



Management Decision

## Skills needed in supply chain-human agency and social capital analysis in third party logistics

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## Abstract

**Purpose:** A shortage of skills is recognized as a major source of risk in supply chain networks. This study uses two independent organizational theories to explain how to build applicable skills for continuous availability of appropriate supply chain talents. The paper proposes an integrated framework that links human agency theory, social capital theory and supply chain skill.

**Design/ methodology/approach:** This framework is analyzed in Third Party Logistics (3PL) organizations by confirmatory factor analysis and tested using a survey. After pre-testing by six academics and six practitioners, and following the total design method, the data were collected from 183 3PL organizations in India. Data was checked to ensure no non-response bias. Research hypotheses were tested using WarpPLS-Structural Equation Modeling.

**Findings:** Primary finding offers guidance to 3PL managers. Their driving role and mediating role of access to information and access to resources facilitate building supply chain skill. Leaders who invest in library, acquiring e-resources, offer financial support and create trust among employees are enablers of building supply chain skill.

**Originality/value:** This study classified fourteen supply chain skill into three categories as: managerial skill, quantitative skill and supply chain core skill. The study could be extended to similar companies in other developing countries.

**Keywords:** *Supply Chain Skill, Social Capital Theory, Human Agency Theory, Partial Least Squares (PLS).*

## 1. Introduction

In recent years, most organizations are experiencing people related issues. However, the coverage of people issues operations and supply chain literature is limited (Gattorna, 2010). The supply chain is now regarded as a significant subject yet it is poorly understood by academia and

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3 practitioners (Corominas, 2013). The supply chain literature is one of the fastest evolving disciplines  
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5 (Cousins *et al.*, 2006). Organizations have now embraced supply chain as their guiding philosophy.  
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7 Supply chains have significant impact on company value (Brandenburg and Seuring, 2011). Although  
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9 the supply chain challenges are myriad, the people issues have greatly impacted the present  
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11 generation supply chains which may be commercially managed or may be designed for humanitarian  
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13 aid (see Dimitriadis and Koh, 2005; Pettit and Beresford, 2009; Huo *et al.*, 2015; Jhavar *et al.*, 2016 ).  
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15 Mangan and Christopher (2005) argued for the need for investment in talent to build necessary  
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17 managerial skills and competencies to manage complex supply chains. Melnyk *et al.*, (2009)  
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19 attempted to identify the current practices and how the firms will shift their focus in future. There is  
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21 a rich body of literature focusing on supply chain competency (Spekman *et al.*, 2002) and supply  
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23 chain skill issues (Meixell and Gargeya, 2005; Lorentz *et al.*, 2013; Hohenstein *et al.*, 2014), however  
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25 empirical research on supply chain skill gaps is scant. The supply chain skill gap is identified as one  
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27 of the major sources of risk in supply chain network (Finch, 2004), however researchers from supply  
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29 chain community have so far failed to address human resource and behavioral issues in supply chain  
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31 network. Gammelgaard and Larson (2011), have argued that supply chain skill competencies theory,  
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33 which a logistics manager should possess to work in dynamic environment, has been least studied.  
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35 Thomas (2014) argued that the biggest concern for any organization is to get the right supply chain  
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37 talents. Thus we argue that soft dimensions in supply chains an aspects which deserves more  
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39 attention. Hence our research objective is to investigate supply chain skill using two independent  
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41 theories (i.e., human agency theory and social capital theory) to explain how to build applicable skills  
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43 to have a continuous supply of the right supply chain talents. To answer our research objective, we  
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45 have outlined our guiding sub-objectives as: (i) To develop a conceptual framework; (ii) To test the  
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47 validity of the conceptual framework; and (iii) To identify further research directions.  
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3 Our current study is organized as follows, based on the relevant structural guidelines (see  
4 Mollenkopf, 2014; Busse, 2014; Fawcett *et al.*, 2014; Kaufmann and Gaeckler, 2015; Hazen, 2016). In  
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6 the next section we develop our conceptual framework and classify our accordingly. Subsequent  
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8 sections develop a model based on this framework, describe the construct operationalization and  
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10 data collection method, present the data analysis procedure and the results of the model validity test,  
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12 and discuss the findings and their theoretical and managerial implications. This paper finally  
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14 concludes with a discussion about our findings and further research directions.  
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## 19 **2. Underpinning Theory**

### 20 ***2.1 Supply Chain Skill***

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22 In this section we undertake a critical review of literature focusing on supply chain skill. We  
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24 have classified literature into two broader activities of supply chain. Table 1 presents a list of  
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26 significant literature focusing on purchasing or procurement or supply management skill and their  
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28 strategic nature.  
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Table 1. Procurement/Purchasing Skill Gap Studies

| Purchasing/<br>Procurement<br>Skill           | Reference                        | Contributions   |
|---|----------------------------------|---|
| <i>Purchasing skill</i>                       | Giunipero and Pearcy (2000)      | Thirty purchasing skills were converted to seven orthogonal factors using exploratory factor analysis based on one hundred and thirty six purchasing professionals' responses. The seven factors are: strategy, process management, teaming, decision-making, behavioral, negotiation and quantitative skill. |
| <i>Purchasing skill</i>                       | Carr and Smeltzer (2000)         | An empirical study administered among senior purchasing professionals, suggest that there is significant positive association between purchasing skill of managers and organizational performance.  |
| <i>Supply management skill</i>                | Giunipero <i>et al.</i> , (2006) | The study highlighted the need for a strategic role to be played by the supply managers. The skill set desired is: team building skill, strategic planning skill, communication skill, technical skill, and broader financial skill.  |
| <i>Procurement skill</i>                      | Tassabehji and Moorhouse (2008)  | The study has identified the role of organizational support and recognition on procurement skill and its impact on organizational performance.  |
| <i>Purchasing and Supply management skill</i> | Feisel <i>et al.</i> , (2011)    | The study has raised an interesting issue related to alignment of human resource development(HRD) with purchasing and management skill (PMS) of an organization. The HRD need to be customized due to strategic in nature.  |
| <i>Purchasing competence of CPO's</i>         | Kern <i>et al.</i> , (2011)      | The study attempted to establish link between chief purchasing officer's (CPO's) competence with and different purchasing measures using confirmatory factor analysis. The study confirms stakeholder theory.   |

From Table 1 it can be noted that organizations need to focus on building skills among procurement and supply managers. Procurement is one of the most important activities in a supply chain network where supply managers must continuously maintain strong relationship with vendors.

In Table 2 we have attempted to classify literature based on studies focusing on logistics skills and their effects on organizational performance.

**Table 2.** Logistics Skill Gap Studies

| Logistics skill                                       | Reference                        | Contributions  |
|---|----------------------------------|--|
| <i>Skill for logistics manager</i>                    | Poist (1984)                     | A logistics manager's need to possess business, logistics and management (BLM) skill. The proposed framework is popularly known as BLM framework.  |
| <i>Educational strategies for logistics career</i>    | Murphy and Poist (1994)          | Need for education which focuses beyond technical skill required for building competency of logistics managers.  |
| <i>Skill required for senior logisticians</i>         | Murphy and Poist (1998)          | The study is an attempt to test BLM framework with respect to senior logisticians. The study outcome suggests the order of importance of first management skills followed by business skills and then logistics skills. Among management skills the integrity, motivation, organizing and planning are the most important. |
| <i>Teaching supply chain management to executives</i> | Vollmann <i>et al.</i> , (2000)  | The importance of skills to address four issues in managing supply chain: flawless execution of operations, the change from supply to demand focus, outsourcing and supply base development, and partnership implementation.   |
| <i>Logistics skill gap</i>                            | Dubey and Singh (2009)           | The study attempted to explore the factors that lead to logistics skill gap, tested using structural equation modeling.  |
| <i>Logistician competency</i>                         | Dazmin <i>et al.</i> , (2011)    | The study has tested the BLM framework in context of Malaysian logistics firms.  |
| <i>Logistics competency</i>                           | Thai <i>et al.</i> , (2011)      | The study has tested the BLM framework.  |
| <i>Logistics skill / supply chain skill</i>           | Bourlakis <i>et al.</i> , (2013) | The study has attempted to explore the logistics and supply chain skills for which UK industry is looking when employing post graduates.   |

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3 Table 2 presents a list of literature which has attempted to highlight the skills required for  
4 becoming logisticians. However depending upon level, ranging from entry level to senior manager  
5 level positions, the priority of BLM framework may change. For instance in case of junior level the  
6 logistics skill may be important; however in case of senior level the management skill is highly  
7 important. Based on synthesis of literature given in Table 1 and Table 2, we can observe that  
8 procurement and logistics skills are most important skills for managing supply chain network  
9 efficiently and effectively.

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Ambulkar *et al.* (2016) have developed a model to investigate how building absorptive  
capacity of individual supply chain managers can help to mitigate supply chain risks. Hence we can  
argue that right kind of skill may help the organization to sustain itself in an environment which is  
full of uncertainty.

## ***2.2 Human Agency Theory***

The human agency theory has been increasingly applied to explain the behavior of managers  
in translating company vision and mission into desired actions (Liang *et al.*, 2007). Bandura *et al.*,  
(2006) attempted to explain various modes of human agency using social cognitive theory. They  
identified three modes of agency: individual, proxy, and collective. The top management needs to  
assume greater responsibility for both technical and organizational changes. The top management  
plays an integral role in creating culture of learning which fosters excellence through belief and  
participation. This indicates that human agency theory will offer better insight to understand the fine  
thread that links social capital theory and supply chain skill.

## ***2.3 Social Capital Theory***

Coleman (1988) defined social capital theory as "... a resource for action in one way of introduction  
social structure into the rational action paradigm". He argued that in the creation of physical capital, it  
involves changes in materials so as to facilitate production, and human capital is involved in

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3 changing individual's skill and capabilities. In recent years social capital theory has attracted interest  
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5 from scholars from all management disciplines (e.g. Adler and Kwon, 2002; Wasko and Faraj, 2005;  
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7 Krause *et al.*, 2007; Lawson *et al.*, 2008; Carey *et al.*, 2011). In operations management, Krause *et al.*,  
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9 (2007) attempted to establish relationships between supplier development, commitment, social  
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11 capital accumulation and performance improvement. In that paper they considered cognitive capital,  
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13 structural capital and relational capital as constructs of social capital accumulation. Lawson *et al.*,  
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15 (2008) have further tested how social capital theory can be used to explain buyer-supplier  
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17 relationship, which is regarded as a critical driver in value creation. Carey *et al.*, (2011) have further  
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19 tested empirically Krause *et al.*, (2007)'s three components of social capital (i.e. cognitive capital,  
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21 structural capital and relational capital). However, still the social theory has not been exploited by  
22  
23 the operations management research community. Hence, we argue that social capital theory can be  
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25 exploited in our present study to explain the supply chain skill which is one of the missing links in  
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27 human resource and supply chain literature.  
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### 33 ***2.4 Research Gaps***

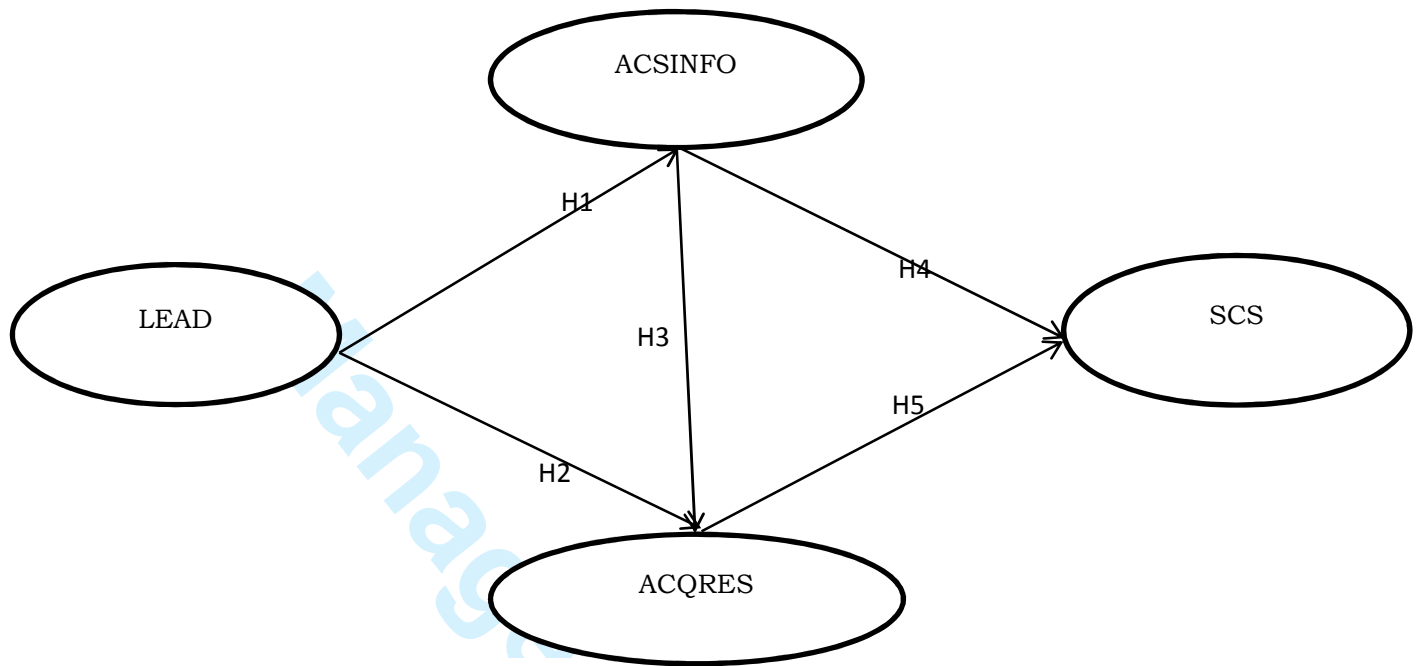
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36 Most studies have either focused on purchasing/procurement and supply management skill  
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38 or on logistics skill. The past studies have attempted to identify skills needed by purchasing or  
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40 logistics professionals. The focus on enablers of supply chain skills is missing in current literature.  
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42 Further, there is no comprehensive framework which can be adopted to build supply chain skills to  
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44 meet current and future supply chain / logistics sector. We also note that theory focused research  
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46 focusing on the supply chain skill gap is scant.  
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50 We next discuss how integration of two independent theories can be used to explain how  
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52 organizations are struggling to address the supply chain skill gap.  
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### 3. Theoretical Framework and Hypotheses Formulation

The foundation of our theoretical framework (see Figure 1) comprises of two elements: human agency theory (Eisenhardt, 1989) and social capital theory for career enhancement (Seibert *et al.*, 2001). The human agency theory states that leaders act as an agent between external factors and supply chain skill. Depending upon the current business scenario, top management provides the necessary resources to build the desired supply chain skills. On the other hand, social capital theory states that the way the leadership contacts and networks with the external world (i.e. professional links with supply chain and logistics bodies such as *APICS, Institute for Supply Management, Chartered Institute of Logistics and Transport, Confederation of Indian Industries Institute for Logistics, American Society for Transportation Logistics* and other professional societies) help to acquire and grow supply chain skills (see Siebert et al. 2001). However, the social capital theory in literature has not been explored. Hence, we suggest that social capital theory may provide a different perspective which current literature focusing on supply chain or logistics skill has failed to address. Our theoretical framework is grounded in the proposition that top management commitment, contact with top management and association with external societies help in building supply chain skill.



**Figure 1.** Conceptual Framework

We now describe the Conceptual Framework shown in Figure 1 in the following subsections.

### ***3.1 Leadership***

Gattorna (2010) argued that leaders and leadership styles are both dynamic in nature. Hence successful leadership cannot be transferable from one organization to another. Similarly, any one leadership style is not necessarily right for a particular organization. The effective leaders can play a significant role in shaping subcultures and implement the organizational strategy needed in a complex supply chain environment (Kotter, 1990). Kotter (1990) argued that the leadership role is to institutionalize leadership-centered culture. In the seminal work, Kotter (1990) resolved the existing debate of the time that leadership and management may not necessarily be the same. Rather they should be regarded as complementary roles to each other. Ancona *et al.*, (2007) argued that no leader can be perfect. Hence, the most successful leaders are those who concentrate on honing their strengths and seek to collaborate with those who can complement them. In recent years, scholars

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3 have expressed the desire for authentic leadership (Avolio and Gardner, 2005; Brown and Trevino,  
4 2006; Walumbwa *et al.*, 2008; Avolio *et al.*, 2009). Krause (2005) identified seven factors for  
5 leadership that include vision, credibility, collaboration, feedback and recognition, accountability,  
6 communication and action orientation. Men (2012) argued that leader's credibility is determined by  
7 leader's expertise and trustworthiness. The leader who possesses expertise, and can be trusted, has  
8 positive influence on the motivation of their employees.  
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### 17 ***3.2 Leadership and Access to information***

19 Nonaka *et al.*, (2000) argued the role of leadership in creating knowledge which is the source  
20 of competitive advantage. Here we argue the role of leadership in providing access to information.  
21 This can be further explained using leader's belief and participation in creating hub for information.  
22 In recent years successful organizations invest in creating libraries with access to top journals,  
23 reports and magazines. This helps in enhancing the knowledge base of the employees in the  
24 organization. As the business environment is becoming complex and highly volatile, knowledge  
25 needs to be dynamic. Thus, the organization needs to invest in dynamic information like periodicals,  
26 journals, magazines and reputable industry databases. We therefore can hypothesize as:  
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38 H1: The leadership has significant influence on access to information;  
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### 40 ***3.3 Leadership and Access to network resources***

42 The role of leaders is to provide resources, both financial and material, for enhancement of  
43 career. From the social capital theory point of view, when the distance between top management  
44 and the employee is very close, then the chance of availing of resources is high (Seibert *et al.*, 2001).  
45 We therefore argue that good rapport with top management helps to earn better recognition and the  
46 chance of getting resources in terms of funds for career advancement is high. The professional  
47 training offered by leading universities or institutions is very costly and very few get sponsorship to  
48 attend such programs. In such scenario, the proximity to the top management enhances the chance  
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3 of getting favor in terms of financial or material resources. However it may be debated that how  
4 such proximity can help in building supply chain skill. We are trying to investigate this dimension  
5 from supply chain skill perspective, but the assumptions may hold true in the case of any skills. It  
6 cannot be ignored that in past employee having good rapport with top management, had always  
7 enjoyed better support. Hence, we argue in our study that proximity and good relationship with top  
8 management helps to derive stronger support. We therefore hypothesize in our study as:  
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17 H2: Leadership helps to create resources for building supply chain skill;

### 18 19 ***3.4 Access to information and supply chain skill***

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Spekman *et al.*, (2002) argued that information results in knowledge which helps to achieve  
better supply chain performance. Marra *et al.*, (2012) argued based on exhaustive literature review  
that the supply chain literature has failed to establish the significant role of knowledge management  
in supply chain network. However, we argue that access to information in the form of journals,  
reports, magazines, videos and other form of relevant materials helps in improving skills which may  
help to improve supply chain performance in the network. We therefore hypothesize:

H3: Access to information leads to significant improvement in supply chain skill

### 3.5 Access to information leads to access to network resources

The right information is very important for building knowledge which is supported by  
various studies. The knowledge is further translated into skill and ability to perform particular task  
(McCain *et al.*, 2005). Hence, we argue that access to information helps in building network  
resources which include trust and confidence. We therefore hypothesize it as:

H4: Access to information leads to access to resources;

### 3.6 Access to network resources leads to supply chain skill

Sohal (2013) argued the need for collaboration between business, universities and industry  
associations to build supply chain skills. Further, Coleman (1988) argued that social capital in social

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3 networks plays an important role in building skills and capabilities in individual which is intangible  
4 asset but very valuable in terms of its impact on organizational success. The intangible resources like  
5 trust, faith and support beside other material and financial resources assist in building skills. Hence  
6 we argue that network resources are very important for building supply chain skill. Thus we  
7 hypothesize:  
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11 H5: Access to network resources has significant impact on building supply chain skill  
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### 14 ***3.7 Control Variables***

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16 To fully account for the differences among individuals in terms of skill required, we also  
17 include three control variables that characterize our unit of analysis. These variables are age, gender  
18 and designation of the respondents. We select these variables because of their potential to impact  
19 the outcome of the studies on supply chain skill as suggested by extant literature.  
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## 28 **4. Research Design**

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30 This section provides details of the survey developed based on the research constructs, data  
31 collection and non-response bias test.  
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### 35 ***4.1 Construct Operationalization***

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37 To test our conceptual framework as we have shown in Figure 1, we used the survey  
38 method. A survey instrument was developed by identifying appropriate measures from literature. We  
39 made some modifications in the existing scales to make them suitable for the third party logistics  
40 sector in India. We consulted a panel of experts drawn from these 3PL companies who have  
41 professional membership of at least one of Chartered Institute of Logistics Transport (India),  
42 Institute of Supply Management (India), Indian Institute of Materials Management and Asian  
43 Council of Logistics Management. These experts examined the face validity of the items. A few  
44 changes to the scales were made in order to match the Indian context. All the exogenous constructs  
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3 in the conceptual framework are operationalized as reflective constructs. The dependent construct,  
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5 supply chain skill, was operationalized as a formative construct. These constructs are discussed next.

### 8 ***Leadership***

10 We reviewed the existing literature as the basis for developing leadership scale for this study  
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12 (Krause, 2005; Gattorna, 2010 and Men, 2012). In the present research we used a seven-factor  
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14 leadership scale (Krause, 2005) with slight modifications for our study. The items that we used were  
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16 vision, credibility, collaboration, feedback and recognition, accountability, communication and  
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18 action orientation.

### 21 ***Access to information***

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24 In this case we have used a threeitems scale (Spreitzer, 1996). These items were designed to  
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26 measure access to information. The items that we included in our study are “*I have access to the strategic*  
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28 *information I need to do my job well*”, “*I understand top management’s vision of the organization*” and “*I*  
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30 *understand the strategies and goal of the organization*”.

### 33 ***Access to network resources***

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36 We have reviewed existing literature as the basis for developing the access to network  
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38 resources scale for this study (Spreitzer, 1996; Seibert *et al.*, 2001). Seibert *et al.*, (2001) used a three-  
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40 items construct for measuring access to resources. We modified the construct to measure access to  
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42 network resources in Indian context. The items of the construct are “*I am allowed to attend seminars and*  
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44 *conferences related to supply chain management*”, “*I can obtain sponsorship for attending management development*  
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46 *programs related to supply chain management*”, and “*I have access to the resources I need to build my skill related to*  
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48 *supply chain*”.

### 51 ***Supply Chain Skill***

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54 Gammelgaard and Larson (2001) classified five supply chain skills into three orthogonal  
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56 constructs using exploratory factor analysis. The three constructs are named as  
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3 interpersonal/managerial skill, quantitative or technological skill and SCM core skill. However, the  
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5 findings of the Gammelgaard and Larson (2001) was an extension of classical Poist (1984) BLM  
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7 framework. Gammelgaard and Larson (2001) considered the need for quantitative skills which in  
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9 recent years have become very important to address the dynamic supply chain issues. In our present  
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11 study we used a modified form of Gammelgaard and Larson (2001) three constructs supply chain  
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13 skill scale. Rahman and Qing (2014) further classified supply chain skill into four categories based on  
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15 graduate students' responses. In our study we used fourteen items to measure supply chain skill after  
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17 consulting with senior practitioners from 3PLs sector (see Table 4). The fourteen items are classified  
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19 under three categories: managerial skill, quantitative skill and supply chain core skill.  
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#### 24 ***4.2 Data Collection***

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26 A two-stage process was used for data collection which consisted of pre-testing and testing  
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28 the survey (Malhotra and Grover, 1998). The survey instrument was pre-tested with 6 academic  
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30 professors with sound research and teaching background in supply chain related fields. The  
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32 professors are also editorial board members of some of the reputable journals in the field of  
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34 operations and supply chain management. Besides academics, we also pre-tested the survey  
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36 instrument with 6 senior professionals with strong exposure to 3PL sector, some of them having  
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38 professional certification like CSCMP (Certified Supply Chain Management Professionals), CTL  
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40 (Certified in Transportation and Logistics), and CPSM (Certified Professional in Supply  
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42 Management). Based on the results of the discussions, survey instrument questions were adjusted  
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44 accordingly. No items were dropped. The goal was to ensure that the questions were understandable  
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46 and not vague, ambiguous, or difficult to answer (Dillman, 2011).  
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52 The survey was administered to managers in 3PL companies operating in India. The samples  
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54 were drawn from Chartered Institute of Logistics and Transport (India), Institute of Supply Chain  
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56 (India), and Asian Council of Logistic Management (India). These three professional bodies  
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represent over 1500 registered logistics and supply chain firms in India. The databases were chosen in order to reach a high number of practitioners with significant experience and knowledge to answer the questions. We requested the secretaries of these professional societies to provide the contact e-mail address, phone number, affiliation and designation of contact person. The complete survey was sent to targeted individuals in supply chain management along with a covering letter. In the covering letter we specifically mentioned that the respondent's details will be kept strictly confidential.

The initial sample was 286 firms, moreover, we were interested only in 3PL organizations. Data collections were conducted following a modified version of Dillman's (2011) total design method. Overall, we received 124 complete and usable responses in the first attempt and 59 usable responses after several follow-ups through e-mails and telephone calls to non-respondents. The total received responses represent 63.99%. The sample size is sufficient for studying the hypotheses developed in the study (Hair et al. 2006). The Table 3 presents the types of the business, ownership, profiles of the responding companies and demographic profiles of the respondents.

**Table 3.** Demographic profiles of the respondents

| Demographic Profile            |                           | Number of respondents | Percentage of respondents |
|--------------------------------|---------------------------|-----------------------|---------------------------|
| <i>Job Title</i>               | Vice President            | 65.00                 | 35.52                     |
|                                | General Managers          | 78.00                 | 42.62                     |
|                                | Managers                  | 38.00                 | 20.77                     |
|                                | Deputy/Assistant Managers | 2.00                  | 1.09                      |
| <i>Work experience (years)</i> | Above 20                  | 77.00                 | 42.08                     |
|                                | 15-20                     | 53.00                 | 28.96                     |
|                                | 14-Oct                    | 32.00                 | 17.49                     |



|                            |                        |       |       |
|----------------------------|------------------------|-------|-------|
|                            | 9-May                  | 21.00 | 11.48 |
|                            | 0-4                    | 0.00  | 0.00  |
| <i>Age of the firms</i>    | >20                    | 97.00 | 53.01 |
|                            | 15-20                  | 45.00 | 24.59 |
|                            | 14-10                  | 41.00 | 22.40 |
|                            | 5-Sep                  | 0.00  | 0.00  |
|                            | 4-Jan                  | 0.00  | 0.00  |
| <i>Revenue</i>             | > 2000 crores (INR)    | 45.00 | 24.59 |
|                            | 1500-2000 crores (INR) | 75.00 | 40.98 |
|                            | 1000-1499 crores (INR) | 43.00 | 23.50 |
|                            | 500-999 crores (INR)   | 13.00 | 7.10  |
|                            | < 500                  | 7.00  | 3.83  |
| <i>Number of employees</i> | Greater than 500       | 18.00 | 9.84  |
|                            | 250-500                | 55.00 | 30.05 |
|                            | 100-249                | 88.00 | 48.09 |
|                            | Less than 100          | 22.00 | 12.02 |

#### 4.3 Non-response bias

The statisticians recommend a non-response bias test on collected data before it can be used for further statistical analyses. Lambert and Harrington (1990) have provided a simple definition of non-response bias as the difference between the answers of respondents and non-respondents. Here we have used wave analysis suggested by Armstrong and Overton (1977). We compared the responses of early and late waves of returned surveys. The t-tests were performed on two samples and we found that the statistical difference between two set of responses is significant at  $p > 0.05$ . Hence the null hypothesis is accepted (i.e. there is no significant difference between early wave and late wave). Hence, we can conclude that our data is free from non-response bias issues.

## 5. Data Analyses and Results

We use WarpPLS 5.0, which relies on the Partial Least Squares (PLS) method to estimate the hypothesized relationships. PLS is prediction oriented and allows researcher to assess the predictive validity of the exogeneous variables (Peng and Lai, 2012). Hence, our study aims to assess the prediction or explanatory power of antecedent factors (i.e. leadership, access to information's and access to resources). The PLS is most appropriate method for data analysis for estimating a complex structural equation model, as proposed in this study. In conducting the model estimation, we follow the procedure advocated by Peng and Lai (2012) by evaluating PLS models in two stages: examining the validity and reliability of the structural model and analyzing the structural model.

### *5.1 Measurement model reliability and validity*

In our case since we have used modified scales from literature, we used confirmatory factor analysis to check convergent validity and discriminant validity (Chen and Paulraj, 2004). The convergent validity of the constructs as shown in Figure 1 is presented in Table 4.

**Table 4.** Convergent Validity of the Constructs

| Construct                       | Question/ Item   | Factor Loading | Variance | SCR   | AVE   |
|---------------------------------|--|----------------|----------|-------|-------|
| Leadership (LEAD)               | Vision   | 0.725          | 0.526    | 0.84  | 0.51  |
|                                 | Credibility  | 0.778          | 0.605    |       |       |
|                                 | Feedback and Recognition                                 | 0.732          | 0.536    |       |       |
|                                 | Communication  | 0.581          | 0.338    |       |       |
|                                 | Action Oriented  | 0.749          | 0.561    |       |       |
| Access to Information (ACSINFO) | Access to strategic information                          | 0.83           | 0.689    | 0.75  | 0.51  |
|                                 | Understand top management vision                         | 0.736          | 0.542    |       |       |
|                                 | Understand strategies and goal of the organization       | 0.534          | 0.285    |       |       |
| Access to resources (ACQRES)    | Allowed to attend seminar and conferences related to SCM | 0.736          | 0.542    | 0.80  | 0.63  |
|                                 | Sponsorship for training                                 | 0.612          | 0.375    |       |       |
|                                 | Access to resources to build skill related to SCM        | 0.906          | 0.821    |       |       |
| Supply Chain Skills (SCS)       | Decision Making  | 0.731          | 0.534    | 0.943 | 0.549 |
|                                 | Listening  | 0.937          | 0.878    |       |       |
|                                 | Organizing Skill   | 0.707          | 0.500    |       |       |
|                                 | Communication Skill                                      | 0.563          | 0.317    |       |       |
|                                 | Statistical Analysis                                     | 0.703          | 0.494    |       |       |
|                                 | Quantitative Methods                                     | 0.884          | 0.781    |       |       |
|                                 | Computer Programming                                     | 0.837          | 0.701    |       |       |
|                                 | Spreadsheet Modeling                                     | 0.787          | 0.620    |       |       |
|                                 | Exposure to ERP  | 0.515          | 0.265    |       |       |
|                                 | Knowledge of Industry                                    | 0.844          | 0.712    |       |       |
|                                 | Supply Chain Awareness                                   | 0.582          | 0.339    |       |       |
|                                 | Negotiation Skill  | 0.872          | 0.760    |       |       |
|                                 | Project Management                                       | 0.692          | 0.479    |       |       |
| Cross-functional awareness      | 0.562  | 0.316          |          |       |       |

We note that the factor loadings of each item of the all constructs is greater than 0.5, the scale composite reliability greater than 0.7 and the average variance extracted (AVE) greater than 0.5 (see Table 4), indicating that the constructs of the framework (see Figure 1) possess convergent validity (Fornell and Larcker, 1981). Next to establish the discriminant validity we produced an inter-correlation matrix among the six constructs, as shown in Table 5.

Table 5. Correlation Matrix

| Construct | LEAD          | ACSINFO       | ACQRES        | SCS           |
|-----------|---------------|---------------|---------------|---------------|
| LEAD      | <b>0.714*</b> |               |               |               |
| ACSINFO   | 0.253         | <b>0.714*</b> |               |               |
| ACQRES    | 0.229         | 0.201         | <b>0.794*</b> |               |
| SCS       | 0.167         | 0.257         | 0.122         | <b>0.748*</b> |

\*Bold value represent ( $\sqrt{\text{AVE}}$ )

We note that the bold value on the diagonal which is square root of average variance extracted is greater than all the inter-construct correlations. The result clearly indicates that the constructs of our model demonstrates discriminant validity (Fornell and Larcker, 1981; Chen and Paulraj, 2004).

### 5.2 Common Method Bias Test

With all self-reported data, there is a potential for common method biases resulting from multiple sources such as consistency motif and social desirability (Podsakoff *et al.*, 2003). We attempted to enforce a procedural remedy by asking the respondent not to respond to the supply chain skill on the basis of their personal experience, but on the basis of consultation with their team members. In addition, we performed statistical analyses to assess the severity of common method bias. First, a Harmon one-factor test (Podsakoff and Organ, 1986) was conducted on the six constructs in our conceptual framework. Results from this test showed that six factors are present and the most covariance explained by one factor is 26.32 percent, indicating that common method biases are not likely to contaminate our results.

### 5.3 Hypotheses Test

The PLS does not assume a multivariate normal distribution, traditional parametric-based techniques for significance tests are inappropriate. PLS uses a bootstrapping procedure to estimate standard errors and the significance of parameter estimates (Chin, 1998). Figure 2 represents the estimates obtained from WarpPLS 5.0 SEM analysis. The  $R^2=0.471$  indicates that the model explains a substantial amount of variance for supply chain skill.

The PLS path coefficients and p-values are reported in Table 6. The hypotheses H1 ( $\beta=0.69$ ;  $p<0.01$ ), H3 ( $\beta=0.18$ ;  $p<0.01$ ), H4 ( $\beta=0.39$ ;  $p<0.01$ ) and H5 ( $\beta=0.45$ ;  $p<0.01$ ) are supported. However, hypothesis H2 ( $\beta=-0.52$ ;  $p<0.01$ ) regarding leadership effecting acquisition of resources was not supported. To examine the robustness of the PLS results, we computed the p values upon 1000 and 15000 bootstrapping run which are consistent with the p-values upon 500 bootstrapping runs.

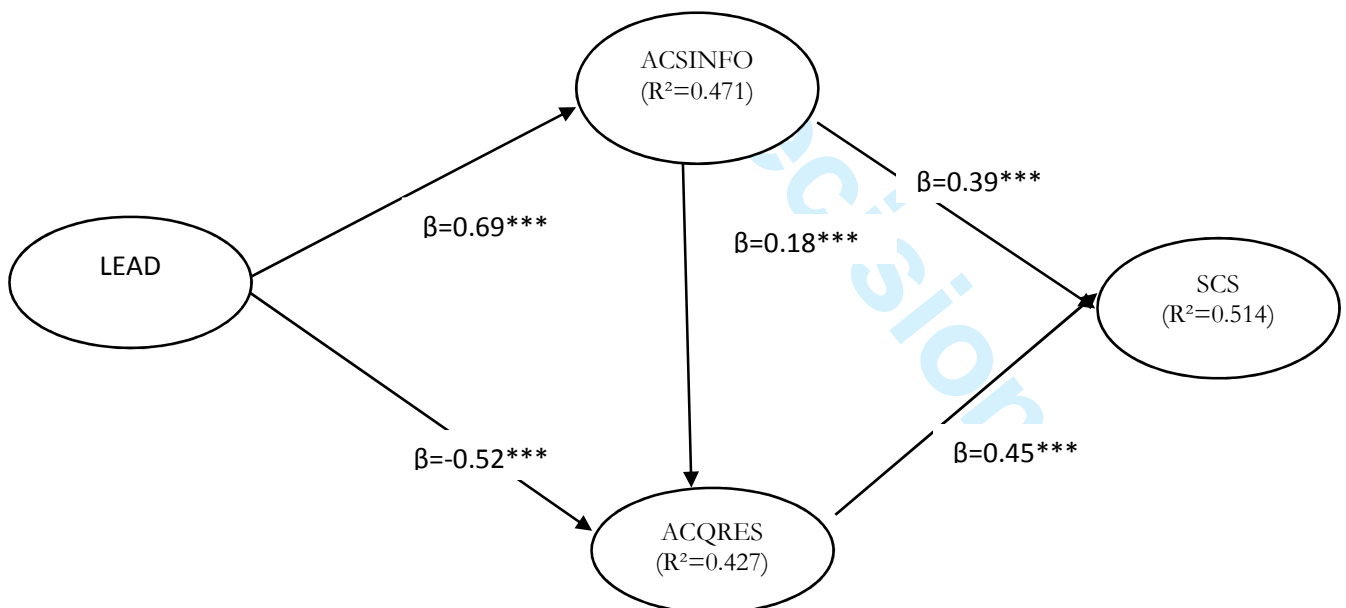


Figure 2: PLS Analysis of Results (\*\*\*)  $p<0.01$

**Table 6.** Hypotheses Test

| Hypothesis | Effect of | On      | $\beta$ | p-value | Results       |
|------------|-----------|---------|---------|---------|---------------|
| H1         | Lead      | ACSINFO | 0.69    | <0.01   | Supported     |
| H2         | Lead      | ACQRES  | -0.52   | <0.01   | Not supported |
| H3         | ACSINFO   | ACQRES  | 0.18    | <0.01   | Supported     |
| H4         | ACSINFO   | SCS     | 0.39    | <0.01   | Supported     |
| H5         | ACQRES    | SCS     | 0.45    | <0.01   | Supported     |

Next, to evaluate the explanatory power of the research model, we have examined the  $R^2$  value of the endogenous constructs. Using  $R^2$  to assess the structural model is consistent with the objective of PLS to maximize the variance explained in the endogenous variables. The  $R^2$  of ACSINFO (0.471), the ACQRES (0.427) and SCS (0.514), respectively which are moderately strong (Chin, 1988) (Table 7). To evaluate the effect size of each predictor construct, we have used Cohen  $f^2$ .  $f^2$  is equal to the increase in  $R^2$  relative to the proportion of variance that remains unexplained in the endogenous latent variable (Moshtari, 2016). Following, Cohen (1988) arguments,  $f^2$  values of LEAD on ACSINFO (0.471) and ACQRES (0.332), which may be considered large (Cohen, 1988). Similarly, the  $f^2$  values of ACSINFO on SCS (0.232) and ACQRES on SCS (0.283) which may be considered medium (Cohen, 1988).

Finally, to examine the model's capability to predict,  $Q^2$  for endogenous constructs are ACSINFO (0.47), ACQRES(0.42) and SCS (0.514), which are greater than zero, indicating acceptable predictive relevance (Peng and Lai, 2012).

**Table 7.**  $R^2$ , Effect Size and Prediction

| Construct | $R^2$ | $f^2$ in relation to |         |        | $Q^2$ |
|-----------|-------|----------------------|---------|--------|-------|
|           |       | LEAD                 | ACSINFO | ACQRES |       |
| ACSINFO   | 0.471 | 0.471                |         |        | 0.47  |
| ACQRES    | 0.427 | 0.332                |         |        | 0.42  |
| SCS       | 0.514 |                      | 0.232   | 0.283  | 0.514 |

## 6. Discussion

Our interest in investigating the role of social capital theory and human agency theory in building supply chain skill was triggered by two facets of the supply chain skill development process: first, the social capital which is important for building human capital, is widely noted in other fields. However, social capital perspective was not exploited in supply chain research to a great extent. Second, the supply chain skill was developed in past by various researchers. However there was lack of integrated framework linking human agency theory, social capital theory and supply chain skill. The existing literature on supply chain skill is focused on developing scales for supply chain skill. However, the majority of the studies lack supporting theory. Under these circumstances we argue that the social capital theory is equally, if not more, important for explaining supply chain skill.

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3 To lend further coherence to our conceptual framework, we also identified top management  
4 or leaders in organizations as the primary agency which will drive the social capital theory to achieve  
5 desired supply chain skill.  
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10 The factor analysis results indicate that credibility, feedback and recognition and vision are  
11 important items from leadership perspective. Similarly, the factor analysis result on access to  
12 information indicates that access to strategic information is very important. The access to resources  
13 to build SCM skill is very important item out of the three-items construct. In the case of managerial  
14 skills, the listening and decision making skills are regarded as the most important. In case of  
15 quantitative skill the quantitative methods and computer programming skill are regarded as most  
16 important skill and negotiation and knowledge of industry are observed as most important core  
17 SCM skill.  
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29 The conceptual framework was further tested using PLS-SEM. The result suggests that the  
30 constructs of our conceptual framework possess construct validity. Further  $R^2$  of the model suggests  
31 that our model explains substantial amount of variance in SCS. The hypothesis tests further support  
32 our assumptions which we derived through extensive literature review. The present study is unique  
33 for two reasons. One, to our knowledge this is the first study which has attempted to develop an  
34 integrated framework. Two, the study provides broad understanding of leadership, social capital and  
35 supply chain skill. We have classified the discussion into two broad sub-sections next.  
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### 45 ***6.1 Theoretical Contributions***

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47 The role of social capital theory is well discussed in enhancement of career success in  
48 organizational literature (Seibert *et al.*, 2001). What is less understood is how social capital affects  
49 supply chain skill. Two key aspects of this study signify our contribution to theory. First is the focus  
50 on leadership driving social capital and second, the social capital is affecting supply chain skill. These  
51 findings extend the work of (Gammelgaard and Larson, 2001 and Rahman and Qing, 2014) from  
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3 identifying supply chain skill to the factors affecting supply chain skill. Furthermore, the extension  
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5 of social capital theory to explain supply chain skill has extended the work of Siebert *et al.*, (2001).  
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8 This study integrates human agency theory and social capital theory to explain supply chain  
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10 skill in one model and reconciles what had previously been presumed to be independent. In the  
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12 existing literature, these two concepts were rarely studied together. Finally, we have tested the theory  
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14 in context to Indian 3PL sector. In the past there was barely any empirical study to determine supply  
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16 chain skill for 3PL sector, other than purely descriptive work lacking any underpinning theory.  
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### 19 ***6.2 Managerial Implications***

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21 Our findings offer guidance to 3PL organizations' managers. The driving role of managers  
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23 and mediating role of access to information and access to resources to build supply chain skill  
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25 provides that the leaders who invest in library and acquiring e-resources and in addition provide  
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27 financial support and create trust among employees are enablers of building supply chain skill. It has  
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29 been argued that supply chain skill provides unique competitive advantage to their organizations.  
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31 The present study can be used as a guideline for building supply chain skill. In our study we have  
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33 classified 14 supply chain skills into three categories – managerial skills, quantitative skills and supply  
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35 chain core skills. The findings of our study is based on 110 organizations' responses which are  
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37 purely 3PL organizations operating in India. However, the findings could be further extended to  
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39 other similar transport companies and other 3PL companies in developing countries.  
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### 45 **7. Conclusion**

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47 Drawing broadly on social capital theory, the human agency theory, and literature focusing  
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49 on classification of supply chain skill, we developed a conceptual framework and tested it in the  
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51 context of Indian 3PL organizations. Our conceptual framework reconciles the independent  
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53 contributions of three well-established streams of literature on social capital theory, human agency  
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55 theory and supply chain skill. We attempt to explicate how leaders influence supply chain skill  
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3 mediating through access to information and access to resources. Analyses are based on 110 Indian  
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5 3PL organizations largely support the hypothesized relationship in the conceptual framework. This  
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7 study contributes to organizational theories in supply chain by focusing on social capital theory and  
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9 its effect on supply chain skill. It confirms that social capital theory is important for human  
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11 development, and is also significant for building supply chain skill.  
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15 Although we feel that our present study offers unique contributions, it has numerous  
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17 limitations which offer opportunities to take the present research to next level. The present study is  
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19 focused on 3PL organizations. However, the proposed modeling framework needs to be tested with  
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21 respect to other sectors. Second, in our case we have collected data at one point of time. It is argued  
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23 by the statisticians that causality of the relationship cannot be established using cross sectional data.  
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25 Hence it is advisable in future to test the theory using longitudinal data. Third, we have used  
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27 literature review to build theory. In one of the seminal papers, Ketokivi and Choi (2014) have argued  
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29 in support of alternative methods like case studies for building theory. Pagell and Wu (2009) have  
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31 used 10 exemplary cases to build more comprehensive theory. Sometimes a deductive approach fails  
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33 to build strong theory. Beside case studies we further recommend using other alternative methods  
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35 like grounded theory, appreciative inquiry and systems theory like interpretive structural modeling  
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37 and total interpretive structural modeling for building comprehensive theory. Finally, we  
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39 recommend to further test proposed modeling framework in the context of developing countries  
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41 and draw the comparison in terms of scope of its implications.  
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