



The effect of internal communication and employee satisfaction on supply chain integration



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ABSTRACT

This study explores from the perspective of Social Capital Theory the effect of internal communication and employee satisfaction on supply chain integration; supply chain integration being comprised of internal and external integration with trading partners. The data for this study are from an emerging market context and as such may yield insight in contexts where markets are evolving rapidly. Structural equation modeling is used to analyze survey data collected from 214 China based manufacturers. The results reveal that internal communication has a significant positive effect on employee satisfaction and that internal communication and employee satisfaction significantly influence internal integration, which subsequently affects external integration. Furthermore the analysis reveals that employee satisfaction partially mediates the relationship between internal communication and internal integration. The findings also indicate that internal communication has a direct and positive effect on external integration, while employee satisfaction only indirectly affects external integration through internal integration. Specific implications include the following. Managers should not focus on employee satisfaction exclusively, but rather should work on communicating with employees as this both facilitates improved satisfaction and integration both internally and with trading partners. Effective communication in conjunction with satisfied employees is requisite for improving firm performance in the coordination of material, information, and money. However, they are cautioned that while employee satisfaction can act as a road block to integration it cannot act as an accelerator and as such excessive effort or investment toward that end are not recommended. Lastly, it may be as important to carefully craft communication campaigns aimed at employees as those aimed at customers since the former appear to lead to more effective integration with customers, which elsewhere has been linked to improved financial and market performance.

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1. Introduction

As supply chain complexity has grown, firms have begun to encounter difficulties with moving products to market quickly, in the right quantities, and in the right locations (Closs et al., 2008; Jacobs, 2007). One reason for the challenge is that research has treated human resources topics such as communication and employee satisfaction as separate from supply chain management (Moberg et al., 2002). The topic is important because competitive advantage can accrue to firms that communicate well internally. While supply chain integration (SCI) is one

strategy firms have embraced to manage supply chain complexity and attain increased performance (Droge et al., 2012), antecedents to SCI should be examined (Schoenherr and Swink, 2012) and more research that isolates communication processes from integration has been called for (Moberg et al., 2002). Greater clarity on this topic will enable managers to more effectively leverage relationships with trading partners with the result being improved organizational performance.

SCI entails the use of systems to manage material, information, and money flows to create customer value while at the same time seeking to improve profitability (Warkentin et al., 2001). Integration amongst trading partners requires exchanging information and imparting context specific knowledge to enable the effective management of activities across organizational boundaries (Yu et al., 2013). SCI includes the interconnecting of business processes involved in the provision of products, services, and information in ways that add value for stakeholders—from design through

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delivery, from original suppliers to end users (Gunasekaran and Ngai, 2005; Lambert et al., 1998)–with the objective of providing maximum value to customers (Bowersox et al., 1999; Naylor et al., 1999; Zhao et al., 2008).

SCI is multidimensional in nature (Flynn et al., 2010) and the literature reveals consensus that there are mainly two types of SCI: internal and external integration (Narasimhan and Kim, 2002; Swink, et al., 2007; Vijayasathya, 2010). Internal integration is the degree to which a firm structures its organizational strategies and practices into synchronized processes directed at meeting customer requirements (Cespedes, 1996; Kahn and Mentzer, 1996); the aim of internal integration being departments and functions within a company operating as a single cohesive process (Flynn et al., 2010). External integration often includes formal initiatives and programs facilitating linkages between the trading partners. External integration may include incorporating input from external partners into decisions pertaining to products offered to the market (Pagh and Cooper, 1998; van Hoek et al., 1998) and encompasses the methods and strategies employed to improve coordination between the trading partners (Frohlich and Westbrook, 2001), e.g. sharing market information (Petersen et al., 2005). As such, external integration encompasses flows of information, service, and materials; information flowing back from buyer to supplier and services/materials flowing forward (Frohlich and Westbrook, 2001; Narasimhan and Carter, 1998). In particular, Wisner et al. (2008) indicate that external integration entails understanding the interaction between the supplier's products and processes and the buyer's business. The attention and resources directed by the supplier toward these activities are for the purpose of helping the customer improve its competitive standing. SCI has been widely considered by both practitioners and researchers to be a vital contributor to the success of the firm (Flynn et al., 2010; Jacobs et al., 2011; Prajogo and Olhager, 2012; Wong et al., 2011; Yu et al., 2013). McAfee et al. (2002) suggest that there are factors internal to the organization that may affect the development of integrated coordinated relationships with suppliers and customers. In particular, social structures such as employee communication practices (Powell and Dent-Micallef, 1997) result in social assets such as employee satisfaction (Heskett 1994, 1997; Kassinis and Soteriou, 2003; Yee et al., 2008) that are recognized as important for successfully managing an integrated supply chain (Gowen and Tallon, 2003). Because human resources management (HRM) and SCM have been treated as separate in the literature (Yee et al., 2008) the importance of internal communication and employee satisfaction's effects on improving SCI has remained largely unexplored (Boudreau, 2004; Yee et al., 2008). Theories such as Socio Technical Theory and Social Capital Theory suggest that human resources principles and supply chains are inextricably linked in most business scenarios (Boudreau, 2004). However, little research has examined the relationship between these social structures and assets and the success or failure of the development of SCI. Left unanswered is the question of what factors lead to internal integration. Logically, as presented in the practitioner literature, one factor could be propensity toward internal communication (Gowen and Tallon, 2003; McAfee et al., 2002).

Communication is central to stimulating an organization to act (Yates and Orlikowski, 1992) as actions flow from the “exchange of information and ideas within an organization” (Bovee and Thill, 2000), which we define to be internal communication. Such employee communication has the potential to create an atmosphere of respect for all employees of the organization (Md Norbin et al., 2011) and as such impact employee satisfaction. The capability to build and maintain trusting and strategic relationships with supply chain members (such as customer and supplier) appears to require tacit complex coordination and communications skills that competitors may find difficult to replicate (Hall, 1993; Powell and Dent-Micallef, 1997). Employees who are

satisfied with their jobs are more likely to be involved in their company's operations and more dedicated to delivering the high quality services (Yee et al., 2008) that will help the company develop an integrated supply chain. Although previous research (e.g., Barrett, 2002; Hargie and Tourish, 2009; Vercic et al., 2012) has recognized internal communication as a strategic and crucial variable in determining organizational success, the importance of internal communication to developing SCI practices has not enjoyed such recognition. Furthermore, the role of employee satisfaction has largely been overlooked in supply chain research and as such its role remains in need of illumination (Moberg et al., 2002).

While the SCI – performance relationship has been studied the literature, focus has primarily been on business performance as an outcome directly. Yet, there are a number of variables that may lead to performance differentials (Schoenherr and Swink, 2012). The present study investigates two such variables (internal communication and employee satisfaction) to reveal their importance since to date they have not been well delineated or empirically validated in the context of trading partners (Narayanan et al., 2015). Following herein we seek to address these gaps in the literature by offering a conceptual framework rooted in the literature and hypothesizing relationships between constructs. Toward this end we have adopted Social Capital Theory (SCT) to explain the relationships between the constructs. SCT indicates that social structures enable social actors to generate/exchange assets, e.g. information, (Koka and Prescott, 2002; Nahapiet and Ghoshal 1988), and create value (Coleman, 1988). Social capital has been regarded as the “relational glue” between social actors, e.g. employees, suppliers, buyers. Thus the social capital perspective suggests that communication will lead to an understanding of the parties' mutual needs and ultimately SCI. Further on we provide information about the research design, results of analyses, and discuss the theoretical and managerial implications. We conclude with limitations and opportunities for future research.

2. Theoretical background and hypothesis development

2.1. Social Capital Theory

SCT suggests that social structures facilitate the creation of “collectivity-owned” social assets (Koka and Prescott, 2002; Nahapiet and Ghoshal, 1988). Social capital thus refers to both social structures that enable actions between social actors, e.g. employees or departmental units, and social assets generated through the interaction among social actors (Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1988). Based on both social structures and social assets, various characterizations of social capital have been described. Coleman (1988) describes three dimensions of social capital: trustworthiness, information sharing, and relational norms and sanctions. These three forms of capital are consistent with factors associated with supply chain integration (Jacobs et al., 2007) and employee satisfaction (Durmusoglu et al., 2014). Nahapiet and Ghoshal (1998) propose three forms of social capital: cognitive capital (e.g. behavioral norms and congruent goals), structural social capital (e.g. connections among and patterns of relating between parties), and relational capital (e.g. trust, respect, and friendship).

In addition to social structures and social assets, the literature has also conceptualized social capital using a broader view, which includes the expected benefits resulting from the social actors leveraging their relationships. According to Coleman (1988), social capital creates value and makes possible the realization of benefits. In other words, social actors who decide to invest in social structures obtain benefits, derived from both social structures and

social assets (Autry and Griffis, 2008), through the process. This broader view of social capital is applicable to the context of supply chain management (SCM) since relationships across the supply chain can be conceptualized as relationships between social actors creating a social asset through leveraging their relationships to improve performance (Autry and Griffis, 2008; Cousins et al., 2006; Cousins and Menguc 2006; Koka and Prescott, 2002; Villena et al., 2011). Our study similarly adopts this broader view of social capital. Firstly, our study represents the organization's systems for collaborating as a social structure enabling actions between social actors, e.g. employees. Social assets such as internal communication practices are in turn generated through the interactions among employees (Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1988). Secondly, it is through the process of interacting that the organization can achieve important benefits (Autry and Griffis, 2008) such as SCI. It has been argued that SCI and collaboration practices represent a higher level of supply chain relationship (Hoyt and Huq, 2000). Accordingly, SCI could represent a form of social asset. According to Cousins and Menguc (2006), socialization structures and integrated supply chain structures are linked closely together, which could represent the means through which supply chain actors interact with one another. This interaction can reduce the perceived risk between partners, increase respect and reciprocity, and thus increase information flow and information richness (Cousins and Menguc 2006). Further, it is through the process of interacting and exchanging information that an understanding of the parties' mutual needs is generated and collaboration improved (Autry and Griffis 2008; Cousins and Menguc 2006). Thirdly, it is through social structures that benefits such as employee satisfaction can be obtained (Flap and Völker, 2001). For instance, social aspects such as climate at work and cooperation with management and colleagues have been suggested to influence employee satisfaction (Flap and Völker, 2001). Specifically, work environments characterized by trust and loyalty provide the means through which employee satisfaction is developed (Helliwell and Huang, 2010).

Drawing from the logic expressed in the literature and SCT, we begin to lay out the conceptual framework of this research in the following sections. Specifically, we model that internal integration is antecedent to external integration consistent with Droge et al. (2012). We do so because there has been limited and conflicting empirical evidence (Schoenherr and Swink, 2012). Testing such a relationship in a new context is important for theory development (Tsang and Kwan, 1999) and its predictive validity and generalizability (Douglas and Craig, 2005). We then add to that the antecedent roles of internal communication and employee satisfaction consistent with the tenants of SCT. The resulting model is presented in Fig. 1 wherein the numbering of the arrows refers to the hypotheses developed below. Since good practice when using structural equation modeling is to test competing models and

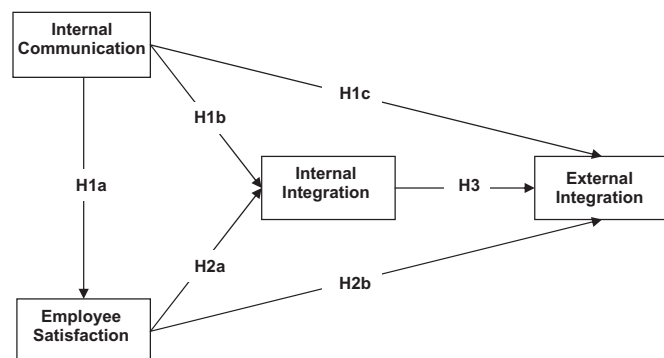


Fig. 1. Research model.

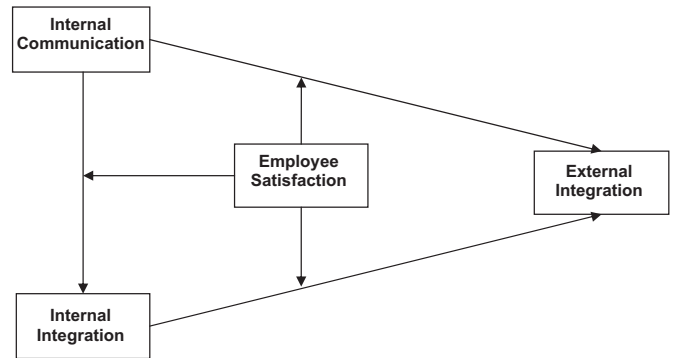


Fig. 2. Alternative research model.

since there is vagueness in the literature as to whether the role of employee satisfaction is that of mediator or moderator, we also tested the alternative model shown in Fig. 2.

2.2. The role of internal communication

Kogut and Zander (1992, 1996) suggest that the capabilities of organizations derive from their nature as social organizations. As such, internal communication is fundamental to the success of the organization (Borca and Baesu, 2014; Vercic et al., 2012; Welch, 2012; Goodman, 2006; Hume and Leonard, 2013) and it is important that organizations grasp that communicating with employees is a critical success factor (Borca and Baesu, 2014). While internal communication can be defined in many different ways (Kalla, 2005), our focus is consistent with Argenti (2003) who states that internal communication entails creating an atmosphere of respect for all employees within the organization. Accordingly, in the present study, we define internal communication as the exchange of information and ideas among employees or members of an organization (social actors) to build trusting and open relationships and to create understanding (Bovee and Thill, 2000; Vercic et al., 2012).

The main objective of organizational communication is to inform employees about the organization's goals and policies and help them understand their merits (Borca and Baesu, 2014). Internal communication is primarily concerned with the relationship between social actors, e.g. the organization and its employees (Kennan and Hazleton, 2006), employing social structures that include a range of formal and informal communication mechanisms between individual employees, teams, project groups, and between staff and line management (Welch, 2012). Internal communication underpins organizational effectiveness through contributing to positive internal relationships by enabling information transfer among social actors (Welch, 2012). Communication when open, incorporating feedback and listening, and facilitating participation in decision-making, builds and maintains relationships (Mazzei, 2014). Research has shown associations between internal communication, organizational communication, and employee satisfaction (Borca and Baesu, 2014; Byrne and LeMay, 2006). Despite its importance, there remain considerable gaps in research on internal communication (Forman and Argenti, 2005; Welch and Jackson, 2007), especially its association with SCI.

Employees have been treated predominantly as receivers of internal communication, but they are also senders and active agents in the communications of a company (Durmusoglu et al., 2014; Frandsen and Johansen, 2011; Kim and Rhee, 2011). There is growing awareness among managers that, in order to achieve managerial objectives, employees at all levels of the organization should be informed about key issues so as to be able to contribute more fully to the success of the company (Tourish and Hargie,

1996). High levels of internal communication tend to be much more productive in problem solving and goal attainment, as well as engendering greater employee satisfaction (Smith et al., 1994; Tourish and Hargie, 1996). Previous researchers (e.g., Borcaa and Baesu, 2014; Byrne and LeMay, 2006) have argued that effective employee communication is positively related to organizational outputs such as organizational commitment and employee satisfaction. Internal communication can thus be a motivator for employees resulting in greater customer engagement and personal satisfaction (Vercic et al., 2012).

To compete effectively in a highly dynamic marketplace, supply chains should be integrated and aligned (Lee, 2004). This requires cross-functional integration within a firm and external integration with suppliers and/or customers to be successful (Kim, 2006, 2009; Swink et al., 2007; Van der Vaart and Van Donk, 2008; Zhao et al., 2011). SCI refers to “the degree to which a firm can strategically collaborate with its trading partners and collaboratively manage intra- and inter-organization processes to achieve effective and efficient flows of products and services, information, money, and decisions with the objective of providing maximum value to customers at low cost and high speed” (Zhao et al., 2008, p. 374). In the internally integrated firm, functional departments act as part of a collaborative and synchronized process in order to meet customer requirements (Flynn et al., 2010; Stock et al., 1998; Zhao et al., 2011). *Internal integration* thus entails the sharing of real-time data and information across business functions, cross-functional collaboration, and coordination of logistics activities with other functional areas (Chen and Paulraj, 2004; Flynn et al., 2010; Frohlich and Westbrook, 2001; Zhao et al., 2011). Internal communication, in fact, incorporates all social actors to enhance strategic information sharing across functional areas (Kalla, 2005). Social Capital Theory suggests that effective internal communication creates social assets which in turn yield organizational benefits in the form of trust, information sharing, and relational norms which are integral to corporate success (Tourish and Hargie, 1996). Internal communication is a critical area of management that has been proven to have a major impact on an organization's effectiveness, particularly when managed strategically (Hume and Leonard, 2013; Yates, 2006). *External integration* encompasses joint planning, strategic information sharing, and collaboration between a focal firm and its upstream suppliers and downstream customers to manage a collaborative and synchronized process (Chen and Paulraj, 2004; Paulraj et al., 2008; Yu et al., 2013; Wong et al., 2011; Zhao et al., 2011). By extending the scope of information sharing and collaboration to include trading partners, such external integration enables firms to establish social structures such as strategic relationships with suppliers and customers that create social assets through the joint development of strategies to capitalize upon market opportunities; the result being the maximization of stakeholder value (Flynn et al., 2010; Frohlich and Westbrook, 2001; Narasimhan and Kim, 2002; Zhao et al., 2011). Given the forgoing we propose the following hypotheses:

H1a. *Internal organizational communication has a significant positive effect on employee satisfaction.*

H1b. *Internal organizational communication has a significant positive effect on internal integration.*

H1c. *Internal organizational communication has a significant positive effect on external integration.*

2.3. Employee satisfaction and SCI

Supply chain integration requires extensive coordination and collaboration, both within and across firm boundaries (Kim, 2009; Swink et al., 2007; Van der Vaart and Van Donk, 2008; Zhao et al.,

2011). Functional departments within a firm must act as part of a collaborative and synchronized process in order to meet customer requirements (Flynn et al., 2010; Stock et al., 1998; Zhao et al., 2011) and as such, changes in this dimension for any reason, including employee satisfaction, will impact the ability or willingness to collaborate. Many organizations extend collaboration to trading partners to maximize the value of the trading relationship (Flynn et al., 2010; Frohlich and Westbrook, 2001; Narasimhan and Kim, 2002; Zhao et al., 2011). But again, the effectiveness may depend upon a number of factors, including the satisfaction of employees. Although HRM and SCM are intimately tied to each other in virtually all business scenarios, the importance of employee satisfaction and its effect on SCI have largely been neglected in the SCM literature (Gowen and Tallon, 2003; Farndale et al., 2010).

Inspired by the service-profit chain (Heskett et al., 1994, 1997), previous research in the service industry context has identified relationships among employee satisfaction, service quality and firm performance (e.g. Silvestro and Cross, 2000; Yoon and Suh, 2003; Yee et al., 2008). For example, Yee et al. (2008) report that employee satisfaction is significantly and positively associated with service quality and customer satisfaction. Employees not satisfied with their job context provide lower levels of engagement and performance (Herzberg et al., 1959; Herzberg, 1966, 1968). In particular their orientation toward providing service (Hogan et al., 1984; Johnson, 1996; Keillor et al., 1999; Schneider et al., 1980; Wilson and Frimpong, 2004) or engaging customers constructively is impaired (Hoffman and Ingram, 1991, 1992). These are affected by a diminishment in prosocial and citizenship behaviors (Batesman and Organ, 1983; Bettencourt and Brown, 1997; Puffer, 1987; Smith et al., 1983). Employees who are satisfied with their jobs tend to be more involved in organizational activities and more dedicated to delivering high quality services (Yee et al., 2008). These findings are consistent with Social Capital Theory which suggests that the interactions of social actors (employees) will result in social assets (e.g. high quality service). We suggest that these behavior patterns may be present in other contexts as well; specifically in the areas of the firm responsible for integration. As such we suggest satisfied employees will better coordinate and collaborate with functional areas within the organization and build strategic alliances with trading partners.

Employee satisfaction is an important factor influencing external integration with trading partners. McAfee et al. (2002) argue that developing relationship-based HRM strategies enables employees to make long-term investments in a firm's supply chain partners and that supply chain partners perceptions are influenced by the employees that manage the relationships. Accordingly, we argue that companies with high levels of employee satisfaction are more likely to establish close and interactive relationships with trading partners; it can also be argued that satisfied employees are more committed to working in cross-functional teams (Gowen and Tallon, 2003; McAfee et al., 2002). Conversely, employees not satisfied will provide lower levels of engagement and performance (Herzberg et al., 1959; Herzberg, 1966, 1968). As such we offer that:

H2a. *Employee satisfaction has a significant positive effect on internal integration.*

H2b. *Employee satisfaction has a significant positive effect on external integration.*

2.4. Internal integration and external integration

Previous research (e.g. Gimenez and Ventura, 2005; Stevens, 1990) has suggested that companies follow an integration process that progresses through multiple stages. For example, Stevens

(1990) suggests that companies integrate internally first, and then extend integration to trading partners. In other words, before successfully developing external integration with supply chain partners, companies must develop internal integration, which includes social processes such as teamwork among social actors from different functional areas (Zhao et al., 2011). Companies with a high level of internal integration are more likely to be in a better position to integrate processes with trading partners (Yu et al., 2013; Zhao et al., 2011). This may be attributable to the information processing capabilities (social asset) that facilitate absorption of knowledge (Schoenherr and Swink, 2012); absorption being facilitated by social structures such as rules and cross functional relationships (Hult et al., 2004). Zhao et al. (2011) further argue that external integration is simultaneously influenced by internal integration because organizations should first develop internal integration capabilities through system and process integration before building strategic cooperation with customers and suppliers where these integration capabilities can be further employed. Yu et al. (2013) and Zhao et al. (2011) both find that internal integration influences integration with customers and suppliers. As such there is evidence of social structures and actors creating social assets (e.g. capacity to integrate and collaborate) to be exploited. Accordingly, we argue that a company performing well in internal integration will be more predisposed to integration with trading partners. Thus, we propose the following hypothesis.

H3: *Internal integration has a significant positive effect on external integration.*

3. Research method and data

3.1. Sample and data collection

The proposed research model was tested using survey data collected from manufacturers in China. The survey comprised sample firms from a number of regions and provinces, such as Beijing and Hebei province (north China), Henan province (central China), Zhejiang province (east China), and Guangdong province (south China). To gain a representative sample, we used the Yellow Pages of China Telecom as a starting point for determining the potential sample pool. Following previous research (e.g., Peng and Nunes, 2008; Zhao et al., 2006), we identified a key informant in each randomly selected manufacturer with the help of Guanxi networks (personal connections with government officials, industrial authorities, and/or universities), which facilitates data collection in China. Respondents typically held titles such as CEO, president, director, supply chain manager, operations manager, marketing manager, and sales manager and had been in their position for more than five years. Thus, it is reasonable to expect that the respondents could offer meaningful insights into the functional activities investigated herein and be knowledgeable about the content of the inquiry (Droge et al., 2004).

Following previous guidance (e.g., Dillman, 2000; Frohlich, 2002; Zhao et al., 2006), several steps were employed to maximize the response rate and minimize response bias in subjective data obtained from the respondents. Since the scales adapted from the literature were in English, the original scale was first developed in English and then translated into Chinese. In order to ensure the reliability of the questionnaire a back-translation process was used to ensure conceptual equivalence (Flynn et al., 2010; Wong et al., 2011). Before executing the survey, two academics from the field of SCM reviewed the initial measurement scales and provided feedback. We then conducted a pilot-test with two directors and one president in China to ensure that the questions were clear, meaningful, relevant and easy to interpret (O'Leary-Kelly and

Vokurka, 1998). Minor changes to the scales were made accordingly. The questionnaires were then sent to 736 manufacturing firms that agreed to participate in the study. Each questionnaire was accompanied by a cover letter indicating the purpose of the study and potential contributions. The letter also assured complete confidentiality to the respondents. Additionally, to encourage participation and improve the response rate, the respondents were promised a summary of the study findings. Follow-up calls were made to encourage completion and return of the questionnaires and to clarify any questions or concerns that potentially had arisen (Frohlich, 2002; Zhao et al., 2006). We ultimately obtained 221 completed questionnaires, but seven responses were discarded due to significant missing data. This resulted in 214 usable responses, yielding an effective response rate of 29.08%. A profile of the respondents is reported in Table 1.

Since questionnaire surveys are often criticized for non-response bias, we used the approach of Armstrong and Overton (1977) to test for non-response bias. A *t*-test was run to compare characteristics of early and late respondents in terms of industry type, annual sales, and number of employees. The *t*-test results indicate no significant statistical difference ($p < 0.05$) among the category means for number of employees and company sales across different industry groups. Thus, non-response bias is not a problem.

To test for possible common method bias, we adopted three main procedures. In the first test, we conducted Harmon's single-factor approach (Podsakoff et al., 2003). The results of exploratory factor analysis (EFA) show four distinct factors with eigenvalues above 1.0, explaining 65.55% of total variance. The first factor explained 38.24% of the variance, which is not the majority of the total variance. The finding suggests that common method bias is

Table 1
Demographic characteristics of respondents.

	Number of firms	Percent (%)
Industries		
Arts and crafts	3	1.4
Building materials	16	7.5
Chemicals and petrochemicals	18	8.4
Electronics and electrical	22	10.3
Equipment manufacturing	25	11.7
Food, beverage and alcohol	24	11.2
Jewellery	2	0.9
Metal, mechanical and engineering	27	12.6
Pharmaceutical and medical	15	7.0
Publishing and printing	6	2.8
Rubber and plastics	13	6.1
Textiles and apparel	25	11.7
Toys	4	1.9
Wood and furniture	14	6.5
Annual sales (in million Yuan)		
Below 10	44	20.6
10–50	56	26.2
50–100	30	14.0
100–500	37	17.3
500–1000	17	7.9
1000–2000	10	4.7
2000–5000	8	3.7
Above 5000	12	5.6
Number of employees		
1–99	24	11.2
100–199	33	15.4
200–499	45	21.0
500–999	39	18.2
1000–4999	34	15.9
5000–9999	20	9.3
10,000 or more	19	8.9

not a problem. In the second test, confirmatory factor analysis (CFA) was applied to Harman's single-factor model (Flynn et al., 2010; Podsakoff et al., 2003). The model fit indices (χ^2/df (736.921/135)=5.459, CFI=0.665, IFI=0.668, TLI=0.620, RMSEA=0.145 and SRMR=0.111) were unacceptable and significantly worse than those of the measurement model. This result indicates that a single factor model is not acceptable and that common method bias is unlikely. In the third test, following Lindell and Whitney (2001), we used the years of employment of the respondents as the marker variable. As shown in Table 5, the number of years of employment is not significantly related to the four theoretical constructs, which provides further evidence that there is no problem with common method bias. Based on our examination, we conclude that common method bias is not a serious concern in this study.

3.2. Measures

Table 2 reports the reflective measurement scales used in this study. The measures for internal communication were drawn from (Powell and Dent-Micallef, 1997), which emphasized the exchange of information and ideas among employees of manufacturing companies. Employee satisfaction was measured using several items that focus on increased employee satisfaction levels, high employee retention rates and job satisfaction (Heskett et al., 1994, 1997; Kassinis and Soteriou, 2003). All items for internal communication and employee satisfaction were measured using a seven-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). The measures for internal and external integration were drawn from Flynn et al. (2010), which focused on data integration among internal functions and strategic cooperation with customers and suppliers. All these items were measured using a seven-point scale from 1 (not at all) to 7 (extensively). All of the scales from which our measures are drawn were reflective constructs as are those used in this research. As such, they do not need to fully capture the construct but rather only portions of it (Kerlinger, 1992).

Because the dependent variables (internal and external integration) in this study may be influenced by other factors, two

control variables incorporated into the research model, namely firm size and industry type. We controlled for firm size by using the number of employees as a proxy because larger firms may have more resources for managing supply chain activities, and thus may achieve a higher level of SCI compared with small firms (Zhao et al., 2011). Industry types were controlled because firms in different manufacturing industries may have different levels of SCI (Devaraj et al., 2004).

4. Data analysis and results

In estimating and testing the proposed research model, we followed the two-step procedure suggested by Anderson and Gerbing (1988). Structural equation modeling (SEM) with AMOS 21 was used to analyze the survey data.

4.1. Measurement model

Based on the CFA results summarized in Table 2, we conclude that the unidimensionality is confirmed (Hu and Bentler, 1999; Kline, 2005). Table 2 also indicates that the Cronbach's alpha coefficient and composite reliability of the constructs exceed the widely recognized rule of thumb of 0.70 (Fornell and Larcker, 1981; Nunnally, 1978; O'Leary-Kelly and Vokurka, 1998). Thus, we conclude that our theoretical constructs exhibit adequate reliability.

We conducted a CFA using the maximum likelihood approach to assess the convergent validity of each measurement scale (O'Leary-Kelly and Vokurka, 1998). Table 2 shows that all indicators in their respective constructs have statistically significant ($p < 0.001$) factor loadings greater than 0.50, which indicate convergent validity of the theoretical constructs (Anderson and Gerbing, 1988). Additionally, the CFA results reveal that the standardized coefficients for all items are greater than twice their standard errors and that the t-values are all larger than 2.0 (Flynn et al., 2010; Zhao et al., 2011), which further demonstrates convergent validity. Furthermore, the average variance extracted (AVE) of each construct exceeds or is only marginally below the

Table 2
Construct reliability and validity analysis.

Construct	Factor loadings	t-values	α	CR	AVE
1. Internal communication (Powell and Dent-Micallef, 1997)			0.803	0.815	0.530
Our employees would say this is a loose and informal place to work	0.607	–			
Written and oral communications are very open in our company	0.838	8.877			
Our employees communicate widely, not just with their own departments and functions	0.828	8.836			
In general, our employees accept change readily	0.604	7.178			
2. Employee satisfaction (Heskett et al., 1994, 1997; Kassinis and Soteriou, 2003)			0.830	0.835	0.628
Our overall employee satisfaction levels increased	0.792	–			
Our employee retention rates have been improving	0.853	11.065			
Our employees are satisfied with physical environment and management style	0.728	10.303			
3. Internal integration (Flynn et al., 2010)			0.869	0.872	0.577
Enterprise application integration among internal functions	0.659	–			
Integrative inventory management	0.796	9.854			
Real-time searching of the level of inventory	0.789	9.780			
Real-time searching of logistics-related operating data	0.796	9.846			
Real-time integration and connection among all internal functions from raw material management through production, shipping, and sales	0.749	9.391			
4. External integration (Flynn et al., 2010)			0.844	0.847	0.482
The level of computerization for our major customer's ordering	0.652	–			
The level of sharing of market information from our major customer	0.627	7.939			
The level of information exchange with our major supplier through information networks	0.713	8.828			
The establishment of quick ordering systems with our major supplier	0.777	9.443			
The level of strategic partnership with our major supplier	0.707	8.766			
Stable procurement through network with our major supplier	0.678	8.470			

Model fit statistics: χ^2/df (257.732/129)=1.998; RMSEA=0.068; CFI=0.928; IFI=0.929; TLI=0.915; SRMR=0.063.

Table 3
Descriptive statistics.

	Mean	S.D.	1	2	3	4
1. Internal communication	4.815	1.099	0.728 ^a			
2. Employee satisfaction	5.081	1.114	0.280 ^{**}	0.793		
3. Internal integration	5.342	1.035	0.459 ^{**}	0.260 ^{**}	0.760	
4. External integration	4.895	1.118	0.524 ^{**}	0.180 ^{**}	0.667 ^{**}	0.694
5. Years of employment (marker variable)	9.470	6.584	-0.038	-0.076	0.097	0.064

^a Square root of AVE is on the diagonal.
^{**} Correlation is significant at the 0.01 level (2-tailed).

Table 4
Pairwise comparison of χ^2 values (Discriminant validity analysis).

Construct pairs	Unconstrained		Constrained		$\Delta\chi^2$
	χ^2	df	χ^2	df	
Internal communication					
Employee satisfaction	26.390	13	33.473	14	7.083 ^{**}
Internal integration	56.525	26	85.074	27	28.549 ^{***}
External integration	89.819	34	99.269	35	9.450 ^{**}
Employee satisfaction					
Internal integration	29.718	19	74.190	20	44.472 ^{***}
External integration	51.953	26	86.547	27	34.594 ^{***}
Internal integration					
External integration	117.990	43	122.248	44	4.258 [*]

^{***} $p < 0.001$.
^{**} $p < 0.01$.
^{*} $p < 0.05$.

recommended minimum value of 0.50 recommended by Fornell and Larcker (1981), which indicates convergent validity. Based on these results, we conclude that the constructs and scales have convergent validity (Table 3).

We adopted two main approaches to evaluate discriminant validity. First, discriminant validity was examined by comparing the correlation between the construct and the square root of AVE. Discriminant validity is indicated if the AVE for each multi item construct is greater than the shared variance between constructs (Fornell and Larcker, 1981). Table 4 indicates that the square root of AVE of all the constructs is greater than the correlation between any pair of them, which provides evidence of discriminant validity (Fornell and Larcker, 1981). Second, discriminant validity was further examined using Chi-square difference test (Bagozzi et al., 1991). As shown in Table 4, all six χ^2 differences between the fixed model (the correlations between the paired constructs were constrained to 1) and unconstrained model are significant. Thus, discriminant validity is further confirmed (Bagozzi et al., 1991).

Partial Least Squares (PLS) modeling was considered as an alternative technique, but since the sample size is similar to other studies employing co-variance based SEM e.g. Jayaram and Xu, 2013, $n=197$; Koufteros et al., 2005, $n=244$; and Swink et al., 2007, $n=224$), we considered the sample size to be sufficient. Further, the literature has highlighted differences between the PLS and SEM approaches (Barroso et al., 2010; Chin, 1998; Peng and Lai, 2012) and offered guidance. For example, Chin (1995) states that co-variance based SEM is superior to PLS since parameter estimates are unbiased. As such Peng and Lai (2012) suggest that SEM be used in place of PLS any time the covariance based assumptions of SEM are met (as they are in the present study).

Table 5
Proposed model: hypothesis test using SEM.

Structural paths	Standardised coefficient	t-values	Hypothesis test
Internal communication → Employee satisfaction	0.298 ^{***}	3.521	H1a: Supported
Internal communication → Internal integration	0.435 ^{***}	4.777	H1b: Supported
Internal communication → External integration	0.331 ^{***}	4.175	H1c: Supported
Employee satisfaction → Internal integration	0.156 [*]	2.075	H2a: Supported
Employee satisfaction → External integration	-0.065	-1.072	H2b: Not supported
Internal integration → External integration	0.603 ^{***}	6.201	H3: Supported

Model fit statistics: χ^2/df (294.621/159)=1.853; RMSEA=0.063; CFI=0.925; IFI=0.927; TLI=0.911; SRMR=0.061.

^{***} $p < 0.001$;
^{*} $p < 0.05$.

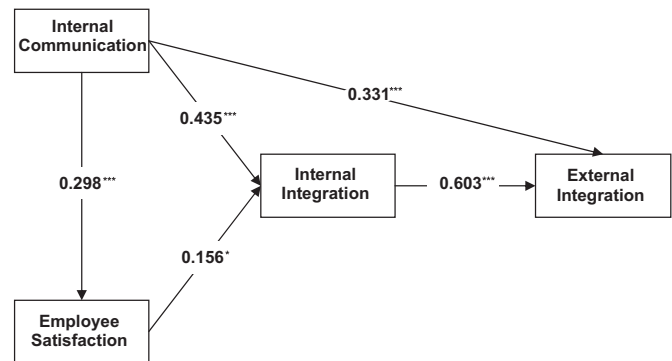


Fig. 3. Statistically significant paths.

4.2. Structural model (proposed and competing)

Table 5 and Fig. 3 report the hypothesis tests results. The overall fit indices of the primary structural model (χ^2/df (294.621/159)=1.853, RMSEA=0.063, CFI=0.925, IFI=0.927, TLI=0.911, SRMR=0.061) were good (Hu and Bentler, 1999; Kline, 2005). The proposed model indicates that internal communication has a significant positive effect on employee satisfaction, and that internal communication and employee satisfaction significantly influence internal integration, which subsequently affects external integration. Thus, H1a, H1b, H2a and H3 are supported. The structural model also shows that internal communication has a direct and positive effect on external integration, and that employee satisfaction does not significantly affect external integration. Thus, H1c is supported and H2b is rejected. Furthermore, following Baron and Kenny (1986), to identify the mediation effect of employee satisfaction and internal integration, we estimated three additional models: directly linking internal communication with internal integration, linking internal communication with external integration, and linking employee satisfaction with external integration. The model results indicate that internal communication has a significant effect on internal integration ($\beta=0.476, p < 0.001$) and external integration ($\beta=0.595, p < 0.001$), and that employee satisfaction has a significant effect on external integration ($\beta=0.194, p < 0.05$). However, as shown in Fig. 3, the effect of employee satisfaction on external integration became non-significant ($\beta=-0.065, n.s.$) and the effect of internal communication on external integration remains significant ($\beta=0.331, p < 0.001$) but the influence is reduced when the mediator (i.e. internal integration) was added in the proposed model. Fig. 3 also

indicates that the impact of internal communication on internal integration remains significant ($\beta=0.435$, $p < 0.001$) when the mediator (i.e. employee satisfaction) is added, but the influence is slightly reduced. Additionally, to directly examine the significance of the mediating effect, we conducted the Sobel test (Sobel, 1982). The results of the Sobel test provide further evidence for the partially mediating role of employee satisfaction on the link between internal communication and internal integration ($t=1.793$, $p < 0.10$), the partially mediating role of internal integration on the relationship between internal communication and external integration ($t=3.792$, $p < 0.001$), and the fully mediating effect of internal integration on the relationship between employee satisfaction and external integration ($t=1.979$, $p < 0.05$).

Following previous studies (e.g. Paulraj et al., 2008; Yee et al., 2008), we compared our proposed model (Fig. 1) with alternative model (Fig. 2) in order to ascertain which model fits the data the best. To examine the moderating effects of employee satisfaction (see Fig. 2), following Wong et al. (2011), we conducted a multiple-group analysis of structural invariance across employee satisfaction using AMOS 21. We created a two group model by dividing the sample into high ($n=97$) and low ($n=117$) employee satisfaction groups based on the median of its composite score (Byrne, 2009; Germain et al., 2008; Wong et al., 2011). The results of the multi-group analysis are reported in Table 6. As shown in this table, the fit indices of the alternate structural model (CFI=0.876, IFI=0.880, TLI=0.848) were not good (Hu and Bentler, 1999; Kline, 2005). The z-scores further suggest that the relationships between the factors in the three structural paths (internal communication → internal integration, internal communication → external integration, and internal integration → external integration) are invariant under a low and high employee satisfaction. Thus, the results of multiple-group analysis clearly document that employee satisfaction does not moderate the relationships among internal communication, internal integration and external integration. As such we conclude that the proposed model is the best-fitting model compared with the competing model. The specific implication is that employee satisfaction mediates rather than moderates the relationship between internal communication and internal integration. As such all of the conclusions drawn are based upon the proposed model.

5. Discussion and implications

There are a variety of implications and insights that flow from this research. We will begin the discussion with theoretical implications and then transition to managerial topics. The first theoretical insight from this research is that the roles of internal communication and employee satisfaction have been illuminated

Table 6
Competing model: moderation test using multiple-group analysis.

Structural paths	Low employee satisfaction		High employee satisfaction		z-score
	Estimate	P-value	Estimate	P-value	
Internal communication → Internal integration	0.552	0.000	0.429	0.002	-0.629
Internal communication → External integration	0.485	0.001	0.335	0.021	-0.715
Internal integration → External integration	0.764	0.000	0.760	0.000	-0.019

as precursors to internal integration. This ties supply chain integration to the management research investigating communication and also that research investigating employee satisfaction. Hence we show that the ramifications of communication programs and employee satisfaction extend beyond the firm boundaries through their antecedent role to internal integration, which is in turn antecedent to external integration. The results lend strong support for the assertion that internal communication is an important determinant of employee satisfaction and SCI (internal and external). Although previous research has argued that internal communication is important to achieving organizational success (Borcaa and Baesu, 2014; Goodman, 2006; Hume and Leonard, 2013; Vercic et al., 2012; Welch, 2012), to the best of our knowledge, this is the first empirical study evaluating the importance of internal communication in the SCI context. Therefore, our study fills an important research gap by offering empirical evidence that internal communication plays a significant role in enhancing internal integration and external integration with customers and suppliers.

This research also revealed that, consistent with SCT, social structures indeed lead to social assets that can be leveraged for organizational purposes. This can specifically be seen in the relationship between employee satisfaction and internal integration; in particular, the mediating role of employee satisfaction between internal communication and internal integration. This adds to the literature and clarifies relationships which prior were unclear (Yee et al., 2008). Our analysis indicates that in reference to employee satisfaction the proposed mediation model fits better than the competing moderation model. The results of the proposed model lend support to the assertion that employee satisfaction functions as a partial mediator of the relationship between internal communication and internal integration. This partial mediation role suggests that in addition to having significant direct effect, internal communication contributes to internal integration through employee satisfaction. Furthermore, our results also suggest that employee satisfaction indirectly affects external integration through internal integration. The empirical findings strongly support the conceptual arguments from previous researchers (e.g. Fardale et al., 2010; McAfee et al., 2002) who propose that an important consideration in developing a supply chain strategy (such as SCI) is a firm's HRM (e.g. employee satisfaction) strategy. Although much research has been conducted to investigate the importance of employee satisfaction in improving service quality and firm performance, research investigating the effect of employee satisfaction on SCI is scarce (Fardale et al., 2010; Gowen and Tallon, 2003). Therefore, our study fills another important research gap by providing strong empirical evidence that employee satisfaction plays an important mediating rather than moderating role in developing SCI strategy.

Operations and supply chain management and human resources have a long history of separateness (Boudreau et al., 2003; Yee et al., 2008). As such the operations and supply chain management literature has paid insufficient attention to human resource management (HRM) (Koulikoff-Souvion and Harrison, 2007). Drawing upon SCT, our results suggest that SCI emanates from internal communication and employee satisfaction. Supply chain managers in highly dynamic manufacturing industries should focus attention on strengthening the HR system (such as internal communication and employee satisfaction) in supply chain process when initiating strategic actions to enhance SCI.

This research empirically confirms the antecedent role of internal integration to external integration suggested by Stevens (1990). Compared with internal integration, external integration is viewed as a higher level SCI capability (Yu et al., 2013; Zhao et al., 2011). To survive in today's highly dynamic environment, companies must forge and maintain collaborative relationships with

trading partners; relationships which are developed based upon the implementation of internal business practices (Zhao et al., 2011). While previous studies (e.g. Yu et al., 2013; Zhao et al., 2011) also found empirical support for the relationship between internal and external integration, our study does so in a different context and by incorporating the roles of internal communication and employee satisfaction. More specifically, we found that internal integration partially mediates the link between internal communication and external integration, and fully mediates the link between employee satisfaction and external integration. Our research findings thus not only provide empirical support for the benefits of the combination of HRM programs and SCI strategies (e.g. Farndale et al., 2010; McAfee et al., 2002), but also extends previous research by identifying the mediating roles of internal integration. In particular, this research reveals there is no benefit to external integration from employee satisfaction unless internal integration is developed. This is an important finding, since much of the SCI literature has not explicitly modeled internal integration as a dimension of SCI. Hence this study identifies a missing variable, which may be clouding prior research findings or leading to inaccurate conclusions by its absence (Flynn et al., 2010).

Furthermore, our findings support Social Capital Theory, which suggests that social structures create and facilitate the exchange of social assets which in turn translate into positive returns to those assets (Koka and Prescott, 2002). It has been suggested that SCT has the potential to explain SCM phenomena since, conceptually, a supply chain represents linkages between stakeholders leveraging their relationships to improve performance (Autry and Griffis, 2008). Accordingly, this research adds to the growing number of studies that build on SCT in the context of SCM by demonstrating that interactions among employees can increase perceived mutual benefit from the relationship between social actors. These social processes in turn create an understanding of mutual needs and make visible necessary adjustments that when made will translate into positive benefits, e.g. employee satisfaction and SCI.

The context of this study is also important since greater understanding of developing economies is needed and the characteristics of developing economies may be informative for understanding rapidly developing markets in developed economies. In regards to alternative contexts, prior research has explored employee satisfaction in western cultures. Herein we identified the mediating role of employee satisfaction in a non-western culture, thus adding to the richness of the literature on the topic.

Just as academics can find value in this research, managerial practice can also be informed by the findings of this research. In particular, this research suggests that managers executing an integration strategy should endeavor to provide clear, regular, and complete communication to all relevant parties. This communication should not be constrained to just the integration strategy, but rather be comprehensive; communication about all aspects of the employment relationship and shared values will enhance employee satisfaction which will in turn facilitate increased internal integration. Importantly, satisfaction of employees can act as a road block to integration, but not an accelerator. As such managers should be careful to create an environment where employees can be satisfied, but not over-emphasize satisfaction as excessive investments in employee satisfaction may not enhance the successfulness of the integration efforts. Furthermore, because internal integration fully mediates the employee satisfaction–external integration link, managers should not expect that high levels of employee satisfaction would directly lead to external integration with trading partners. It is internal communication and internal integration that directly affect external integration. Therefore, it is important for managers to understand the critical

role of the implementation of internal business practices (such as communication and integration) in manufacturing success.

Our findings indicate that employee satisfaction directly affects internal integration, and that internal integration fully mediates the relationship between employee satisfaction and external integration. Managers should thus focus their effort on improving employee satisfaction, and satisfied employees will enable the manufacturers to facilitate the sharing of real-time data and information across business functions. Employee satisfaction is thus one of the important considerations for supply chain managers in developing an integrated supply chain strategy.

6. Conclusions, limitations, and future research

The specific findings of the research are that employee satisfaction partially mediates the impact of internal communication on internal integration and that internal integration is antecedent to external integration. Furthermore internal communication is found to impact employee satisfaction. Hence for a firm to improve market performance through the coordination of material, information, and money amongst trading partners it must first establish effective internal communication processes and stimulate employee satisfaction. The specific tactics for realizing effective internal communication and employee satisfaction are left to other researchers and studies. While this research has developed greater insight into facilitators of internal integration, there remains room for a more comprehensive model of antecedents to internal integration.

While the research has made significant contributions to research and practice, there are limitations that need to be considered when interpreting the study findings. As are all survey based studies, it is but a snap shot in time. Future studies should incorporate the roll of time and explore the evolution of internal integration as it relates with internal communication and employee satisfaction. While it is a strength of this study that it explores a non-western cultural context, it is also a limitation. The findings may be idiosyncratic to China and may or may not be extended to other emerging or developed economies. As such, future studies should investigate a multi-cultural sampling frame. While the industry range for the sample is quite broad, it does not include service firms. As such caution should be taken in extending the findings to services. An opportunity for future research is to incorporate service firms in the sample. This would enhance generalizability and afford the opportunity to contrast product and service contexts to see if there is a material difference. The latter might reveal whether the institutional perspective is more pronounced or whether absorptive capacity or the resource based view is universally applicable. The present study revealed a relationship between internal communication and enhanced levels of supply chain integration. However, it cannot answer the question as to why this is the case. Future studies should investigate, maybe via case based research, the mechanisms whereby capability in one form of communication is transferred to other contexts. Additionally future studies may consider a broader range of ‘communication’ and its impact on employee satisfaction. For example, does the elegance or opulence of the physical work environment communicate anything to employees and does it directly impact their satisfaction. These are important areas that have been revealed and remain to be further investigated for understanding the relationships and between trading partners and the success thereof.

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