Effects of organisational learning on service innovation performance: the mediating effect of supply chain collaboration and the moderating role of interpersonal trust

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Abstract: This paper discusses the relationships between organisational learning and service innovation performance, as well as the mediating role of supply chain collaboration and the moderating role of interpersonal trust. The empirical study shows that: 1) different dimensions of organisational learning have different effects on different dimensions of supply chain collaboration and service innovation performance; 2) supply chain collaboration acts as a mediatior between knowledge absorption, knowledge integration, and service innovation performance, but it does not have a mediating effect on the relationship between learning intention and service innovation performance; 3) the positive relationship between knowledge integration and service innovation performance is stronger if the interpersonal trust is higher than it is low. But interpersonal trust does not have a moderating effect on the relationship between the other two dimensions of organisational learning (learning intention and knowledge absorption) and service innovation performance. The segmentation study in this paper gives some theoretical values and insights on research of supply chain collaboration, organisational learning and service innovation performance, and enriches the empirical research of these areas to some extent.
1 Introduction

Service innovation has received much attention and has become one important operational resource in recent years following the transition from traditional product-oriented economy to service-oriented economy; it offers a new driver of growth for company (Carlborg et al., 2014). As implied in the service-dominant logic, service innovation is a complex and incremental process (Vargo et al., 2008). It refers to improve and change the existing service process and product through using new technologies (such as information and communication technologies) to promote service quality and service efficiency, and finally forms the competitive advantage (Inaba and Miyazaki, 2010; Jian and Zhou, 2015). Service innovation is special compared with product innovation because it may provide intangible outcomes (Lusch and Nambisan, 2015). In the past several decades, large of scholars explored company innovation and its antecedents and consequences. Their results revealed that there are many internal and external drivers of innovation, including internal R&D, management capability, senior executive support, partners’ relationships management, ICTs’ using, and so on (Damanpour and Aravind, 2012; Im et al., 2013; Prajogo and McDermott, 2014). In general, people think innovation brings good performance for company.
Most studies provide insights into the collaboration and co-creation when they explored some practice about service innovation (Vargo et al., 2008; Galvagno and Dalli, 2014), particularly co-creation with customer (Vargo et al., 2008; Gustafsson et al., 2012). Customer is generally seen as the critical collaborator of service innovation, new value is not produced until customer applies the service (Gustafsson et al., 2012). However, scholars also give their attention to other stakeholders in supply chain in the creating process of service innovation in recent research. Collaborating with partners (including all stakeholders in supply chain) and learning from them will smooth the process of service innovation and improve the innovation performance (Agarwal and Selen, 2013; Lusch and Nambisan, 2015). For example, collaborating with supplier and learning from them help company identify and prevent potential risk that could result in the following innovation process (Mengue et al., 2014). However, although the positive effect of organisational learning on innovation performance was demonstrated in previous studies, few of them explore the bridging character of supply chain collaboration and the moderating effect of interpersonal trust between different learning process and service innovation performance, and few of studies consider the segmentation study about learning and collaboration and their influence on service innovation performance. That is, the research about the role of different dimensions of organisational learning and supply chain collaboration on service innovation performance is poor.

This paper explores the relationship between different dimensions of organisational learning and service innovation performance, and the mediating role of different dimensions of supply chain collaboration. Further, to clarify the relationship between organisational learning and service innovation performance, we consider the moderating role of interpersonal trust based on the Chinese Guanxi context. After literature review on the relevant variables, we put forward five hypotheses. Then using structural equation model (SEM) and AMOS20.0 to test the direct effect between constructs, and using SPSS20.0 to test the moderating effect of interpersonal trust. In the discussion section, we analysed the conclusions, implications, research limitations and future research.

2 Literature review and hypothesis

2.1 Organisational learning

Organisational learning is an important process by which company obtains information and creates new knowledge to meet the changes in an uncertain environment (García-Morales et al., 2012). Inconsistent with general organisational learning, learning in supply chain means company obtains knowledge and information not only from one partner (such as one customer or one supplier), but also from different actors in supply chain simultaneously (Alcalde and Guerrero, 2016). It makes knowledge more diversified and interactive. Companies know where knowledge storage in supply chain according to transactive memory system theory (Jin et al., 2014). It forms an organisational memory that different company has different professional knowledge among organisations interaction. Company can easily know where to find and get the knowledge they need in supply chain, it is an effective way to learn for every company. Therefore, organisational learning in supply chain network is a very important issue for future research.
In this paper, we use three stages to measure organisational learning in supply chain, there are learning intention, knowledge absorption, and knowledge integration (Cohen and Levinthal, 1990; Rhodes et al., 2008). First, company should have the intention to learn from others, it is an opportunity to enrich company’s existing knowledge base and improve innovation. Second, company should have the ability to absorb knowledge from external. Knowledge absorptive capability is viewed as an important stimulus for organisational change and organisational improvement (Inkpen and Tsang, 2005). Further, studies show knowledge integration is very important for organisational learning, it configures knowledge power effectively, and breaks it up, then composites it again, and finally applies it to the given task.

2.2 Supply chain collaboration

Supply chain collaboration has been identified as a critical way to develop competitive advantage for company (Matopoulos et al., 2007). It brings many benefits to company, including increased flexibility, higher customer satisfaction and loyalty (Qi et al., 2014), decreased searching cost, and higher service level (Kumar and Nath Banerjee, 2014). Collaboration within a supply chain means all actors share a common achievable target or a common ‘world view’ (Kumar and Nath Banerjee, 2014). It includes three elements: joint decision making, information sharing, and benefit sharing (Ha et al., 2011). Similarly, other researches mentioned that the three elements of supply chain collaboration are information sharing, decision synchronisation and incentive alignment (Simatupang and Sridharan, 2005). Somebody argued the collaboration is a reflection of partner relationships, such as trust, commitment or long-term orientation, interdependence (Sur, 2011; Choi, 2017). Although scholars have done a lot of research on supply chain collaboration, it is rare to study the different dimensions of collaboration behaviour. In order to reveal the supply chain collaborative behaviours and it is outcomes to Chinese company, we divided supply chain collaboration into three dimensions: joint decision making, information sharing, and benefit sharing.

Literatures demonstrate the positive direct influence of supply chain collaboration on company’s operational performance. For example, Ha et al. (2011) revealed joint decision making and information sharing improved the logistics efficiency. Soosay et al. (2008) found joint planning can decrease and overcome inter-company barriers. However, most of literatures missed considering how the different dimensions of supply chain collaboration affect company’s innovation performance. Therefore, this paper attempts to study the mechanism function of different collaborative behaviours on the relationships between organisational learning and company’s service innovation performance. We hope to reveal the important role of supply chain collaboration, and provide more practical guidance for companies.

2.3 Interpersonal trust

The interaction of different companies is mostly implemented by their boundary spanners, such as sales person or other contact people. It forms one kind of business relationships between contact people in two different companies (Barnes et al., 2015). They have a closer relationship than other employees because of the organisational interaction. They are ‘translators’ for company because they translate the external information (such as partner’s knowledge, environment information et al.) to their own
company. In China, the relationship between two contact people is easily formed because of Guanxi. Guanxi is a special culture in China, it is established in the process of the relationships transition from unfamiliar to the familiar between different people (Lobo et al., 2013). Acquaintances with high frequency communication trust each other, they have the willing to share their emotion and other resource. Interpersonal trust which formed in this process is always a kind of irrational relationship, it will be more stable than the rational calculation trust in today’s rapidly changing environment. Although interorganisational trust has been studied in many literatures, the research of interpersonal trust and its influence on company’s innovation has been limited, especially in the field of service innovation. As the performance of service innovation is more reflected in the individual’s perception, interpersonal trust between two contact people based on individual perception is more important to company. This paper will explore the role of interpersonal trust on the relationship between organisational learning and service innovation performance.

2.4 Hypotheses development

The benefits of supply chain collaboration emerge from organisational learning have been discussed. Capturing heterogeneous knowledge creates more competitive advantage, complementary and sustainable knowledge from supply chain network improve company finish innovation projects and collaborate with partners more effectively (Blome et al., 2014). For example, company will make better decision when it obtained knowledge about partners’ target. Organisational learning promotes collaboration in different stages. Specially, learning intention increases the learning enthusiasm, and promotes the effective communication with partners in supply chain. Knowledge absorption is important for companies to face and solve the problem of the increasing costs of knowledge creation, and the problem of increasing knowledge obsolescence. Knowledge integration make company possess different transformative capacity, at the same time, it promotes the accumulation of collaborative experience, so as to maintain the good cooperative relationships (Jian and Zhou, 2015). Therefore, we propose:

H1a Learning intention has a positive effect on supply chain collaboration.

H1b Knowledge absorption has a positive effect on supply chain collaboration.

H1c Knowledge integration has a positive effect on supply chain collaboration.

Literatures on innovation have demonstrated the important contribution of organisational learning. Innovation is known as a learning process that tries to find new ways to solve problems and meet the changing needs (Wang et al., 2016). According to the service science theory, the idea of service innovation mostly arises from the knowledge gained from cooperation with outside partners, but not from traditional R&D. Learning from partners in supply chain make company understand the latest technical knowledge and market information quickly. So as to decrease the environment uncertainty and meet the change of customer needs. Therefore, learning helps companies to maintain or improve their innovation performance. Company considers learning as one important investment for long development and survival. Learning intention affects what kind of information or knowledge which company will gather and use. It helps company to get innovative service ideas, and improves the ability to grasp the source of innovation. Meanwhile,
company need to absorb external knowledge to diversify the existing knowledge. Diversified knowledge provides novel ideas to reorganise company’s knowledge (Tang and Ye, 2015), so as to decrease the research cost of useful knowledge, and improve the effectiveness of service innovation. The integration of internal and external knowledge promote company reach a consensus with partners on the service innovation project, thus promote the implementation of service innovation. Therefore, we put forward the following hypotheses:

H2a Learning intention has a positive effect on service innovation performance.
H2b Knowledge absorption has a positive effect on service innovation performance.
H2c Knowledge integration has a positive effect on service innovation performance.

More and more research emphasises that one company should cooperate with customer and supplier in the process of innovation (Kumar and Nath Banerjee, 2014; Tang and Ye, 2015). Many literatures have shown their supports that supply chain collaboration improves company service innovation (Agarwal and Selen, 2013). The innovation cost may be reduced because of suppliers’ R&D activities, at the same time, it may be decreased by join decision making. Lin (2012) empirically demonstrated that cost-saving innovation is one important type of service innovation. Companies which have collaboration relationships do not need communicate with each other frequently for some details, so as to decrease the transaction cost (Huo et al., 2016). Simatupang and Sridharan’s (2005) study also found that highly collaboration practice of supply chain members can get better operating performance and innovation performance. Collaboration improves customer’s willing of sharing information, such as information about special demands and service needs patterns. This endogenous information advantage make company as an ‘expert’ in innovative market, company obtains benefits of monopoly because of its better service than imitators (Borsenberger et al., 2015). Collaboration with partners improves the efficiency of innovative process, and maintains the reliability of the innovation operation. So, we give the hypotheses as follows:

H3a Join decision making has a positive effect on service innovation performance.
H3b Information sharing has a positive effect on service innovation performance.
H3c Benefit sharing has a positive effect on service innovation performance.

Supply chain collaboration is important for company innovation, it brings lots of benefits, including better quality, lower cost, more timely delivery, and efficient operations (Soosay et al., 2008). The premise of supply chain collaboration requires the skills and knowledge which can form some abilities, such as innovative ability. In the current information era, facing with various external information and knowledge, company has to identify and utilise the valuable knowledge through learning. Learning behaviour increases the interaction frequency between companies, and drives the further collaborative behaviours between them. Company learns from partners’ success and their failure, and realises the rivals’ strength and weakness by collaborating with external partners. Therefore, collaborative practice in supply chain is vital for company service
innovation performance. Some actions which improve company’s innovation performance, such as reducing production cost, improving the process, and so on, often guided by the collaborative practice (Foss et al., 2013). Company develops and promotes its innovative ability through collaboration based on organisational learning, thus to enhance the service innovation performance, and finally, turn it into competitive advantage (Chen et al., 2016). Therefore, we put forward the following hypothesis:

H4 Supply chain collaboration acts as a mediator between the relationship of organisational learning and service innovation performance.

We believe that organisational learning will promote service innovation performance more effectively when interpersonal trust between contact people is high, but the relationship between organisational learning and service innovation performance is not so significant when interpersonal trust is low. The reason is shown as follows. Under the context of Chinese Guanxi, contact people from different companies trust each other often means the high communication frequency between them which based on their job interaction. They are easier to emotionally accept each other, and give the effective suggestions to the problem which rises in organisational learning. The behaviour based on trust pushes the integration of knowledge and improves the service innovation performance (Ha et al., 2011; Balliet and Van Lange, 2013). For example, people may be told some know-how knowledge to their contact people in other company outside of their own job responsibilities. They have the willing to share key knowledge only because they trust each other (Chang et al., 2013). On the contrary, if the inter-personnel trust from two boundary people of different companies is low, people will not provide any additional help outside their responsibilities, this negative act may have a negative impact on service innovation performance. Therefore, we propose:

H5 Interpersonal trust acts as a moderator between the relationship of organisational learning and service innovation performance.

Figure 1 is the conceptual model, it depicts the relationships between organisational learning, supply chain collaboration, interpersonal trust, and service innovation performance.

Figure 1 Conceptual model
3 Research design

3.1 Variables measurement

This study involves concepts about organisational learning, supply chain collaboration, interpersonal trust, and service innovation performance. We use maturity scale from prior studies to assure the validity and reliability of the measurements. The participants were senior managers from different industries, they were asked to answer the questions according to the actual situation, using five-point Likert scale where ‘1’ indicates ‘strongly disagree’ and ‘5’ indicates ‘strongly agree’.

3.1.1 Organisational learning

Organisational learning is important for company improvement, this study measured it from three dimensions—learning intention, knowledge absorption and knowledge integration. Learning intention is the premise of learning behaviour, knowledge absorption help companies to understand the knowledge differences between them, knowledge integration combine external knowledge with internal knowledge from a higher level. The measures involved nine items from Selnes and Sallis (2003). The measures about learning intention include:

1. ‘It is the best opportunity to learn from service innovation for your company’
2. ‘Our executives have strong willing to arrange related people to learn’
3. ‘We have a fixed criterion to facilitate service innovation’. The measures about knowledge absorption include
4. ‘We know the culture difference with partners very clearly’
5. ‘We are able to solve the problem in the process of service innovation because of the knowledge from partners’
6. ‘As soon as we acquire new knowledge from partners, we making fully use of it’. The measures about knowledge integration include
7. ‘Our new knowledge helps our company to restructure the original service’
8. ‘We effectively use the new knowledge into practice’
9. ‘The combination of our knowledge and partners’ knowledge has reduced the uncertainty of our innovation activities’.

3.1.2 Supply chain collaboration

We measured supply chain collaboration from joint decision making, information sharing, and benefit sharing. It focus on the decision of important issues (such as collaboration plan and decision adjustment), critical information sharing (such as some experience and market or customer information), and the attention on long-term collaborative benefit (such as partners’ long-term development and success). All nine measure items came from the research of Hewett et al. (2002), Johnson and Sohi (2003). The measures about joint decision making include:
Effects of organisational learning on service innovation performance

1. ‘We will discuss the problem in the collaboration with partner in a timely manner’
2. ‘We will discuss and summarise the experience of success and the reason of failure’
3. ‘We will be jointly with partners to assess the important decision-making and give an adjustment to it’.

The measures about information sharing include:
4. ‘We have a willing to share the experience to partners’
5. ‘We have a willing to share the market information and customer needs to partners’
6. ‘We have a willing to share service information to partners’. The measures about benefit sharing include
7. ‘We believe partners will consider our benefit when they making an important decision’
8. ‘We care about the long-term development and success of partners’
9. ‘We will participate in new product and service development of partners’.

3.1.3 Interpersonal trust

Interpersonal trust is the relationship between two boundary people of different companies, it formed because of the interactive activities. It is one kind of organisational relationships (Barnes et al., 2015). This study measured this relationship from the cognition and contact experience, and conflict resolution according to the research of Doney and Cannon (1997). The measures include:
1. ‘Our contact person understands the operation mode of our company’
2. ‘Our contact person understands the operation mode of our partners’
3. ‘Our contact person has very good experience in the collaboration with partners’
4. ‘Our contact person has a keen insight on the potential conflict between our company and partners’
5. ‘Our contact person can give some constructive suggestion when the conflict occurs’.

3.1.4 Service innovation performance

The assessment for company innovation mainly from cost and benefit in the existing studies. According to the research of Storey and Kelly (2001), service innovation performance is a multi-dimensions conceptual. So, the assessment for service innovation performance also needs to consider multi-dimensions factors. Different with general product innovation, service innovation values customer experience because customer is one of the creator of service innovation (Barrett et al., 2015). Customer orientation and involvement bring dynamic capability for companies, and influence service innovation outcomes and company performance (Ordanini and Parasuraman, 2011). So, this paper combined the effect of service innovation on company financial performance (e.g., cost, return on investment), and market performance (e.g., market share, customer satisfaction) to measure the dependent variable-service innovation performance, using four items from the research of Storey and Kelly (2001). The measures include:
‘The new service innovation has a high return on investment for our company’

‘The new service innovation improves the market share for our company’

‘The new service innovation reduces the cost for our company’

‘The new service innovation improves the satisfaction of customer for our company’.

3.2 Data and sample

The sample companies in this study come from different industries, such as manufacturing, science and technology service, retail and wholesale industry, finance and insurance industry in South China. We choose South China because this area has an advanced service innovation than other areas in China. The data was collected through three stages: pretest interviews, pretest questionnaire distribution and recovery, the formal questionnaire distribution and recovery. We modify the measurement according to the feedback from the first two stages, and send 485 questionnaires to different companies. Finally, we acquired 243 effective questionnaires, and effective return ratio was 50.1%.

4 Analysis and results

We chose SEM and analysis of moment structures (AMOS) 20.0 to test the direct and indirect effects of the relationship between constructs, and use SPSS to test the moderating effect of interpersonal trust on the relationships between organisational learning and service innovation performance. SEM belongs to multivariate statistics, which integrates two kinds of statistical methods (factor analysis and path analysis), it can test the fitness of the hypothesis model. AMOS combines the traditional linear model with common factor analysis, and facilitates the output of best model.

4.1 Reliability and validity test

We used Cronbach’s coefficient alpha to test the internal consistency reliability, it explains the degree to which all the related test items measure a same construct. It demonstrates the interpretation of sample’s data is accurate if the value of Cronbach’s alpha is greater than 0.7 (Tavakol and Dennick, 2011). The results show that all Cronbach’s coefficient alpha of constructs’ are above the threshold value of 0.7 in Table 1. So the internal consistency of constructs’ measurement is good.

We used different methods to test different validity. The maturity scale which was certified by priors researches ensure the content validity. The values of average variance extracted for all variables exceed the 0.50 (except the value about learning intention, it can be accepted if individual variable value can not conform to the standard) as shown in Table 1. Table 1 also shows that the critical ratios are significantly greater than 2.0. So, the convergent validity is also good. Then, we tested the discriminant validity, as it shows in Table 2, the numbers on the diagonal are the square root of the average variance extracted values, and other numbers are the correlation coefficients. The results show that the square roots of the average variance extracted values are greater than any of the correlation coefficient of two components. So the discriminant validity was also demonstrated.
Table 1  The result of confirmatory factor analysis

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Measurement items</th>
<th>Factor loading</th>
<th>Cronbach’s a</th>
<th>AVE</th>
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<tbody>
<tr>
<td>Learning intention</td>
<td>LI-1</td>
<td>0.557</td>
<td>0.726</td>
<td>0.4733</td>
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<td></td>
<td>LI-2</td>
<td>0.764</td>
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<td></td>
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<tr>
<td></td>
<td>LI-3</td>
<td>0.725</td>
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<tr>
<td>Knowledge absorption</td>
<td>KA-1</td>
<td>0.572</td>
<td>0.766</td>
<td>0.527</td>
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<tr>
<td></td>
<td>KA-2</td>
<td>0.775</td>
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<td></td>
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<tr>
<td></td>
<td>KA-3</td>
<td>0.808</td>
<td></td>
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<tr>
<td>Knowledge integration</td>
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<td>0.8052</td>
<td>0.5813</td>
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<td></td>
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<td></td>
<td>KI-3</td>
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<td>Join decision making</td>
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<td>JDM-2</td>
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<td></td>
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<td>Information sharing</td>
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<td>IS-2</td>
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<td></td>
<td>IS-3</td>
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<td>Benefit sharing</td>
<td>BS-1</td>
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<td>Interpersonal trust</td>
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<td></td>
<td>SIP-4</td>
<td>0.780</td>
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Table 2  The square roots of the average variance extracted values, correlation coefficient

<table>
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<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tbody>
<tr>
<td>Interpersonal trust</td>
<td>0.731</td>
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<tr>
<td>Learning intention</td>
<td>0.435</td>
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<tr>
<td>Knowledge absorption</td>
<td>0.569</td>
<td>0.595</td>
<td>0.726</td>
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<td>Knowledge integration</td>
<td>0.385</td>
<td>0.572</td>
<td>0.570</td>
<td>0.762</td>
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<tr>
<td>Join decision making</td>
<td>0.543</td>
<td>0.503</td>
<td>0.478</td>
<td>0.516</td>
<td>0.721</td>
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<tr>
<td>Information sharing</td>
<td>0.389</td>
<td>0.266</td>
<td>0.307</td>
<td>0.348</td>
<td>0.401</td>
<td>0.708</td>
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<tr>
<td>Benefit sharing</td>
<td>0.434</td>
<td>0.417</td>
<td>0.491</td>
<td>0.315</td>
<td>0.440</td>
<td>0.181</td>
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<td>Service innovation</td>
<td>0.637</td>
<td>0.571</td>
<td>0.602</td>
<td>0.602</td>
<td>0.701</td>
<td>0.479</td>
<td>0.464</td>
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</table>
The confirmatory factor analysis also test the goodness-of-fit index of the model, it shows all the values meet the criteria (Chi-square/df = 1.880 < 3, CFI = 0.907 > 0.90, NNFI = 0.909 > 0.90, RMSEA = 0.06 < 0.08), it suggests the goodness-of-fit index of the model is good.

4.2 Hypothesis test

First, we use SEM and AMOS20.0 test the direct effect between variables, the results show in Figure 2.

Figure 2  The results of path analysis (see online version for colours)

As it shows in Figure 2, the direct effect from different dimensions of organisational learning to different dimensions of supply chain collaboration is different. Learning intention has a significant effect on join decision making and information sharing respectively, but no significant effect on benefit sharing. Knowledge absorption has significant effects on every dimension of supply chain collaboration. Knowledge integration has positive effect on join decision making and benefit sharing respectively, but no positive effect on information sharing. So Hypothesis 1-1 has been partially supported, Hypothesis 1-2 has been supported under the confidence level of 0.1, Hypothesis 1-3 has been partially supported too. The results also show join decision making and benefit sharing both have significant effect on service innovation performance, but information sharing has not a significant effect on the dependent variable, Hypothesis 3-1 and Hypothesis 3-3 are supported, but the Hypothesis 3-2 are not supported. Learning intention and knowledge absorption both have not positive effect on service innovation performance, but knowledge integration has positive effect on it.
Second, the mediating effect of supply chain collaboration was tested by bootstrap methods. The results show in Table 3, we can see the confidence interval of knowledge absorption and knowledge integration do not include 0, it means the indirect effect from these two variables to service innovation performance are significant and mediation are established. But the confidence interval of learning intention includes 0, it means the indirect effect from learning intention to service innovation performance is not significant and mediation is not established (Zhao et al., 2010). So, the Hypothesis 4 is partial supported.

**Table 3** The results of mediating effect test

<table>
<thead>
<tr>
<th></th>
<th>Learning intention</th>
<th>Knowledge absorption</th>
<th>Knowledge integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>The confidence interval</td>
<td>Upper 0.323</td>
<td>0.411</td>
<td>0.337</td>
</tr>
<tr>
<td></td>
<td>Lower -0.026</td>
<td>0.001</td>
<td>0.019</td>
</tr>
<tr>
<td>P value</td>
<td>0.094</td>
<td>0.049</td>
<td>0.029</td>
</tr>
</tbody>
</table>

Notes: (a) Level of confidence for confidence intervals: 95, (b) number of bootstrap resamples: 5,000.

**Table 4** The results of SPSS

<table>
<thead>
<tr>
<th>Service innovation performance</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main effect</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning intention</td>
<td>0.116*</td>
<td>0.082</td>
</tr>
<tr>
<td>(0.046)</td>
<td>(0.159)</td>
<td></td>
</tr>
<tr>
<td>Knowledge absorption</td>
<td>0.167**</td>
<td>0.177**</td>
</tr>
<tr>
<td>(0.008)</td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>Knowledge integration</td>
<td>0.279***</td>
<td>0.297***</td>
</tr>
<tr>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>Interpersonal trust</td>
<td>0.316***</td>
<td>0.336***</td>
</tr>
<tr>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
</tr>
</tbody>
</table>

| Interaction effect             |         |         |
| Learning intention x interpersonal trust | -0.010  |          |
| (0.875)                        |         |
| Knowledge absorption x interpersonal trust | -0.093  |          |
| (0.186)                        |         |
| Knowledge integration x interpersonal trust | 0.222** |          |
| (0.001)                        |         |
| $\Delta R^2$                  | 0.030** |          |
| (0.005)                        |         |

Notes: *p < 0.05, **p < 0.01, ***p < 0.001
Third, the linear stepwise regressive method was used to test the moderating effect. We add four independent variables (including three dimensions of organisational learning and interpersonal trust) into the model in first step and add the interaction items of them into the model in second step. All of the independent variables and the moderating variable are centralised in order to avoid the interference of multicollinearity. The result shows as Table 4.

We can see the change of $R^2$ is significant ($p = 0.005 < 0.05$) when knowledge integration interact with interpersonal trust. It suggests that the interpersonal trust act as a moderator in the relationship between knowledge integration and service innovation performance. Further, the plot of the interpersonal trust moderation effect is presented in Figure 3. It shows that the knowledge integration and service innovation performance relationship is positive for high interpersonal trust. That is, the positive relationship between the knowledge integration and service innovation performance is stronger if the interpersonal trust is high than it is low. But the results also show that the change of $R^2$ are not significant when learning intention and knowledge absorption interact with interpersonal trust, so it has not the moderating effect of interpersonal trust on the relationship between other two dimensions of organisational learning (learning intention and knowledge absorption) and service innovation performance. So, the Hypothesis 5 is partial supported too.

**Figure 3** Interaction effects of interpersonal trust and knowledge integration

5 Discussion

5.1 Conclusions

First, the results show that different dimensions of organisational learning have different effects on different dimensions of supply chain collaboration, for example, the
hypotheses of the effect of learning intention and knowledge integration on supply chain collaboration are partial supported. Among them, learning intention has no significantly effect on benefit sharing, knowledge integration has no significantly effect on information sharing. Knowledge absorption has positive effect on supply chain collaboration when the level of significant is 90%. The results are not consistent with the hypothesis completely, it may be because learning intention only forms a climate that supports for collaboration and innovation in company (Scott and Bruce, 1994). It needs more management and resource support to translate it into implement collaborative behaviour. Meanwhile, as scholars mentioned, knowledge integration have combined different information and made full use of them (Prajogo and Olhager, 2012), so, it has not direct effect on information sharing.

Second, the results show that different dimensions of organisational learning have different effects on service innovation performance. Among them, learning intention and knowledge absorption have no significant effects on service innovation performance respectively. But knowledge integration has a significant effect on service innovation performance when the level of significant is 90%. This study illustrates the learning behaviour itself can not directly promote company service innovation performance, but need some other mechanisms’ role, such as supply chain collaboration. At the same time, we explore the influence of supply chain collaboration on service innovation performance. The results show different dimensions of supply chain collaboration have different effects on service innovation performance. Join decision making has a positive effect on service innovation performance, benefit sharing also has a positive effect on service innovation performance, but information sharing has not significantly effect on service innovation performance.

Third, our study explores the mechanisms between organisational learning and service innovation performance. The results show that supply chain collaboration has a mediating effect on the relationship between knowledge absorption and service innovation performance, it has the same effect on the relationship between knowledge integration and service innovation performance. But supply chain collaboration does not act as a mediator between learning intention and service innovation performance. Our study also finds the moderating effect of interpersonal trust on the relationships between organisational learning and service innovation performance. Interpersonal positively moderates the relationship between knowledge integration and service innovation performance. However, it has not significant moderating effect on the relationship between the other two dimensions of organisational learning (learning intention and knowledge absorption) and service innovation performance.

5.2 Theoretical and managerial implications

First, studies of organisational learning generally use it as a whole concept and discuss its influence on organisational innovation performance (García-Morales et al., 2012), same as the supply chain collaboration. Different from most research, we have explored the roles of different dimensions of organisation learning and different dimensions of supply chain collaboration on service innovation performance. This segmentation study enriches the research of organisational learning and supply chain collaboration, it helps people to have a deeper understanding of the influence factors related to company service innovation performance. Our research suggests that managers should pay more attention
to the different learning behaviours among the organisations, and refine their collaborative behaviours with other companies to promote service innovation performance.

Second, the existing research on supply chain collaboration is often used it as a antecedent variable to test its impact on company’s performance, but few literatures demonstrate that whether the collaborative behaviour can act as an mediating mechanism. Our results show that supply chain collaboration has a partial mediating effect on the relationship between organisational learning and service innovation performance. It makes the relationship between organisational learning and service innovation performance more transparent. It enriches the empirical research of these areas to some extent.

Third, our research also enriches the relational theory under China context. We explore the moderating effect of interpersonal trust on the relationship between organisational learning and service innovation performance, the results show that the positive relationship between knowledge integration and service innovation performance is stronger when the interpersonal trust between two company’s contact people is higher. It suggests managers pay more attention on the relationship between two contact people. Managers should create convenient conditions to make the communication between two contact people more smoothly to build a more stable and trusting relationship, so as to help company integrate knowledge and promote innovation.

5.3 Limitations

This study has several limitations. First, we explored service innovation only in South China but did not compare it with other areas in China. Future research could study the difference of service innovation between different areas. Second, under Chinese Guanxi context, different culture and company nature may have different effects on company learning and innovative behaviours. Future research could add such control variables. Third, we primarily discussed learning from other companies but did not explore the bi-directional study or network study for different companies simultaneously. Finally, it may bring the risk of leaking critical knowledge when companies in supply chain network share their knowledge to their partners. Future research could pay more attention on such risk to make knowledge more valuable when it is used inside the company than when it is used by its rivals.

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