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## MODERN 3PL SERVICES IN CHINA: THE ROLE OF TRUST

### ABSTRACT

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The purpose of this research is to provide an understanding of the contemporary 3PL market in China. This study links trust, IT and 3 PL usage and customer relationships. Also, the importance of social connections in business operations is highlighted. The manuscript shows the influence of trust, IT and 3PL usage on customer service performance, and its consequence for satisfaction and loyalty. 3PL usage appears to have a positive influence on service performance. Furthermore, service performance improves the customer relationship outcomes, in terms of satisfaction and loyalty via trust. Trust seems to have a mediating role.

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*Key Words: party logistics, trust, relationship outcomes, service performance, IT usage*

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## INTRODUCTION

With China's accession to the World Trade Organization (WTO) in 2001, the logistics industry has been transformed from an industry dominated by a few big state-owned enterprises, to an industry consisting of many private-owned and foreign logistics providers (Hong 2007). Although the Chinese market for outsourcing logistics is still considered in an infant phase, opportunities in the market have been recognized by both domestic and foreign investors (Goh and Ling 2003, Hong et al. 2004). Already in 2002, over 16,000 companies registered as logistics providers in China, although none of them account more than 1.4 percent market share (Kadar and Huang 2002). Traditional and foreign logistics service providers strive to differentiate to obtain sustained competitive advantage, while offering cost reduction, cost saving and capital (Lau and Zhang 2006). Information Technology can be used in supply chain management to achieve a competitive edge (Bowersox and Daugherty 1995, Powell and Dent-Micallef 1997). This is especially the case for logistics providers who use cutting edge internet technology to adapt to the changing supply chain environment (Porter 2001). At the same time, customer relationship management is used to gain competitive advantage (McHugh et al. 2003, Whipple and Frankel 2000). Trust is considered "a critical factor fostering commitment among supply chain partners. The presence of trust improves measurably the chance of successful supply chain performance. A lack of trust among supply chain partners often results in inefficient and ineffective performance as the transaction costs (verification, inspections and certifications of their trading partners) mount." (Kwon and Suh 2004, 4). Although the role of trust in supply chain management has been investigated (Fawcett et al. 2008, Kwon and Suh 2004, Lau and Zhang 2006), the relationship of trust with IT usage, third party logistics (3PL) usage, service performance, trust, and the relationship outcomes, customer satisfaction and loyalty, have not been analyzed. Our study aims to identify the before mentioned relationships and to provide empirical, quantitative results.

The paper is organized as follows. In the next section, the literature on trust, 3PL, customer outcomes and IT tools applied by the 3PL industries will be reviewed. Next, based on the hypotheses a conceptual model will be developed. The hypotheses are empirically tested using empirical data. In addition, findings are presented, followed by a discussion, managerial implications and limitations.

## LITERATURE REVIEW

Trust is generally recognized as playing an increasingly important role in supply chain relationships, due to the fast pace of globalization, large cultural differences and increased interdependency of supply chain relationships (Gainey and Klaas 2005, Wu et al. 2004). According to Kwon and Suh (2004) and Morrow et al. (2004), successful supply chains depend on a high level of trust and strong commitment among supply chain partners. Trust appears to serve as a unique mechanism, which not only largely reduces transaction costs via for example less control mechanisms (Becerra and Gupta 1999), but also creates value by increasing mutual information sharing, which will in turn improve, for example, performance in buyer - seller relationships (Dyer and Chu 2003). A number of studies were conducted on the topic of trust in supply chain relationships, showing that trustworthiness lowers transaction costs (Dyer and Chu 2003), while the presence of trust measurably improves the chance of successful supply chain performance (Kwon and Suh 2004, Morrow et al. 2004). Wong et al. (2005) state that cooperative goals lead to trust in supply chain relationships, which in turn results in the products and service that satisfy customers; Chapman and Corso (2005) pointed out that no amount of technology can overcome a lack of trust between key partners involved in cross-company projects.

The marketing literature indicates that the antecedents and consequences of trust vary by context and population. One explanation of this finding could be the social factors. Many studies in the service marketing literature recognized that the social component is a critical aspect in determining customer satisfaction. Mavondo and Rodrigo (2001) identified that in business markets the social bonding, e.g. the degree of reciprocal friendship and personal liking between the buyer and the seller, is the main antecedent, both directly and indirectly, of important relational outputs for the selling company. In Chinese words, this social bonding is *guanxi*, which generally refers to relationships or social connections based on mutual interests and benefits (Bian 1994, Gold et al. 2002). *Guanxi*, *xinyong*, *renqing* and *ganqing* are related to trust concepts (Wang 2007). While substantial research embeds the *guanxi* concept (Buckley et al. 2006, Ramasamy et al. 2006, Lovett et al. 1999), *xinyong* seems more in line with trust, as defined in the Morgan and Hunt (1994). The former refers to a "...relationship that bonds the exchange partners through reciprocal obligations to obtain resources through a continual cooperation and exchange of favors" (Wang 2007, 81). The latter to "...one's credit ability of return favors than relied on one's integrity and competency." (Wang 2007, 82). Another trust related

concept is *mianzi*. Mianzi, the recognition by others of an individual's social standing and position or 'face', is considered a key component in guanxi and both of them are needed in a successful business relationship (Buckley et al. 2006). Kidd et al. (2003) have drawn special attention to the difficulties of creating and maintaining supply chains in China, pointing out that "one must trust deeply in others in the supply chain, or use their guanxi (relationship) nets to ensure delivery."

Trust in this study is defined most in line with the concept of xinyong: when one party has confidence in an exchange partner's reliability and integrity (Morgan and Hunt 1994), the party's willingness to rely on an exchange partner in whom one has confidence (Moorman et al. 1993) and the party's willingness to take risk (Grossman 2004).

Information technology (IT) is important in developing logistics services in a customized supply chain environment. In current research, information technology in the logistics area has been intensively investigated (Evangelista and Sweeney 2006, Gammelgaard and Larson 2001, Van Hoek 2001). Porter and Millar (1985) suggested that the diffusion of IT into the activities of the supply chain strengthened its value-creating potential. According to Brandyberry et al. (1999), IT has the potential to manage the flow and to influence many of the dimensions of the supply chain such as cost, quality, delivery, flexibility and responsiveness, and thereby increase the profits of the firm. As noted by Sauvage (2003), technological effort has become a critical variable in a highly competitive business characterized by time compression. IT seems of critical importance in determining the final success in managing the supply chain and is a necessary factor in the survival of supply chain management projects (Auramo et al. 2005, Handfield and Nichols 1999).

Outsourcing can contribute to profits by enabling users to gain competitive advantage, adding measurable value to products, enhancing customer service, assisting in opening new markets, and providing dedicated resources (Foster and Muller 1990). Third party logistics providers can enhance value creation for customers, leading them to become more competitive and profitable through speedy and superior customer service (Daugherty and Pittman 1995). The companies have been forced to focus on their core competencies and furthermore to outsource non-core activities, for the sake of the increasing competition, globalization, customer demands, and pressure of cost reduction. This study uses the definition by Africk and Calkins (1994) of third party logistics: "*a relationship between a shipper and third party which, compared with basic services, has more customized*

*offerings, encompasses a broader number of service functions and is characterized by a longer-term, more mutually beneficial relationship” (Murphy and Poist 1998, 26).*

The shipper refers to the party that either sends or receives the goods; the source or destination of the goods. Longer-term, mutually beneficial relationships suggest possible benefits from incorporating relationship marketing theory into the study of third party logistics (Stock 1997, 2002).

### **Services of 3PL providers**

The services provided by 3PLs have been summarized in various articles. Sink et al. (1996) show that the most common activities of 3PLs that are outsourced are: transportation, warehousing, inventory management, order processing, information systems, and packaging. Coyle et al. (1996) suggest five types of 3PL suppliers: transportation, warehousing/distribution, forwarder, shipper/management and financial/information based.

Bardi and Tracey (1991) and Lieb and Randall (1996) analyzed firms using outsourced services (rather than 3PLs) to determine the extent to which they used the services of outsourcing partners. According to Bardi and Tracey (1991), the outsourcing of logistics functions is becoming increasingly common, and the most commonly outsourced functions are those that are non-core, routine-based, or asset based. Lieb et al.’s studies (1993, 1996, 2004a, 2004b, 2005) made comparisons of 3PL services by large US manufacturers respectively from the year 1991 to 2004. Sink and Langley (1997) and Rabinovich et al. (1999) suggest the framework of 3PL services can be divided into four categories: warehousing, transportation, customer service, and inventory and logistics management. Arroyo et al. (2006) report that the most frequently outsourced services are customs brokering, product delivery, fleet management and operations, supplier payment and auditing and shipment planning and consolidation. Wilding and Juriado (2004) concluded that the most frequently used functions of 3PL are transportation, warehousing and inventory and information systems.

### **Service performance**

There is overall support that third party logistics providers will have a positive influence on the performance of their customers: via cutting costs, saving time, expanding into new markets and increasing flexibility (Power et al. 2007, Sanders et al. 2007, Foster

and Muller 1990). These providers can enhance value creation for their customers by leading them to become more competitive and profitable through speedy and superior customer service (Daugherty and Pittman 1995). Boyson et al. (1999) indicated that the outsourcing of logistics functions has proven to be effective in helping US firms to achieve competitive advantage, improve their customer service levels and reduce their overall logistics costs. Skjøtt-Larsen (2000) stated that the usage of 3PL will help to cut the transaction costs and build network development. Knemeyer et al. (2003) suggested that there the benefits outweigh the increased costs of developing closer partnerships with 3PLs. Thus,

*Hypothesis 1: The usage level of 3PLs is positively related to customer performance.*

### **IT usage and 3PL**

IT usage impacts the 3PL industry in terms of bringing about new e-services, new functions, and new alliances (Evangelista and Sweeney 2006). The use of technological capabilities may leverage transport and logistics services, facilitate more effective integration across companies in the supply chain, enable the rapid customization of products and maintain competitive lead-times. In short, IT applications can directly or indirectly impact the competitive advantage in the 3PL industry by creating value for customers as many value-added activities (Crowley 1998).

Indicators of IT impact on the supply chain are IT department technical quality, IT plan utilization, and top management of IT, which positively affect the supply chain (Byrd and Davidson, 2003). Thus,

*Hypothesis 2: The level of Information Technology in 3PL is positively related to service performance.*

### **Customer relationship outcomes**

Customer satisfaction is a customer's overall or global judgment regarding the extent to which product or service performance matches expectations (Stank et al. 1999, Anderson and Sullivan 1993). Developing and maintaining satisfactory customer relationships can help to reduce perceived risk, reduce transactions costs, increase customer loyalty and customer retention and thus impact on organizational performance (Bejou et al. 1996). Increased customer satisfaction can offer some respite from intense

price-based competition and is likely to result in improved market share (Daugherty et al. 1998).

Empirical studies in operations, marketing, and logistics offer support for links between performance and customer satisfaction (Crosby et al. 1990, Cronin and Taylor 1992, Innis and La Londe 1994, Youngdahl and Kellogg 1997, Daugherty et al. 1998). Customers tend to be more satisfied with providers who have a better delivery performance (De Wulf et al. 2001). Cronin and Taylor (1992) report that higher service quality leads to higher customer satisfaction, and Leuthesser and Kohli (1995) state that suppliers' relational behavior pertaining to communications and responsiveness influence buyer satisfaction. Furthermore, both operational performance and relational performance affect customer satisfaction positively (Innis and La Londe 1994, Daugherty et al. 1998). Thus,

*Hypothesis 3: Service performance is positively related to customer satisfaction.*

## **Trust**

Trust is regarded as an outcome of good internal service quality within organizations, plays a key role within service provision and is considered important in building relationships (Chenet et al. 2000).

The concept of trust has received special attention in marketing literature due to the notable influence on the attainment of long-lasting and profitable relationships. It encompasses the person's behavioral intentions as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party." (Mayer et al. 1995, 712). Some studies state that trust is a unitary concept (Rotter 1971), although most report multidimensional concept (Rousseau et al. 1998). In this paper, the definition of Gefen et al. (1999, 2003) is used; trust is a set of specific beliefs dealing mainly with the integrity (trustee honesty and promise keeping), benevolence (trustee caring and motivation to act in the truster's interest), competence (trustee's ability to do what the truster needs) and predictability (trustee's behavioral consistency) of a particular vendor.

Trust is considered to be of remarkable importance in the process of building and maintaining relationships (Lagace 1991, Morgan and Hunt 1994, Oakes 1990). Firms

invest a considerable amount of resources in building trust relationships with their business partners and the termination of such relationships often leads to a significant loss for both parties. Such negative consequences clearly show the importance of trust in business-to-business relationships. Zucker (1986) summarized three types of trust: process-based, institution-based, and characteristic-based. Process-based trust is created through social exchange between organizations and individuals; institution-based trust is created through a third party; and characteristic-based trust is created through a sense of shared commonality with the other party. We look at characteristic-based trust and explore the relationship between performance, customer satisfaction and trust in 3PL industry.

Performance is positively related to trust in business marketing relationships (Stank et al. 1999) and according to Hess and Story (2005), trust and satisfaction develop from the product/service performance. The longevity of the relationship depends on the ability of the provider's services to fully meet the requirements of the buyer (Gounaris 2005). Walter et al. (2003) concluded after a study of information from 745 purchasing managers from different sectors that the degree to which the supplier could meet the functional requirements of the purchasing managers influenced the level of trust of the managers. Thus,

*Hypothesis 4: Service performance is positively related to trust.*

Although trust and satisfaction are suggested to be two key concepts in relationship marketing, empirical research that focuses on exploring the trust-satisfaction relationship has largely been limited to studies of fraud or theft, and little effort has been devoted to explaining the relationship between them (Furnell and Karweni 1999, Ratnasingham 1998). Both concepts are similar in the sense that they represent some overall evaluation, feeling, or attitude about the other party in the relationship. According to Ravald and Grönroos (1996) we propose that trust is an aggregate evaluation at some higher level than satisfaction, and that satisfaction in fact is an important source for trust. However, in accord with social exchange theory (Blau 1964), many commentators have identified that trust evaluations will have a direct influence on perceptions of satisfaction (Gwinner et al. 1998, Singh and Sirdeshmukh 2000). From the customer's perspective, trust is one of the determinants of overall satisfaction (Bejou et al. 1998). The degree to which a customer trusts a particular 3PL provider will be positively influenced by the belief that the 3PL



provider is operating in the customer's best interests, and negatively influenced by the belief that the 3PL provider is operating in their own best interests. Thus,

*Hypothesis 5: Trust is positively related to customer satisfaction.*

## **Loyalty**

Customer loyalty is defined as a long-term commitment to repurchase involving both a favorable cognitive attitude toward the selling firm and repeated patronage (Dick and Basu 1994). Customer loyalty also refers to the recommendation of providers, even if the relationship between the customer and the service provider has ended (Lam et al. 2004, 297).

The link from loyalty to customer satisfaction has been seen as an obvious one and the previous literature suggests a strong link between customer satisfaction and loyalty (Fornell 1992, Anderson and Sullivan 1993, Innis and La Londe 1994, Jones and Sasser 1995). Satisfied customers have a direct influence on future revenue streams and convincing satisfied customers to move to another provider is costly (Fornell 1992). Sharma et al. (1995) report that satisfied customers pay a higher price than unsatisfied or new customers. Oliva et al. (1992) identified that when satisfaction increases above a critical level, repeat purchases increase rapidly. Other studies (Gronholdt et al. 2000, Han et al. 2008, Kristensen et al. 2000) assert that customer satisfaction positively affects loyalty. Thus,

*Hypothesis 6: Customer satisfaction is positively related to customer loyalty.*

Hart and Johnson (1999) identified that the condition beyond satisfaction that ensures true customer loyalty is trust. They argue that the presence of trust reflects a stronger relationship commitment (Morgan and Hunt 1994, Moorman et al. 1993, Sharma et al 1995). Hence, trust is recognized as an important factor in customer loyalty (Fournier 1998).

They furthermore argue that, in order to attract more customers to repurchase products/services from a specific vendor, the development of customers' perceived value and satisfaction was not enough, in line with Heskett et al. (1994) and Schneider and Bowen (1999). They suggested that in some cases, service providers may be unable to

retain even those customers who are satisfied, and therefore, satisfaction alone might not be adequate to ensure a long-term customer commitment to a single provider. One of important findings with significant implications for decision makers is that trust has more importance than customer satisfaction in engendering loyalty (Aydin and Oezer 2005). Furthermore, Gremler and Brown (1996) suggested trust as a conceptual antecedent of customer loyalty. Hart and Johnson (1999) offered evidence in support of a similar argument. Thus,

*Hypothesis 7: Trust is positively related to customer loyalty*

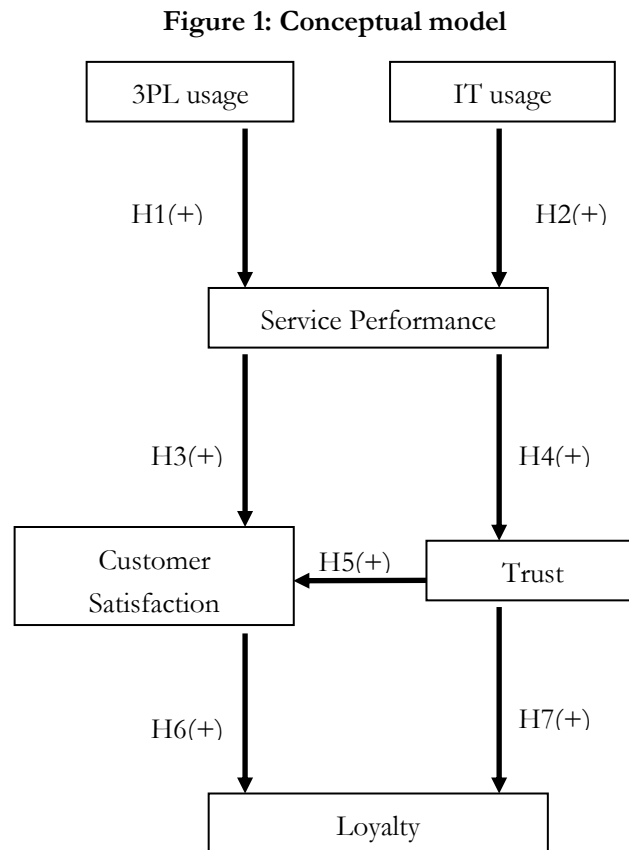


Figure 1 exhibits a conceptual model that links the extent of 3PL usage and customer relationship outcomes, furthermore, the role of the IT tools. Each arrow corresponds to one of the seven hypotheses proposed above.

## DATA AND METHODOLOGY

To test the hypotheses in the conceptual model presented above, an invitation for a self-administered questionnaire was sent to 150 companies. The research focuses on customers and 3PL providers operating in the eastern part of China – the Yangzi and Pearl River Delta - , where industry is more concentrated and 3PL is more common. After six weeks of data collection in combination with a single round of reminder calls, 99 organizations responded. However, 23 of them reported that they do not use 3PL at all and are excluded from the analysis. 76 valid questionnaires are included in the analysis.

In the first part of the questionnaire, general company profile questions with respect to industry, size, location, and investment in other countries can be found. These questions are based on Arroyo et al. (2006).

In the second part of the questionnaire, companies are asked to rank the three most important reasons for outsourcing their logistics services. Literature offers various reasons: cost reduction, focus on core business, avoiding investment, expansion to new markets, labor considerations, operational flexibility, and improving the service level. Additionally, to learn about the services used by 3PL customers, companies are asked about their use of 3PL services in the following eleven areas, again based on Arroyo et al. (2006): suppliers payment and auditing, warehousing operations, carrier selection, logistics information system, shipment planning and consolidation, reverse logistics, order processing, product delivery, inventory management, customs and freight brokering, and fleet management and operations.

In the third part of the questionnaire, questions regarding the items for the latent variables in the conceptual model are posed. The measures on the extent of 3PL usage are constructed by asking what the frequency of the 3PL usage is and the percentage of their logistics budget that is outsourced (Arroyo et al. 2006, Wilding and Juriado 2004). The measure for service performance was originally from Gassenheimer and Ramsey (1994), with a four-item, seven point scale to measure dealer evaluations of the excellence of logistical support provided by a supplier. Satisfaction and trust was adapted from De Wulf et al. (2001). Loyalty is measured with 6 factors, adapted from Stank et al. (1999). Finally IT usage, as mentioned previously in the paper, use the measurement adapted by Byrd and Davidson (2003). Respondents were asked to fill in this part, keeping their largest 3PL provider in mind. A summary list of the survey items used to measure the above

constructs is included in Appendix A. All questions in the third part are based on a seven point Likert-scale.

SPSS 12.0 and PLSGraph (Partial Least Squares) were used to test the conceptual model. "PLS is a structural equation modeling (SEM) technique similar to covariance based SEM as implemented in LISREL, EQS, or AMOS" (Gil-Garcia 2005). PLS has the benefit that it can test factor models and path models simultaneously (Lohmöller 1988). The factor model is often referred to as the "outer model" or the "Measurement model" and the path model is also referred to as the "inner model" or the "structural model" (Gil-Garcia 2005). The factor model and the path model use specific linear equations. The factor model gives a linear equation between the indicators of a latent variable and the latent variable (unobserved constructs) itself. The path model in PLS shows a linear equation between the latent variables themselves (Gil-Garcia 2005, Lohmöller 1988).

PLS is able to model latent constructs under conditions of non-normality and small to medium sample sizes. Furthermore PLS is not as strict about the distribution of the data as for example OLS (Gil-Garcia 2005). Some researchers state that, based on Monte Carlo stimulation, a sample as small as twenty is sufficient for PLS to give information on the appropriateness of the indicators (Chin and Newsted 1999). Additionally PLS is preferable to techniques such as regression which assume error free measurement (Lohmöller 1988, Wold 1982, 1985, 1989).

### **Validity, unidimensionality and reliability**

Content validity, or face validity, is a subjective but systematic evaluation about how well the questionnaire and its scales measure the topics (Malhotra and Birks 2003). Dunn et al. (1994) suggested that latent variables can only be measured if the constructs of these variables are derived from literature. The six latent variables, 3PL usage, IT usage, service performance, customer satisfaction, trust, and loyalty, are derived from literature, implying content validity.

Unidimensionality is one of the necessary conditions to create construct validity, which looks into what construct or characteristics the scale is measuring and if the theoretical grounding is met (Cooper and Schindler 2003). Unidimensionality is established when the items of a scale estimate one factor. It is necessary to delete low load items to get a unidimensional scale, but removing too many items can affect content

validity. This can sometimes lead to the dilemma of choosing between both (Dunn et al. 1994).

The construct validity tests whether and to what extent the manifest variables measure the latent variable they intend to measure. For this kind of validity, both convergent and discriminate validity should be found (Dunn et al. 1994). Convergent validity examines the item loading of constructs and test if the loading of the item is statistical significant, and measures the extent to which the scale correlates with other measures (Malhotra and Birks 2003). Discriminate validity measures the extent to which it does not correlate with other constructs to which it is supposed to be different (Cooper and Schindler 2003, Malhotra and Birks 2003). This can be tested by comparing the square root of the average variance extracted (AVE) with the correlations among reflective constructs (Gil-Garcia 2005). Adequate discriminate and convergent validity appears if the square root of the AVE correlates more with its own measurements than with those of the other latent variables (Gil-Garcia 2005).

Cronbach's alpha's are calculated to measure the reliability of the scales. A higher level of Cronbach's alpha indicates a higher reliability of the scale (Hair et al. 2006). [Cronbach's] alpha levels higher than 0.70 indicate internal consistency among the items of a scale and [...] alpha levels as 0.60 are acceptable for new scales (Dunn et al. 1994, 160).

## **EMPIRICAL FINDINGS**

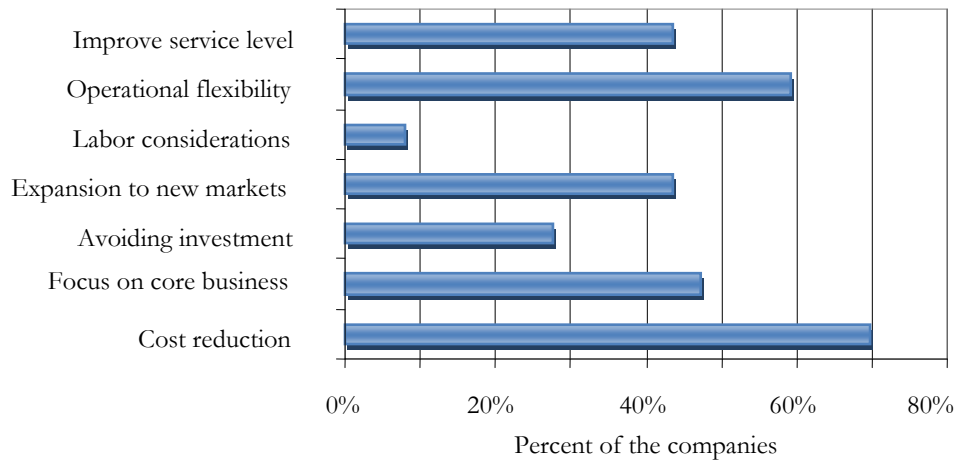
Table 1 shows characteristics of the responding firms. In total, the responses from 76 firms were included in the analysis. Of those firms, the majority is small, and mainly operating in the manufacturing industry. The focus on manufacturing industry can also be found in existing 3PL surveys such as Lieb and Randall (1996), Boyson et al. (1999), and Van Laarhoven et al. (2000). The percentage of manufacturing firms in our sample is close to that of the national level (53% in 2003).

Why do companies outsource? The surveyed companies were asked to choose three of their primary reasons for outsourcing out of seven options. Figure 2 presents the top-scoring reasons.

**Table 1: Characteristics of responding organizations**

Distribution	Percentage
<b>Characteristics of the responding firms (n =76)</b>	
<b>Distribution of economic units by sector</b>	
Manufacturing (percent)	36 (47%)
Commerce (percent)	20 (26%)
Service (percent)	14 (18%)
Other industrial sectors	6 (8%)
<b>Distribution of economic units by size</b>	
Micro and Small (percent)	39 (51%)
Medium (percent)	28 (37%)
Large (percent)	9 (12%)
<b>Distribution of firms by origin of capital</b>	
with foreign investment	21 (28%)
without foreign investment	55 (72%)
<b>Level of turnover (RMB)</b>	
Below 1 million	11 (15%)
1–10 million	37 (49%)
10–100 million	20 (26%)
Over 100 million	7 (9%)
Not stated	1 (1%)

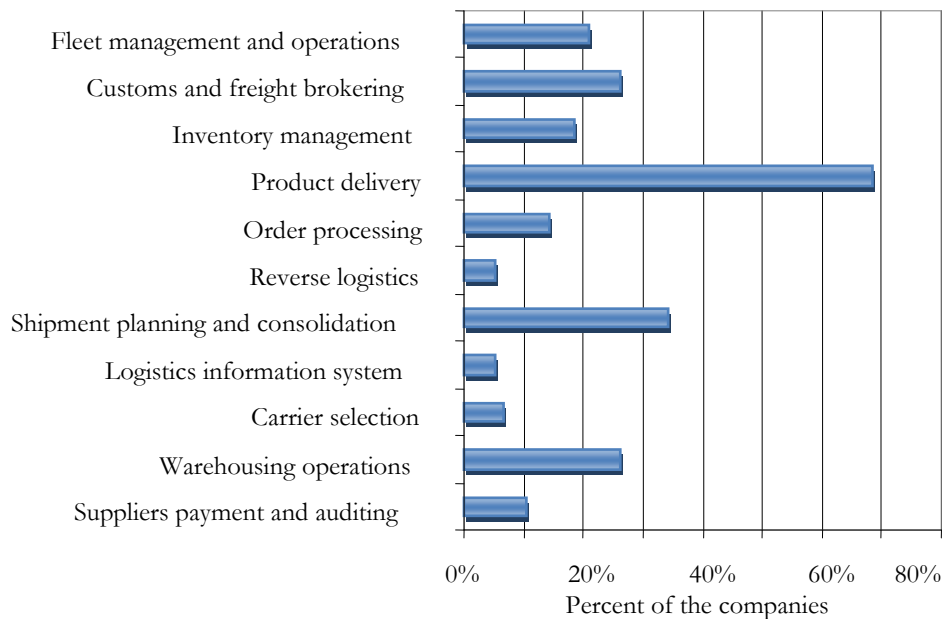
**Figure 2: Reasons for outsourcing**



The figure shows that ‘Cost reduction’ is the most common reason for outsourcing, which is consistent with previous research. Seventy percent of the firms consider cost reduction as the foremost reason to outsource. Operational flexibility, with a percentage close to sixty, is also considered to be an important reason to outsource. The options ‘Focus on core business’, ‘Improve service level’ and ‘Expansion to new markets’ all count for more than 40%.

To identify which logistics functions are seen as the most used outsourcing functions, companies were asked if they used 3PLs in eleven logistics areas. Figure 3 shows the results.

**Figure 3: Different 3PL services outsourced by companies**



Most companies (68%) indicate that they outsource the product delivery, the most likely logistics function to be outsourced, which supports the results of previous research. The rest of the 3PL functions are not as commonly outsourced as product delivery. Customs and freight brokering, fleet management and operations, shipment planning and consolidation, and warehousing operations are outsourced to a degree, although to a relatively lower degree than that of the product delivery function. Particularly, inventory

management is outsourced to a relative low level, which means that the inventory operations are mostly in-house decisions. Furthermore, the outsourcing levels for carrier selection, logistics information system and reverse logistics are less than 10%. The outsourcing of logistics information systems is least preferred by most companies. This finding is in line with current research. As indicated in Gutiérrez and Durán (1997), 3PLs are poor at delivering high quality information systems. Carrier selection is also a not often used outsourced service of the responding firms. There are several possible explanations. Firstly, firms would like to keep the supervision of their carriers even if transportation is mostly outsourced. Secondly, there is a wide selection of carrier companies to choose from, which gives flexibility to the producer's operations. Thirdly, the carriers compete on increases in service quality and a reduction of costs to gain competitive advantage (Lau and Zhang 2006), not on carrier selection as such.

The first step in analyzing a conceptual model is to check the scale of each item and establish the validity and reliability of these latent variables before analyzing and testing the relevant importance of each of these latent variables. In the first part we review the results of the validity and reliability and in the second part we test the independent samples t-test and analyze with PLS.

## RESULTS

Appendix C presents an overview of the latent variables and their items by presenting descriptive statistics. To ensure adequate unidimensionality, an item should have at least a loading of 0.5 (Hulland 1999), and a t-statistic of 1.960 (McClave et al. 2005). 12 of the 34 items had an insignificant t-statistic or a loading below 0.5, and hence these items were omitted from further analyses.

Table 2 shows the results of the reliability tests. The lowest Cronbach's alpha of the model is 0.66, which seems adequate, especially when the alpha is rounded.

**Table 2: Cronbach's alpha coefficients**

Latent variables	Cronbach's alpha	Number of items
3PL usage	0.90	2
Service Performance	0.71	3
Customer Satisfaction	0.66	3
Trust	0.68	3
Loyalty	0.77	5
IT Usage	0.90	5



To test for the convergent and discriminant validity, the square root of the AVE is compared with the correlations of reflective constructs (Gil-Garcia 2005). Table 3 shows that all square roots of the AVE are larger than the correlations of the reflective constructs, thus all constructs correlate more with their own measures than with the other measures. As Gil-Garcia (2005) suggests, the model shows adequate convergent and discriminant validity. All the square roots of the AVE are larger than 0.5, which suggests that there is adequate construct validity.

**Table 3: Discriminant and convergent validity results**

Latent variable	3PL Usage	IT Usage	Service Performance	Trust	Customer Satisfaction	Loyalty
3PL Usage	0.81					
IT Usage	0.66	0.80				
Service Performance	0.35	0.45	0.77			
Trust	0.55	0.65	0.56	0.78		
Customer Satisfaction	0.59	0.63	0.59	0.71	0.72	
Loyalty	0.40	0.35	0.07	0.35	0.23	0.82
Composite Reliability	0.78	0.93	0.84	0.83	0.81	0.84

Table 4 shows all the coefficients of determination in the model. As none of the R-Squares are below 0.3, results seem to indicate that the fit of the model is adequate (Dunn et al. 1994).

**Table 4: Explained variance**

Latent variables	Cronbach's alpha
Service Performance	0.45
Customer Satisfaction	0.33
Trust	0.42
Loyalty	0.63

The results of the goodness of fit indicators in Table 5 imply that the model fits the data in an adequate manner or fairly well (Byrne 2001).

**Table 5: Goodness of fit indicators**

Indicator	Value
Chi-square	116.43
GFI	0.95
AGFI	0.92
NFI	0.91
RMSEA	0.03

Table 6 shows the results of the structural model.

**Table 6: Results structural model and conclusions hypotheses**

Hypothesis	Coefficient	T-value	P-value	Conclusion
H1: 3PL Usage $\square$ Service Performance	0.623	9.234	< 0.01	Supported
H2: IT Usage $\square$ Service Performance	0.101	1.023	> 0.05	Not supported
H3: Service Performance $\square$ Customer Satisfaction	0.151	1.029	> 0.05	Not supported
H4: Service Performance $\square$ Trust	0.652	9.923	< 0.01	Supported
H5: Trust $\square$ Customer Satisfaction	0.466	3.441	< 0.01	Supported
H6: Customer Satisfaction $\square$ Loyalty	0.235	2.645	< 0.01	Supported
H7: Trust $\square$ Loyalty	0.636	7.189	< 0.01	Supported

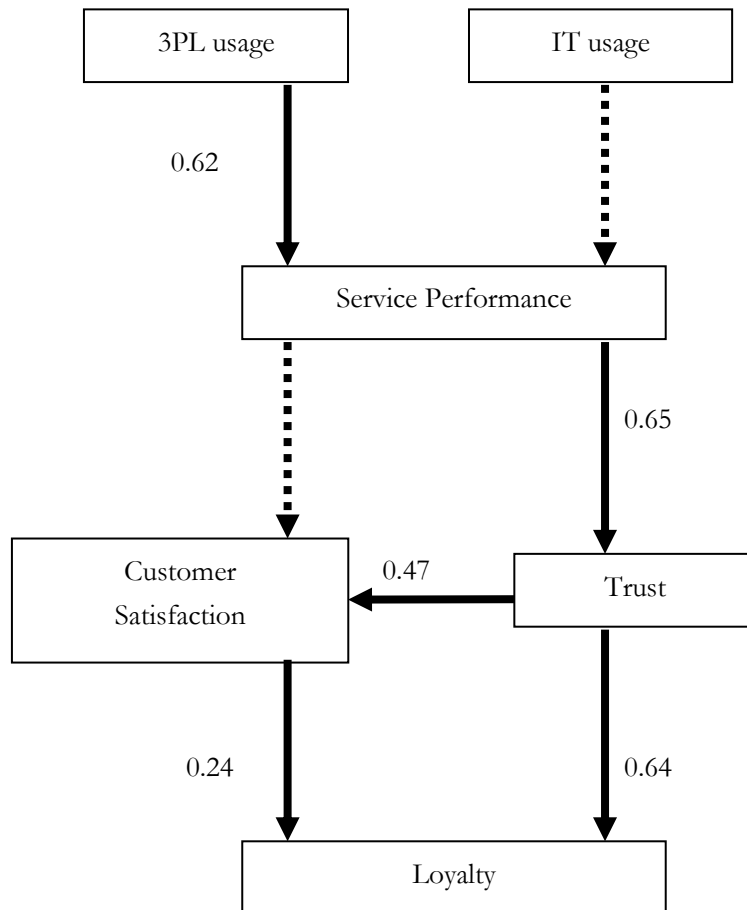
More use of 3PL functions is associated with higher Service Performance levels. A better Service Performance increases the perception of Trust. Trust leads to Customer Satisfaction and Customer Satisfaction leads to Loyalty. Service Performance alone does not lead to Customer Satisfaction; there is no direct linear effect on Customer Satisfaction. These results seem to indicate that trust has a mediating role between the two factors. This conclusion is in line with the pivotal role of trust in the Chinese society as presented in the literature review (Kidd et al. 2003, Mavondo and Rodrigo 2001, Wang 2007).

In contrast to previous research, in this study, no direct linear effect of IT usage on Service Performance is shown. At present, the current governmental regulations and Chinese electronic infrastructure are considered the main reasons. Although the use of internet in China has developed exponentially, according to the survey conducted by the China Internet Network Information Center (2002), the construction of many information management platforms and a basic electronic infrastructure is insufficient. For example, the inadequacies of IT capabilities could hinder the building of RFID system. Besides, the insufficient customer demands and the understanding of the IT usage

in 3PL may hinder the influence of IT usage on perceived customer service performance. Especially for Chinese domestic customers, their huge in-house assets and lack of experience in managing the interface with 3PL providers are inhibitors to correctly understand the IT usage in 3PL.

The results of Table 6 can be presented in a figure as well (Figure 4). The solid lines indicate that the relationship is significant, given a 1 percent level of significance. The dotted arrows show the hypotheses that are not supported.

**Figure 4: Results of the estimated model (N=76)**



Solid lines present significant relations ( $p < 0.01$ ). Dotted lines show non-significant relations ( $p > 0.05$ ).

## DISCUSSION AND CONCLUSIONS

This study focuses on the role of trust in modern 3PL services in China. Therefore, a model was derived on the basis of literature and the relationships between Trust and IT and 3PL usage, Service Performance, and Customer relationship outcomes are analysed. Five out of seven hypotheses are supported by the data.

Based on the results of responses of Chinese firms, the main reasons for these firms to employ 3PL are: Cost reduction, Operational flexibility, and the Focus on core business. In terms of specific 3PL services utilized, nearly 70% of the companies use product delivery, which is the most common used 3PL function (Arroyo et al. 2006, Wilding and Juriado 2004). The other services are less outsourced and none of the other logistics functions exceeds the level of 40%.

Furthermore, usage of 3PL services positively influences the service performance. IT usage has no significant direct linear effect on Service Performances, and cannot be statistically related to Customer relationship outcomes. In addition, Service Performance leads to Customer Satisfaction, mediated by Trust. Trust is positively influenced by Service Performance, and Trust also influences Customer Satisfaction. Finally, both Customer Satisfaction and Trust have a positive effect on Loyalty.

In short, IT usage does not seem to have a significant linear effect on Service Performance, while 3PL usage indeed improves this Performance. As for the Customer relationship outcomes, Service Performance has a positive affect on Trust, and both Trust and Customer Satisfaction improve Loyalty (in line with Aydin and Oezer 2005, Daugherty et al. 1998, Gronholdt et al. 2000, Kristensen et al. 2000, Lam et al. 2004).

This study explores the possible linkage between trust and IT supported 3PL usage and customer relationship outcomes. Five out of seven hypotheses are statistically supported.

Although research states that cost reduction is not an uncontested leader (Wilding and Juriado 2004), in this analysis reducing costs is still the most common reason for outsourcing. This finding is consistent with most of the literature (e.g., Szymankiewicz 1994, Boyson et al. 1999, Fernie 1999, Van Laarhoven et al. 2000, Penske Logistics 1999). Product delivery is the most likely logistics function to be fully outsourced, confirming the results of previous research. Furthermore, the 3PL usage can indeed influence service

performance for the reasons of cost reduction, production flexibility, and focus on core business.

The findings of the research also provide support for the value of relationship marketing efforts in the logistics outsourcing industry. Robert V. Delaney of Cass Logistics has suggested that “the objective of both the service user and the service provider is to achieve an open, long-term business relationship that applies the learning curve in order to continually improve the business process” (Bradley 1994). This research provided more evidence that outsourcing of logistics functions can have major consequences for a company’s customer relationships.

More specifically, this study shows that trust has an important role in building and maintaining customer relationships. As understood in Chinese culture, trust, social bonding, social capital, or “guanxi” and “xinyong” with customer are the quickest and most reliable route to accomplishment. Davies et al. (1995) highlighted a number of benefits to be derived from “guanxi”: it can serve as an information gathering mechanism; it can act as a means of securing access to important resources; it smoothes the process of gaining privileges such as government licenses, etcetera; it is often used to improve company reputation and it can contribute to the building of the competitive advantage.

## **IMPLICATIONS**

This study investigates the relationships between trust, IT usage, 3PL usage and customer relationship outcomes factors and leads to a number of important managerial implications.

First, our study shows that information technology in the Chinese logistics industry seems still in its infancy regarding usage. Results also show that there is no significant direct influence of IT usage on service performance. In spite of all the discussions in the popular press about current IT capability, our findings show that the usage of IT does not lead to better service performance, and that few firms are able to use these technologies to their full potential. At the same time, the literature stipulates that the diffusion of IT strengthens the value-creation process (Porter and Millar 1985), influences many dimensions of the supply chain (Brandberry et al. 1999) and has become a critical variable in a highly competitive business, such as logistics (Handfield and Nichols 1999, Sauvage 2003). IT investments can lead to large benefits and significant productivity gains (Barua and Lee 1997). Nevertheless, IT investment should be considered with some prudence.

Managers should clearly understand their company's competitive advantage and assess the IT applications for their ability to support these functions, rather than follow current competitors to make a huge IT investment.

Secondly, although this study focuses on the customer's perspective of outsourcing, the findings also have implications for the 3PL providers. By building trust and reputation, providers may be able to improve customer satisfaction and in consequence achieve customer loyalty. Managers should understand the importance of customer relationships, especially trust, and try to build trust in their customer relationships with various channels. Furthermore, although there is a huge potential market demand for 3PL, substantial investments from global 3PLs to China have been added by China's accession to the World Trade Organization and its Go West policy. In order to deal with the fierce competition, domestic 3PL providers should make extra efforts towards organizational reform or innovation, and outside marketing tactics, to incorporate the diverse customer demands.

The study also has significant implications on understanding the Chinese culture for multinational companies that expand their business to and in China. Western firms that are looking for opportunities in China need to understand the logic of social connections in these regions, where the use of "guanxi" or "xinyong" is the most efficient route to accomplish Customer Satisfaction and Loyalty.

## **LIMITATIONS AND FURTHER RESEARCH**

This exploratory study analyses the relationships between trust, IT usage, 3PL usage and Customer relationship factors. Future research should take into account some of the limitations of this research. As discussed previously, the data only cover a few parts of the eastern areas of China, with a primary focus on manufacturing companies.

The study could be improved by investigating different organizational and regional levels.

Second, the surveyed firms are not specifically analyzed and examined by their characteristics, like capital of origin, industry sector, and company size. For example, multinational companies could have a different view towards the use of domestic and international 3PL providers. Future research could examine and compare the difference of the perspective of and between domestic and multinational companies, outsourcing 3PL and providing 3PL services. Moreover, it would be useful to take into account the

different viewpoints from domestic Chinese companies on 3PL companies originating from the US or Europe, especially on the formation of Trust in and among these institutions.

This study is a preliminary one, which examines the influence of Trust and IT usage on Service Performance from the customer's perspective. The investigation of the provider's perspective on the implementation of IT usage might be of great interest. The same holds for a provider's perspective on the challenge to implement 3PL services in the Chinese market. The idea of considering both perspectives of providers and users of 3PL seems very helpful for future managerial decision making in the Chinese and international business context.

In this study, the 3PL usage and IT usage is considered separable. Realistically, the use of 3PL services incorporates the introduction, development and implementation of IT services. Hence, in addition to survey studies, case studies would be useful to obtain in-depth insight into the actual 3PL practices, the usage of IT and decision making processes, both within domestic Chinese companies and multinational companies operating in China.

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APPENDIX

**Table A: Outsourced logistics areas-summary of studies reported in Wilding and Jurado (2004)**

Category of logistics function	Dapiran et al. (1996): wide range of industries	Van Laarhoven et al. (2000): wide range of industries	Boyson et al. (1999): all industries	Modern Materials Handling (2001): wide range of industries	Sohail and Sohal (2003): manufacturers
Transport and shipment related	Fleet management (53) Shipment consolidation (42) Carrier Selection (27)	Line haul (81) Network based transport (70) Emergency transport (70)	Freight payment and auditing (57) Carrier selection and rate negotiation (24) Shipment planning (18) Fleet management (17)	Direct transport services (63) Freight payment (52) Shipment consolidation (48) Carrier selection (44)	Shipment consolidation (58) Fleet management and operations (49) Freight payment (42) Carrier selection (39)
Warehousing and inventory related	Warehouse management (47) Order fulfillment (33) Order processing (16)	Storage (87) Order picking (79) Inventory administration (64)	Warehouse operations (29) Inventory management (8)	Warehouse management operations (60)	Warehouse management and operations (33) Order fulfillment (30) Inventory replenishment (24)
Information systems related	Logistics information systems (22)	Tracking and tracing (64) Order entry (11) Forecasting (2)	Information systems (20)	Tracking and tracing (33)	Logistics information systems (21)
Other (related to value added services)	Product returns (33) Product assembly and installation (13)	Labelling (52) Customisation (26) Assembly (19)	Packaging (15) Product returns (15)	Freight forwarding (46) Customs brokerage (41)	Product returns (21)

Note: Figures in parentheses are percentages. Percentages refer to the share of companies outsourcing these logistics functions as identified by the five studies.  
Source: Wilding and Jurado (2004), p. 631

**Table B: Overview of the latent variables and their items and their abbreviation**

Latent Variable	Item description
<b>3PL usage</b>	
TPL1	The level of 3PL usage in your company (7 categories, from “do not use 3PL at all” to “always use 3PL”)
TPL2	Percentage of logistics budget that is outsourced (7 categories, from “0-15%” to “85-100”).
<b>Service performance</b>	
SP1	Manufacturer’s performance in meeting promised delivery dates
SP2	Length of promised order cycle times (from order submission to delivery).
SP3	Accuracy of manufacturer in committing to estimated shipping dates
SP4	Fill rate on base/line in stock items(% of order included in initial shipment).
<b>Customer satisfaction</b>	
RS1	As a regular customer, I have a high-quality relationship with this 3PL provider.
RS2	We are happy with the efforts this provider is making towards regular customers like us.
RS3	We are satisfied with the performances and relationship we have with this 3PL provider.
<b>Trust</b>	
T1	This 3PL company gives us a feeling of trust.
T2	We have trust in this 3PL company.
T3	This 3PL company gives us a trustworthy impression.
<b>Loyalty</b>	
L1	The relationship that my firm has with this 3PL provider is something we are very committed to.
L2	The relationship that my firm has with this 3PL provider is something we intend to maintain indefinitely.
L3	The relationship that my firm has with this 3PL provider deserves our maximum effort to maintain.
L4	Maintaining a long-term relationship with this 3PL provider is very important to my firm.
L5	I would recommend that my successor continue using this 3PL provider.
L6	Other things being equal, price, quality, etc., I intend to continue buying from this 3PL provider because of their service.
<b>IT usage</b>	
<b>IT department support</b>	
ITS1	Hardware and operating system performance
ITS2	Business applications software performance
ITS3	Communications services efficiency
ITS4	Communications services performance
ITS5	Application development cycle time
ITS6	Information technology investments and expenditures
ITS7	Software maintenance efficiency
<b>Top Management support</b>	
TMS1	Top management cultivates information technology project champions.
TMS2	Top management restructures work processes to leverage information technology opportunities in your firm.
TMS3	Top management sponsors initiatives taken by the information technology department.
TMS4	Top management ensures adequate funding of information technology research and development.
TMS5	Top management facilitates technology transfer through your firm.
<b>IT plan utilization</b>	
ITPU1	Information technology department planning supports your firm’s ability to keep up with changing technology.
ITPU2	Long-term data infrastructure plans exist and are followed.
ITPU3	Long-term network infrastructure plans exist and are followed.
ITPU4	Long-term strategy plans ensuring adequacy of enterprise-wide processing capabilities exist and are followed.



**Table C: Descriptive statistics on item level**

Latent variable	Item	Mean	Standard deviation	Loading	T-Statistics	Skewness	Kurtosis
<b>3PL Usage</b>	TPL1	3.36	1.49	0.95	10.13	0.50	-0.07
	TPL2	4.14	1.47	0.60	2.70	0.34	-0.76
<b>Service Performance</b>	SP1	6.08	0.61	0.75	8.71	-0.03	-0.21
	SP2	5.99	0.60	0.78	10.26	0.00	-0.11
	SP3	6.04	0.62	0.80	8.25	-0.02	-0.32
	SP4	6.08	0.91	0.49	3.64	-0.60	-0.59
<b>Customer Satisfaction</b>	RS1	6.16	0.67	0.78	7.05	-0.22	-0.71
	RS2	5.84	0.71	0.76	6.81	0.23	-0.99
	RS3	5.83	0.68	0.77	5.94	-0.29	0.25
<b>Trust</b>	T1	6.26	0.72	0.85	9.84	-0.88	1.03
	T2	5.86	0.74	0.74	9.37	-0.36	0.08
	T3	5.91	0.68	0.76	8.38	0.11	-0.77
<b>Loyalty</b>	L1	6.18	0.84	0.84	10.20	-0.91	0.36
	L2	5.92	0.96	0.77	8.38	-0.49	-0.75
	L3	5.92	0.83	0.69	7.65	-0.42	-0.30
	L4	6.26	0.55	0.36	3.96	0.05	-0.38
	L5	5.92	0.76	0.68	10.23	0.13	-1.25
	L6	6.36	0.56	0.56	5.98	-0.11	-0.75
<b>IT usage</b>	ITS1	4.43	2.17	0.78	4.27	-0.35	-1.23
	ITS2	4.48	1.82	0.80	3.86	-0.69	-0.40
	ITS3	4.80	1.62	0.77	2.83	-0.72	-0.28
	ITS4	4.76	1.64	0.75	2.71	-0.74	-0.40
	ITS5	4.34	1.13	-0.10	0.53	-0.37	2.42
	ITS6	1.91	1.44	0.28	2.60	1.78	2.75
	ITS7	4.47	1.72	0.68	1.87	-0.52	-0.16
	TMS1	2.80	1.80	0.17	2.85	0.07	-1.90
	TMS2	3.75	1.58	-0.01	0.61	-0.88	-0.43
	TMS3	4.18	0.99	-0.08	1.00	-1.99	4.97
	TMS4	4.14	0.99	0.27	1.08	-1.83	4.78
	TMS5	4.75	0.90	0.10	1.36	-0.28	3.67
	ITPU1	4.88	1.50	0.15	0.37	-1.31	2.00
	ITPU2	4.58	1.32	0.45	2.36	-0.75	1.95
ITPU3	4.45	1.64	0.78	3.14	-0.81	0.25	
ITPU4	4.72	1.31	0.35	0.50	-1.14	2.30	