

Barriers to E-Application in Agrifood Supply Chain

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INTRODUCTION

Proper supply chain management (SCM) is very much important for achieving the objectives of an organization. This helps on one side to producers and on other to customers. Over a period of time, different enablers particularly information technology (IT) helped in spreading the usefulness of SCM. Different applications of SCM with the help of IT have resulted in increased responsiveness, reduced waste, cost saving, higher profitability, etc (Oliveira et al., 2011; Wu, Jiang, & Zhu, 2011).

IT can be used in supply chain of agri-food products also. Agri-food products' supply chain has certain typical challenges, such as high degree of wastage of products, perishability of products, unorganized sector, low margins to farmers and high margins to intermediaries, adulteration, etc (Zerihun & Shekhar, 2011; Joshi et al., 2012). IT can typically solve some of the problems of this supply chain but in a country like India where 60% of the population is employed in agriculture activity, unfortunately suffers with different types of problems resulting in very low profit making activity (Swain, 2010; Joshi et al., 2012). IT implementation can improve efficiency of agri-food supply chain making agriculture a profitable activity but a careful analysis of different barriers is required.

This paper uses Interpretive Structural Modeling (ISM) (Warfield, 1974; Sage, 1977; Jharkharia & Shankar, 2005; Shukla, Garg, & Agarwal, 2012)

methodology in developing a multilevel hierarchy system for barriers for supply chain of agri-food products. These barriers are identified through literature survey and expert discussions.

LITERATURE REVIEW AND IDENTIFICATION OF BARRIERS

The benefits of IT application in SCM require no proof. However, there are certain specific researches which are worth mentioning in the field of use of information technology in SCM. Some of the researchers like Somuyiwa, Adebayo, & Akanbi (2011) and Sinkovics et al., (2011) have used data of more than hundred supply chains in their respective studies to demonstrate that use of IT had resulted sustained performance gain especially in operational excellence and revenue growth.

IT enabled supply chain management is necessary for Indian agri-food sector also. The adoption of IT in agri-food sector improves its competitiveness among the other sectors (Kumar et al., 2013). This helps in organizing their supply chain partners and support its stakeholders. The level of IT adoption in Indian agri-food supply chain is much less as compared to e-adoption in agri-food supply chain of developed nations (Eswarappa, 2011; Tirkaso, 2011; Anwar, Shamim, & Khan, 2012; Nourbakhsh et al., 2012; Opata, Nweze, & Rahman, 2011; Mills et al., 2012).

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To identify barriers for current study, keywords such as Indian agri-food supply chain, IT applications, and challenges for e-Application were used in Scopus, ScienceDirect, EBSCOS Business Source Premier, and Emerald databases and Web portals like Google Scholar. Around 36 academic published papers in journals and some articles and books were read out to carry such research.

For expert panel, the barriers were analyzed by visiting personally to the researchers, academia, and organizations along with stakeholders of agri-based supply chain management system. The total of 24 members includes 7 researchers, 9 academia, and remaining 8 members of Indian agri-based organizations were targeted for checking the relevancy of the barriers (as obtained from literature) by getting responses in the form of Yes/No and then establishing a interrelationship among them with the help of pair-wise comparison. The targeted academia and researchers are experts in the area of supply chain management, operations management, marketing, and information technology management. Also, the members like Supply Chain Manager, Team Leaders, Senior and Junior Research Associates, and Research Scientists were targeted from agri-based organizations in Northern and Eastern part of India to perform the expert panel discussions.

Literature review gives 13 barriers out of which 3 barriers, namely, lack of motivation, lack of top management commitment, and lack of trust were not considered for further analysis as expert panel discussion gave low relevancy for these 3 barriers. Further discussions with experts helped in understanding that these three barriers are important but of general nature. Following ten selected barriers are chosen which are specific to agri-food supply chains.

1. **Lack of Organized Efforts (O_1):** Except few examples such as e-Choupal of ITC and some other, India lacks in organized structure in agri-food supply chain for effective e-Application. As per (Krishnamurthy, 2009) 97% of agri-food products are distributed

through unorganized sector. According to Matusitz & Reyers (2010), Rajkumar (2010), Ramakrishnan (2010), Batool & Zulfiqar (2011), Rana (2011) and Joshi et al. (2012) Indian food industry has serious problem of unorganized activities. This becomes a major barrier for any effort such as e-Application in supply chain of these products.

2. **Lack of Standardization (O_2):** Certain guidelines is available for processed food products regarding quality, packing, expiry dates, etc. But in unprocessed food products, judgemental view of individual stakeholder holds good. Thus, lack of standardization is a very important barrier, as information technology can be conveniently applied in standard products and processes as identified by researchers (Ellert & Urmann, 2010; Henson & Humphrey, 2010; Wever et al., 2010; Ryo, Hideaki, & Arito, 2011).
3. **Lack of E-Literacy (O_3):** The source of agri-food product is farmer where Indian rural literacy rate is much lower (as per Ministry of Home Affairs, Government of India). Further, knowledge of information technology is very low in this area. It is, therefore, difficult to have e-Application in agri-food supply chain (Briggeman & Whitacre, 2010; Nin-Pratt, Yu, & Fan, 2010; Eswarappa, 2011; Opata, Nweze, & Rahman, 2011; Torero, 2011; Mills et al., 2012).
4. **Large Number of Small Farmers (O_4):** According to land holding pattern in India, most of the farmers is small and marginal farmers. According to Ministry of Agriculture, Government of India, small farmers find it difficult to appropriate the use of information technology in supplying their produce to next level of supply chain (McCullough, Pingali, & Stamoulis, 2008).
5. **Weak IT/IS Infrastructure (O_5):** According to Telecom Regulatory Authority of India, number of Internet users in country is increasing at a rate of 18 percent. This rapid growth rate can take benefit of various ser-

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