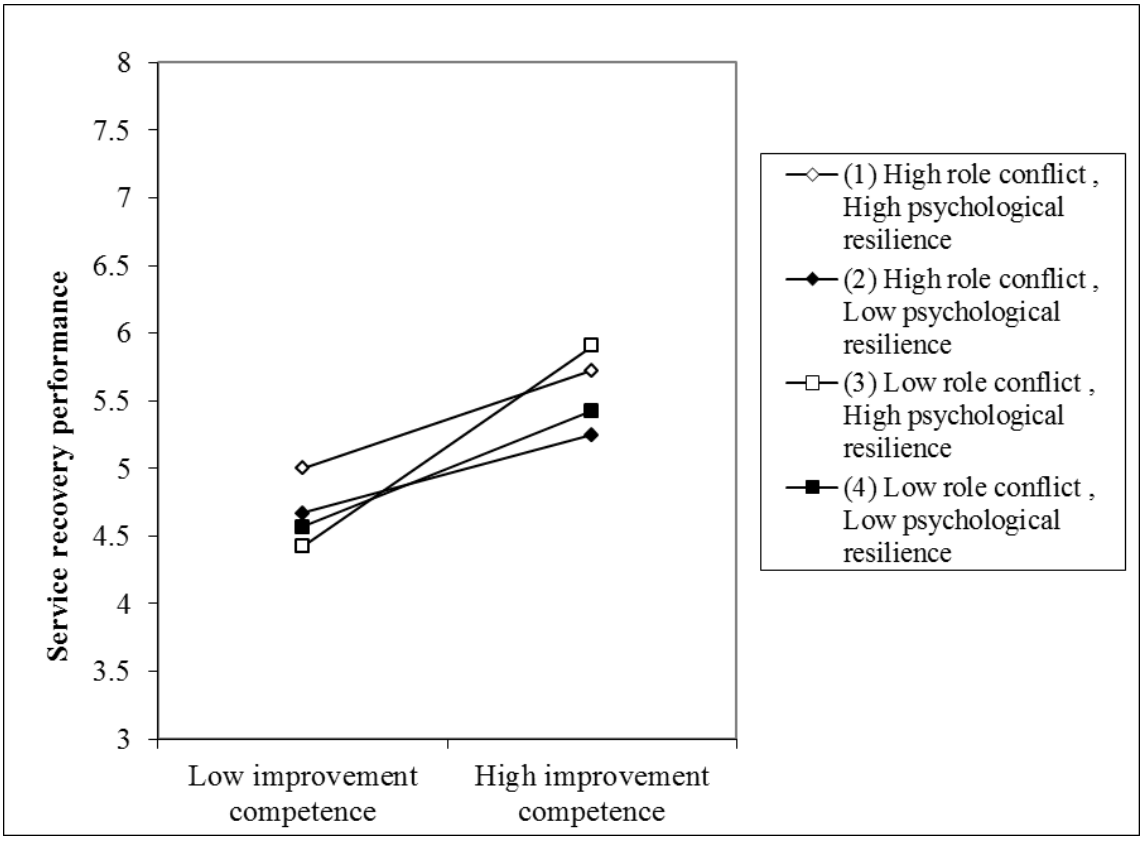


Figure 6-4

Effects of Three-Way Interaction of Role Conflict and Psychological Resilience on the Relationship between Operational Improvement Competence and Service Recovery Performance



6.4 Discussion and conclusion

6.4.1 Discussion and theoretical implication

The first and most important theoretical contribution of Study 3 is to offer new, useful, and empirically-based insights to the body of knowledge of service recovery by using a process management perspective. Successful and effective service recovery is very important for customer retention and organizational profitability. Service recovery is perceived as a core process of service operations, whereas frontline employees play a key role in the recovery process (Miller et al., 2000). Yet empirical evidence integrating process improvement concepts and service recovery performance is scant in the literature. In this study we first employ the OM literature to conceptualize frontline teams' abilities to use a process perspective and structured methods to continuously improve service operations as operation improvement competence (OIC) and then study the relationship between OIC and service recovery performance with data collected from 146 frontline teams of the banking industry of China. We find that OIC helps achieve superior service recovery performance in our sample teams. This finding may partly attribute to frontline employees' willingness to apply OIC to achieve continuous improvement in service recovery processes. Through OIC's systematic methods (e.g., a DMAIC project or a fishbone diagram) and a process perspective, frontline teams can be more effective in identifying the root causes of service failures and proposing the corresponding solutions.

The second theoretical contribution of Study 3 is the added empirical evidence to the literature on role stress theory and conservation of resources theory. Our study represents an initial attempt to link the concepts of these two theories with OM practices

(i.e., OIC and service recovery process). Hypotheses 2a, 2b, and 2c are concerned with the moderating effect of three facets of role stress (i.e., role overload, role conflict, and role ambiguity) on the relationship between OIC and service recovery performance. The analysis results suggest that role conflict, role overload, and role ambiguity negatively moderate the positive relationship between OIC and service recovery performance. One plausible reason is that role conflict, role overload, and role ambiguity can lead to frontline employees' emotional exhaustion and personal accomplishment reduction, which compromise employees' effectiveness in improving recovery process. Hypotheses 3a and 3b suggest that organizational inducements and psychological resilience positively moderate the relationship between OIC and service recovery performance. It is likely that the benefits of organizational inducements and psychological resilience have a significant motivational effect on service teams when they use OIC to improve service recovery performance. These significant empirical findings support that role stress theory and conservation of resources theory are valid theories to help explain the effectiveness of improvement activities in service teams. These findings also imply that since service operations are uncertain and often rely on the frontline employees' and customers' participation, the use of behavioural or organizational theories could be viable choices for future work concerning differing service operations practices or strategies.

The final theoretical contribution of Study 3 is our novel proposition that the factors of role stress theory (i.e., role conflict, role overload, and role ambiguity) and those of conservation of resources theory (i.e., organizational inducements and psychological resilience) can be connected in the sense that the two job resources can

alleviate the negative impact of role stress with respect to the effectiveness of OIC in improving service recovery performance. Hypotheses 4a-4c are concerned with three-way interactions among organizational inducements, role stress (i.e., role conflict, role overload, and role ambiguity), OIC and service recovery performance. The analysis results of H4a and H4b suggest that organizational inducements significantly weaken the negative impacts of role conflict and role overload on the relationship between OIC and service recovery performance. Figure 6-2 shows that Line 1 is always above Line 2 from low OIC to high OIC, implying that when service employees have high levels of role conflict, high organizational inducements always support service employees to use OIC to achieve superior service recovery performance. Figure 6-3 shows similar evidence where Line 1 is also always above Line 2 from low OIC to high OIC. These figures suggest that when role conflict or role overload increases, organizational inducements must be in place to reduce the negative impact of role stress.

Hypotheses 5a, 5b, and 5c are concerned with whether psychological resilience influences the negative impacts of role stress (i.e., role conflict, role overload, and role ambiguity) on the relationship between OIC and service recovery performance. The results of H5a suggest that psychological resilience significantly weakens the negative effect of role conflict on the effectiveness of OIC. Figure 6-4 shows that Line 1 is always above Line 2 from low OIC to high OIC. Similarly, this finding suggests that when a team suffers from high levels of role conflict, adequate levels of psychological resilience alleviates the negative impact of role stress, helping the team to use OIC to achieve superior service recovery performance. Within the literature, service recovery, continuous process improvement, role stress, and conservation of resources are typically

considered unrelated. Our significant three-way interaction finding indicates that they can inter-related in the context of service teams, and that the integration of their relevant concepts results in useful insights leading to improved service recovery performance.

6.4.2 Managerial implications

First, service firms need to be aware of the strategic importance of OIC. Our findings indicate that service recovery performance can be improved by OIC (i.e. a process improvement approach). When attempting to improve service recovery performance, managers should be aware that frontline teams are valuable assets in recovery processes and should try to use different means to develop their abilities (e.g. OIC). Second, the peculiar characteristics of frontline teams (e.g. role stress) can impede the effectiveness of OIC on service recovery performance. Managers need to realize the negative impacts of role stress (i.e. role ambiguity, role overload and role conflict) on the use of OIC. Third, enough job resources impel OIC teams to carry out their OIC duties in service recovery processes and weaken the adverse impact of role stress. In an organization, when service employees have a serious role conflict, managers need to offer enough organizational inducements and provide psychological resilience training. For the role overload of service employees, only enough organizational inducements can reduce its negative effects on the effectiveness of OIC in service recovery. Overall, these findings offer practitioners precise guidelines to aid decision-making on achieving better service recovery performance in certain situations.

Chapter 7 Conclusion

In this chapter, we conclude the findings of Chapters 4, 5 and 6 by presenting their overall academic contributions, managerial implications, limitations and suggest future research. Theoretical literature and practical points of view indicate the importance of frontline teams' ability to improve performance outcomes with respect to operational performance, new service development and service recovery. Also, Anand et al.'s (2009) continuous improvement framework enables us to identify the core elements (i.e. process management, structured methods and continuous attitude) to manifest operational improvement competence. In addition, by considering the peculiar characteristics of service operation environment and frontline employees, we develop relevant and important hypotheses. In the following sections, we summarize our hypotheses and findings of the three studies of this research.

7.1 Summary of all hypotheses and study findings

In our research work, we mainly propose the hypotheses relevant with the relationship between OIC and three main performances (i.e. operational performance, service recovery performance and new service development performance) and interactions among OIC, main performance, peculiar employee characteristics, control mechanism and other contextual factors. Specifically, in the study 1, three hypotheses focus on the interactions among OIC, operational performance, control mechanisms (i.e. risk control and process control formality) and the peculiar characteristic of service operations environment (i.e. ethical risk). In the study 2, six hypotheses are relevant

with the interactions among OIC, creative efficacy, NSD performance, and contextual factors highly relevant with innovation and creativity (team-related factors and service-related factors). In the study 3, we propose five hypotheses, including the relationship between OIC and service recovery performance and some interactions among OIC, recovery performance and employee characteristics (i.e. role stress). The detailed study findings which are corresponding with the above hypotheses are concluded as follow.

Main findings of Study 1: In a service setting, operational improvement competence is positively related to operational performance and when control mechanisms related to process implementation (i.e. process control formality) are in place, frontline service employees perform better in applying OIC to operational processes. Such employees do not respond well to control mechanisms relating to the soft aspects of their firms when participating in operational improvement competence (*OIC) activities. When ethical risks are high, the moderating effects of operations control on both risk control and process control formality become more effective in enhancing the association between OIC and operational performance.*

Our empirical analysis results support that OIC can improve service operations effectiveness, while there are some challenges in the implementation of systematic improvement efforts (e.g. Six Sigma) in service operations (Antony et al., 2007). OIC can help frontline employee identify repetitive processes and root causes of critical operational problems and propose effective problem-solving methods through process management and systematic methods (e.g. a DMAIC project or a fish-bone diagram), thereby achieving operational excellence, which indicates the effectiveness of process improvement practices in service firms can be partly attributed to frontline employees'

skills and knowledge. Indeed, compared with their counterparts in manufacturing or back-office service operations, frontline employees in service settings need to have better skills and more knowledge to cope with frequent customer contact and complicated service environments.

Our findings in Study 1 demonstrate that while process control formality significantly and positively moderates the positive relationship between OIC and operational performance, such a moderating effect of risk control is not significant. Control mechanisms nurturing structured behavior in processes such as standard operating procedures can help employees perform better in applying OIC to operational process. Nonetheless, such employees do not respond well to control mechanisms relating to the soft aspects (e.g., employee attitudes and missions) of their firms when applying OIC. Our samples are collected from frontline employees in financial service sectors. In this setting, frontline employees are often controlled by codes of ethics, as well as less explicit norms imposed by external bodies such as the China Banking Regulatory Commission (Orlikowski, 1991; Von Nordenflycht, 2010; CBRC, 2014), leading to overlap with the effect of such soft-aspect control mechanisms (aka risk control) in a firm. Thus, risk control has little impact on the behavior of frontline service employees.

We also find that when ethical risks are high, the moderating effects of operation control on both risk control and process control formality become more effective in enhancing the association between OIC and operational performance. The findings imply that when ethical risks are a significant threat to service firms, operations control with respect to both risk control and process control formality must be in place to curb

the potential unethical behaviours of service employees and prod them into applying OIC to their duties in processes.

Main findings of Study 2: Operational improvement competence, which is the corresponding form of employee competence in service operations, positively influences employee creativity. Employee creativity (aka employee creative efficacy) enhances new service development performance in our sample. Team-related moderating factors (i.e. leader effectiveness, communication effectiveness, and prior related experience) can significantly influence the relationship between OIC and frontline employees' creative efficacy. Service marketing is an important service-related factor as it positively moderates the relationships between OIC, employee creative efficacy and NSD performance. The results also suggest that service complexity and service newness positively moderate the relationship between employee creativity and NSD performance, but have no effects on the relationship between OIC and employee creativity.

Empirical results indicate that operational improvement competence enhances employee creative efficacy in frontline service teams. This study contributes to the literature by asserting that the practices of continuous improvement should be relevant to employee creativity and offering evidence that OIC as the corresponding form of employee competence in service operations can help develop frontline employees' creativity. Furthermore, our findings extend the NSD literature by showing the evidence that employee creative efficacy enhances new service development performance. When such frontline employees have adequate creativity, they will be able to come up with more new and useful ideas to deal with challenges in their complicated and uncertain tasks and apply these creative ideas to service and service procedures innovation. Our

findings also suggest employee creative efficacy can mediate operational improvement competence and NSD performance.

Team-related factors (e.g. leader effectiveness, communication effectiveness, and prior related experience) moderate the relationships between OIC, employee creative efficacy and NSD performance. Such findings suggest that effective leaders, effective communication and prior related experience can strengthen the impact of OIC on creative efficacy in our sample teams. Also, our findings suggest that while frontline employee creativity improves NSD performance (i.e. See the results of H2 in Table 5-2), effective leadership, effective communication, and prior related experience do not supplement the effectiveness of employee creativity in this respect. Future work on employee creativity and NSD may offer insights into these interesting findings. Service-related moderating factors suggest that service marketing is an important service-related factor as it positively moderates the relationships between OIC, employee creative efficacy and NSD performance. Service marketability represents a total market pressure that when it is of high levels, service employees are likely under enormous pressure to exactly meet market demand. Thus, it gives pressure to frontline employees to better capitalize on their OIC and creativity to achieve higher levels of expected outcomes. The results also suggest that service complexity and service newness positively moderate the relationship between employee creativity and NSD performance, but have no effects on the relationship between OIC and employee creativity. Service complexity and service newness represent more specific market pressure demanding complicated services and innovative services respectively. These two forms of market pressure do not have impact on OIC, but may encourage frontline employees to apply their

creativity to development of more complicated or innovative services, thereby enhancing the performance of NSD.

Main findings of Study 3: Operational improvement competence positively and significantly improves service recovery performance. Role stress can be a significant factor impeding the effectiveness of OIC in improving service recovery performance. Job resources improve the effectiveness of OIC in improving service recovery performance, and reduce the negative impact of role stress on the association between OIC and service recovery performance.

The results of empirical analysis demonstrate that operational improvement competence helps achieve superior service recovery performance in our sample teams. This finding may be partly attributed to frontline employees' willingness to apply OIC in achieving continuous improvement in service recovery processes. Through OIC's systematic methods (e.g., a DMAIC project or a fishbone diagram) and a process perspective, frontline teams can be more effective in identifying the root causes of service failures and proposing corresponding solutions for service recovery.

Our findings also suggest that frontline service employee's characteristics (i.e. employee role stress) negatively moderate the positive relationship between OIC and service recovery performance. Role stress (i.e. role conflict, role overload, and role ambiguity) can lead to frontline employees' emotional exhaustion and personal accomplishment reduction, which compromise employees' effectiveness in improving recovery processes. The benefits of organizational inducements and psychological resilience have a significant motivational effect on service teams when they use OIC to improve service recovery performance. These significant empirical findings show that

the role stress theory and the conservation of resources theory are valid in explaining the effectiveness of improvement activities in service teams. The analysis results of three-way interaction suggest that organizational inducements significantly weaken the negative impacts of role conflict and role overload on the relationship between OIC and service recovery performance and that psychological resilience significantly weakens the negative effect of role conflict on the effectiveness of OIC. Our significant three-way interaction findings indicate that service recovery, process improvement, role stress and conservation of resources can be inter-related in the context of service teams and integration of their relevance of concepts in more useful insights into enhancement of service recovery performance.

7.2 Theoretical and managerial implication

7.2.1 Theoretical implications

The first theoretical contribution of this research is the use of two perspectives (i.e. process improvement perspective and frontline employee perspective) to develop operational improvement competence (OIC) and explore new, useful, empirically-based insights into the effectiveness of OIC in improving operational, service recovery and new service development performance. In the OM literature, the current knowledge of continuous improvement tends to be concerned about manufacturing operations and assume that the participants of improvement practices are workers. Also, related studies indicate that there are challenges in the implementation of systematic improvement efforts (e.g. Six Sigma) in service operations (Antony et al., 2007). However, in our research, we unleash frontline employees' intellectual capital and develop operational

improvement competence as frontline teams' ability in process management and continuous improvement by employing the OM literature.

We firstly examine whether such improvement capability can help service firms achieve operational success, which supplements the current knowledge of continuous improvement and is consistent with prior studies on the effectiveness of operational improvement efforts (e.g. Six Sigma) in service firms (Swink and Jacobs, 2012; Chakraborty and Leyer, 2013). Furthermore, relevant studies of NSD performance argue that frontline employees can take key roles in the NSD process (Martin Jr and Horne, 1995; Brentani, 2001; Ottenbacher et al., 2006). Yet the empirical evidence supporting this argument or indicating how the relevant attributes of employee or service impact on the NSD performance is scant in the literature. In this research, we link employee attributes (i.e. creativity and OIC) to NSD performance by adopting the continuous process improvement perspective and frontline employee perspective and find that employees' operational improvement competence helps the development of their creative efficacy, thereby improving NSD performance, which offers new insights to the body of literature on new service development. In addition, service recovery is perceived as a core process of service operations, and successful and effective service recovery is very important for customer retention and organizational profitability. Also, frontline teams play a key role in recovery processes (Miller et al., 2000). Yet empirical evidence for integration of process improvement concepts into service recovery performance is scant in the literature. In this research, we find OIC indeed can enhance service recovery performance. This finding may partly be attributed to frontline teams' willingness to apply OIC to continuous improvement in service recovery processes, and

offer new and useful knowledge to the body of literature on service recovery by using the continuous process improvement perspective and frontline employee perspective.

The second theoretical contribution of this research is the consideration of the peculiar characteristics of service operational environment and frontline employees, such as ethical risks and employee role stress as moderating factors influencing the effectiveness of OIC. Service firms have a distinct operational environment and some of this environment's peculiar characteristics (e.g. uncertain customer demand, difficult behaviour monitoring, and conflicting goals) (Chase, 1981; Bowen and Ford, 2002; Yee et al., 2008) pose challenges to the effectiveness of OIC in such an environment. Operations control can improve the effectiveness of OIC on operational performance, which offers more insights into management of frontline employees and helps service firms to develop their OIC. In addition, the literature on operations control suggests that it restricts employees' innovative and entrepreneurial behaviours and it can be costly for firms to build control mechanisms (Goodale et al., 2011). Thus, based on the knowledge of employees' ethical behaviours in the literature on business ethics (e.g., Treviño, et al., 2006), our study demonstrates that when service firms facing the threat that their frontline employees may pursue unethical behaviours (i.e. ethical risks), operations control is particularly effective. These insights further supplement the literature on the effectiveness of continuous improvement in service operations.

When a service team employs OIC to improve service recovery, the improvement activities involved are likely to be more complicated than routine service activities (Wetzels, 1999; Maxham III and Netemeyer, 2003; Jong and De Ruyter, 2004; Homburg and Fürst, 2005). Such challenging improvement activities necessitate higher

levels of job commitment and positive attitudes from teams. Although service teams may capitalize on their OIC to improve service recovery, the presence of role stress and the resultant consequences (e.g. emotional exhaustion, slow response to customers, job dissatisfaction, job burnout) can reduce job commitment and positive attitude among team members, weakening the effectiveness of OIC in improving service recovery. Employee role stress can become a moderating factor influencing the effectiveness of OIC. These insights extend the literature relevant to service recovery and also indicate that future research needs to pay more extra attention to the peculiar characteristics of service settings.

The third theoretical contribution of this research is the application of the agency theory in identifying potential agency problems in service operations and how to enhance OIC's effectiveness in improving operational processes. The agency theory is generally used to examine buyer-supplier relationships (Morgan et al., 2007), operational control and compensation (Goodale et al., 2008; Christen et al., 2006), and behaviour monitoring in IT applications (Bhattacherjee, 1998). In our study, goal conflict occurs between frontline members concerned about their sales performance and their OM manager (or the leader of the service team) responsible for pursuing OIC and guiding frontline team members to carry out related activities. Also, they serve under the circumstances of low measurable service outcomes, highly uncertain and intangible service processes, and their behaviour is unmonitored. Thus, under the circumstance with goal conflict and information asymmetry, agency problems like moral hazards and adverse selection may occur. Our findings indicate that when operations control is in

place, employees perform better, and imply that the agency theory can be a valid choice to study the effectiveness of manufacturing practices in service operations.

The fourth theoretical contribution of this research is the application of the RBV theory from firm-level to micro-level concepts in conceptualizing employees' capabilities (i.e. employees' OIC and creativity) and the use of contingency theory in suggesting under which circumstance OIC can enhance service firms' new service development performance. According to the RBV theory, valuable resources should be rare, in-imitable, complicated, uncommon, non-transferable and non-substitutable and such resources can achieve firms' competitive advantage (Crook et al., 2008). Thus, OIC and employee creativity are valuable resources and can help a service firm to offer better values (e.g. efficient and innovative services) to its customers and achieve a specific form of competitive advantage (i.e. NSD performance). Our empirical analysis results support that the application of the RBV theory in conceptualizing micro-level capabilities is valid. Furthermore, based on a review of the literature on service innovation, employee creativity and the contingency theory, we identify two sets of contextual factors pertinent to a team's characteristics and contextual environment. Empirical analysis suggests that effective leaders, effective communication and prior related experience can strengthen the impact of OIC on creative efficacy in our sample teams, implying that team characteristics may facilitate OIC to achieve improvements in operations and have a positive effect on creativity development in employees. In addition, our findings suggest that service marketability is an important service-related factor as it positively moderates the relationships between OIC, employee creative efficacy and NSD performance, whereas service complexity and service newness do not

have impact on the relationship between OIC and employee creativity. Such findings offer useful insights into which circumstance can facilitate the development of OIC and creativity of frontline employees, thereby enriching the literature on employee creativity.

The final theoretical contribution of this research is the added empirical evidence to the literature on the role stress theory and the conservation of resources theory. Our study suggests that that the two job resources (i.e. organizational inducements and psychological resilience) can alleviate the negative impact of role stress on the effectiveness of OIC in improving service recovery performance. This finding represents an initial attempt to link the concepts of these two theories with OM practices (i.e. OIC and service recovery processes) and our novel proposition that the factors of the role stress theory (i.e. role conflict, role overload, and role ambiguity) and those of the conservation of resources theory can be connected in service operational processes. These significant empirical findings support that the role stress theory and conservation of resources theory are valid in explaining the effectiveness of improvement activities in service teams. Our significant three-way interaction finding also indicates that continuous improvement, role stress, job resources and service recovery can be inter-related in the context of service teams, and that the integration of their relevant concepts results in useful insights into improved service recovery performance. These findings also imply that since service operations are uncertain and often rely on frontline employees' and customers' participation, behavioural or organizational theories can be viable choices for future work concerning differing service operations practices or strategies.

7.2.2 Managerial implications

Firstly, service firms need to be aware of the strategic importance of continuous improvement competence in service operations, service recovery and service innovation. When attempting to improve performance outcomes, managers should be aware that frontline employees are important assets in operation processes, innovation and recovery processes. Also, frontline service employees are close to actual service delivery processes and are in a unique position to understand customer requirements. If frontline employees fail to improve service processes or grab useful market information through customer contacts, the efficiency of service delivery processes, NSD performance and service recovery will be at stake. Thus, frontline teams' improvement competence needs to be recognized as a critical factor in improving performance outcomes in service operations. To develop this form of competence in frontline teams, service firms should pay sufficient attention to the three practices of OIC of this study, namely process management, structured methods and continuous improvement. By using the definitions, concepts and measurement items of these three practices, service firms can have detailed guidelines on development of continuous improvement competence in their frontline teams.

Secondly, OM managers or frontline team leaders in service firms should understand that they manage a knowledgeable and skilled workforce that provides important intellectual capital to their firms. These frontline employees have expertise in the procedures they implement and the customers they serve. Also, their creativity is important because it has positive impacts on NSD performance. Indeed, it is common that frontline employees are involved in NSD activities, and their creative ideas are useful inputs to achieve innovation in new services. So managers should not waste such

a valuable asset, but try using different means to gather, share, and utilize the employees' knowledge for achieving improved operational performance and put more pressure on frontline employees to offer creative inputs in new service development activities in response to intense market competition. In addition, service firms also should obtain relevant insights into nurturing creativity in frontline employees by examining the literature on employee creativity.

Thirdly, managers should consider operations control in place to supplement OIC relevant activities in operational processes and take steps to assess the threat of ethical problems in their frontline employees. According to the assessment of ethical problems in their firms, they can make decision on what forms of control mechanisms can be effective to curb unethical behaviours of frontline employees and to prod them into carrying out their duties in service processes and OIC. Because of goal conflict, behavior unmonitored, and outcome immeasurability in service settings, operations control should be in place to help the application of OIC to operational processes. When designing operations control, managers in service firms may pay attention to whether their frontline employee are influenced by an external professional body or controlled by widely-accepted norms and codes of conduct. If this is the case, they can focus on developing mechanisms that control frontline employees' work procedures in their firms. Under the circumstance of ethical risks, operations control is particularly significant in the enhancement of the effectiveness of OIC on operational performance. To effectively apply OIC, managers should take measures to assess the threat of ethical problems to their frontline employees and consider what forms of control mechanisms can be effective to curb unethical behaviours of frontline employees and prod them into

applying OIC. In addition, the root cause for a lack of applying OIC in service firms is likely to be the conflict between the goal of OM managers and the personal goal of frontline employees. Therefore, managers may need to resort to human resources policies (e.g., balanced appraisal systems) to partly address this root cause.

Fourthly, managers should consider contextual factors relating teams and services to enhance the effectiveness of OIC on NSD performance. The nature of these two groups of factors are different in the sense that while team-related moderating factors tend to be under control of service firms, service-related moderating factors tend to be dominated by the external environment. Specifically, service firms which have OIC in place and intend to nurture creativity in frontline employees need to develop effective leadership skills in their frontline team leaders, create an atmosphere that encourages open communication among frontline employees and recruit such employees with adequate and relevant prior-related experience. On the other hand, service-related moderating factors (i.e. service marketability, complexity and newness) are likely characteristics influenced by the external environment. Our findings indicate that when a firm's services are marketable, OIC is particularly effective in enhancing employee creativity. Our findings also indicate that when a firm's services are marketable, complex or new, employee creativity is particularly effective in enhancing NSD performance. These findings offer service firms very useful and precise insights into how to invest more resources into developing OIC and employee creativity.

Finally, managers need to realize the negative impacts of role stress (i.e. role ambiguity, role overload and role conflict) on the use of OIC in service recovery processes and the importance of sufficient job resources in impelling OIC teams to carry

out their OIC duties and weakening the adverse impact of role stress. When a service team employs OIC to improve service recovery, the improvement activities involved are likely to be more complicated than routine service activities. Such challenging improvement activities necessitate higher levels of job commitment and positive attitude in the team. The peculiar characteristics of frontline teams (e.g. role stress) can weaken job commitment and positive attitude, thereby impeding the effectiveness of OIC on service recovery performance. Managers need to realize the negative impacts of role stress (i.e. role ambiguity, role overload, and role conflict) on the use of OIC because sufficient job resources impel OIC teams to carry out their OIC duties in service recovery processes and can reduce the adverse impact of role stress. Specifically, to address role conflict problems among service employees, managers need to offer enough organizational inducement and provide psychological resilience training. When the role stress problems of service employees are mainly concerned with role overload, managers can focus on offering adequate levels of organizational inducement. Overall, these findings offer practitioners precise guidelines on decision making for achieving better service recovery performance in certain situations.

In conclusion, the most urgent guideline for the organization is to develop such improvement competence. OM managers need pay sufficient attention on three practices comprising OIC and put the specific measurement items in the existing policies and regulations. On the operational performance enhancement, service firms also need consider the control mechanism and also need assess the possibility of employee undertaking unethical behavior. On the new service development performance enhancement, service firms need recruit the employee with some experience, cultivate

effective leader and prompt the effective communication. Also, in the new service development process, service firms need consider the new service related characteristics. On the service recovery performance enhancement, service firm should consider the problem of employee role stress and offer sufficient job resources.

7.3 Research limitations and further study

7.3.1 Limitations of this study

There are several limitations to this study. Firstly, given our cross-sectional data, the direction of causality in the posited hypotheses cannot be unambiguously determined. Indeed, in this study, performance improvement has a time lag when applying operational improvement competence. Thus, further study should try to capture the exact time-lag and employ a longitudinal approach to data collection to obtain temporal evidence to support the claimed causality.

Secondly, all the data was collected from survey questionnaires completed by team members and leaders so the data has common method bias. We adopt a series of methods to ensure that it presents no serious problem. For example, we obtain the main variables of our hypotheses from two different data sources (i.e. team leader and member) and design positive and reversed items for main constructs. Finally, we use statistical methods to further assess its severity.

Thirdly, performance measurements are obtained from only the team leader of each team. It may be more precise for data relevant to members' performance collected from both team leaders and customers or objective data should be used for assessing performance outcomes. In financial settings, it is not feasible to contact corresponding customers of each team and objective data about employees' performance is not made

public. Nevertheless, each team is comprised of professionals and its members are likely to give an objective assessment of their team. Such a limitation is unlikely to influence hypothetical relationships.

Fourthly, in terms of research scope, we conduct this study in a financial setting. Frontline employees have high contact with customers, are knowledgeable and also have discretion to make decisions. It means that these findings are unlikely to be generalized to service firms with low-contact customers (e.g. convenience stores) or frontline service employees with only routine operations (e.g. waitresses). For these service firms, our study may have some limitations.

Lastly, the sampling frame of the study is a financial service setting in mainland China. Although operational modes are similar to those of other counties, some contextual factors (e.g. cultural backgrounds and government policies) may influence the effectiveness of the practices involved. Thus, it is worthwhile to examine the impact of these contextual factors such as cultural, strategic and governmental factors on service operations.

7.3.2 Direction for further research

In this study, we use two perspectives (i.e. process improvement perspective and frontline employee perspective) to address the relevant issues of service operations. In a service setting, other strategic and management perspectives (e.g. strategic fit or leader behaviour) may have new implications to enhance performance. Thus, further study can employ different perspectives or types of literature on different disciplines (e.g. behavioural science) to identify new practices relating to the enhancement of operational performance, service recovery performance and new service development performance.

Considering operational improvement competence, our study is based on the continuous improvement infrastructure framework of Anand et al. (2009) in identifying three operational-level practices. Further study can examine whether other process improvement practices with pertinent characteristics of service firms are closely relevant to frontline employees and broaden the scope of operational improvement competence. In addition, to unleash the intellectual powers of frontline service employees, some new improvement methods that fit a dynamic service environment and knowledge intensity in a workforce should also be developed.

Our study examines many moderating factors (e.g. operational control, ethical risk, role stress, job resources, team and service-related factors) affecting the effectiveness of applying operational improvement competence and provides guidelines for future research to find out other factors moderating the effectiveness of OIC. Thus, future research can employ different types of literature or theories to identify moderating factors. For instance, the literature on organizational learning is highly relevant to operational improvement competence in the context of service firms, which can be a potential moderating factor. Also, because service operations are uncertain and often rely on frontline employees' and customers' participation, behavioural or organizational theories can be viable choices for future work concerning different service operations practices or strategies. In addition, the culture and policies of service firms may influence the implementation of process improvement, thereby influencing the performance outcomes of applying OIC. These studies may give more insights to help firms implement process improvement practices, equip frontline employees with

better OIC ability, and provide more comprehensive guidelines for managers on the effective application of OIC.

Future studies can overcome some limitations of the methodology. Firstly, future studies should try to capture the time lags of the relationship between process improvement and performance outcomes and conduct longitudinal analysis, making the relationship more precise. Secondly, future studies focus mainly on a publicly listed financial services firm and obtain objective financial data, avoiding common method bias. Thirdly, it is also desirable to obtain data relevant to performance outcomes and other contingency variables from customers to examine relationships and effectiveness precisely.

Finally, we can consider some interactions among three studies. They not only have the common variable (i.e. OIC), but may have some interactions for future study. For example, the moderators of Study 1 (i.e. control mechanisms) may have relationship with the variable of creativity in Study 2, based on the risk management. Thus, in the future study, we can focus other relationship among three studies.

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