Improving supply chain performance of apparel manufacturing and exporting organizations in a leagile environment

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Abstract

From lean to agile and onwards, apparel manufacturing and exporting organizations (AMEOs) in developing nations are tending towards the leagile approach when serving the U.S and the European markets. However, the competitive performance in the leagile environment is subject to the identification and alignment of certain factors. This research identifies such factors through a literature review and then assesses them through an expert survey from Pakistani apparel organizations and propose a model. The components of the model are discussed then in relation to related literature.

Keywords: Leagile, Supply Chain, Apparel

Introduction

Organization's competitive performance can be recognized from its ability to differentiate itself from competition (Satish & Vivek, 2014). And supply chain management is viewed as an important approach in creating such competitive capability. Since customers are the eventual assessor of organizational performance, their level of satisfaction is considered the yardstick to measure such performance (Estampe, Lamouri, Paris, & Brahim-Djelloul, 2013).

The organizational performance from supply chain perspective depends on a number of priorities which may be categorized in areas such as quality, delivery & flexibility. (Zailani & Rajagopal, 2005). Besides that, Koprulu and Albayrakoglu (2007) note that the primary performance goals of SCM can be characterized as time compression, unit cost reduction, flexibility, and waste reduction by minimizing replication, harmonizing processes and improving quality through increased coordination within and outside the organization.

The competition in today's environment is not between organizations but rather between supply chains (Chen & Paulraj, 2004). Specifically, in relation to the importance of improved performance of apparel supply chains Ngai, Peng, Alexander, and Moon, (2014) suggest that in the wake of increasing globalization and competition, organizations seeking a leadership position in the apparel and textile market need to develop responsive and durable supply chains.

Nature of apparel supply chain

Global textile and apparel industry is a significant manufacturing industry and plays a considerable role in both economically developing and developed nations (Sardar, Lee, & Memon, 2016; Cao, Zhang, Man To, & Po Ng, 2008). According to the trade statistics of WTO, the world clothing trade has reached to US$ 453.8942 billion in 2015 (International Trade and Market Access Data, 2017). Especially, the last couple of decades has observed rapid technological advancements, geopolitical ease and trade deregulations which resulted in the immense advancement of global sourcing especially from industrially advanced nations to developing nations (Kilduff, 2005). Apparel supply chain primarily involves fabric producers, apparel manufacturers, and retailers (Routroy & Shankar, 2014).

Leagile!

Apparel products can be separated into two main subdivisions such as basic and fashion apparel products. Whereby, Cairns and Roberts (2007) contrast that from style and price perspective, apparel products range from High, Moderate, and Fast fashion to Continuity (Basic) products. The corresponding product range also reflects the higher prices to lower ones offered by the organizations such as Valentino, Lacoste, and Zara to Tesco in the corresponding order. Such classification thus becomes the basis for understanding apparel supply chain from lean, agile and leagile perspectives.

Lean and agile approaches contributed well in economically developed nations and now being embraced by emerging economies (Avittathur & Jayaram, 2016). The SC approach such as lean, agile or leagile is intensely related to supply chain performance of the organizations (Rahiminezhad Galankashi & Helmi, 2016). However, performance results of lean and agile differ from cost and flexibility perspectives (Hallgren & Olhager, 2009).

The primary difference between lean and agile is the focus towards certain accomplishments, such as lean focuses towards elimination of wastes in production processes and preventable use of resources. On the contrary, agile approach stresses towards overcoming uncertainties by proficiently altering operating conditions to exploit opportunities and changing customer demands in quick and creative manners without additional investments (Naim & Gosling, 2011; Hallgren & Olhager, 2009). From production perspective in a lean approach, buyers are interested in the particular products, whereas under agile approach buyers are more interested in reserving the capacity to overcome variations in production and products at short notice (Mason-Jones, Naylor, & Towill 2000). Referring to the study carried out by Bruce, Daly and Towers (2004) in relation to factors driven by lean and agility approaches, varied outcomes can be observed; one such outcome suggests that agility impacts positively on quality and delivery performance whereby other results of study proposes that lean

approach has greater influence on quality performance however both agile and lean approaches have quite comparable impact on reliability and delivery speed. However, Avittathur and Jayaram (2016) propose that the adoption of lean or agile approach requires restructuring by keeping local perspectives in consideration.

On the same note, Rahiminezhad Galankashi and Helmi (2016) claim that from a practical perspective the adoption of either pure lean or agile strategy is quite rare in the true sense. Thus, engaging both simultaneously can be advantageous for organizations and their supply chains. Christopher, Peck and Towill (2006) criticize that prevailing "one size fit all" supply chain pipeline is insufficient to endure current fluctuating demands. Unlike functional products & standardized strategy (lean), organizations following innovation strategy (agile) face a variety of risks including misjudged forecast which results in either over or under stock levels besides facing competition from the low-cost entrants. Thus, given the nature of tough competition and ever-changing nature of apparel and textile demand, organizations need to develop their specific and customized supply chain strategies to cater their individual demand individualities & competencies.

Further, the leagile approach is quite practical in a business scenario. It is the combination of lean & agile concepts where upstream supply chain uses lean principles till the decoupling point of downstream where an agile approach is employed in managing variation in the actual demand and avoid bullwhip effect. However, what may be considered "waste" in the lean approach can inversely considered necessary in the agile approach. (Bruce, Daly, & Towers, 2004; Mason-Jones et al., 2000). From a practical perspective, the U.S textile and apparel organizations are focusing towards both lean and agile simultaneously. They attain product differentiation through increased creativity, product innovation, higher variety, speed and flexibility besides becoming cost competitive by working with low-cost manufacturers (Kilduff, 2005).

Market

According to statistics shared by WTO, the EU, and the U.S.A are the largest importer of garments in the world. The EU imported UD$ 94,905 million worth of garments (From outside EU) and the USA imported around US$ 91,028 million worth of garments from the world. Pakistan is the 4th leading producer of cotton in the world. Cotton and its manufactured goods including home textiles are significant contributor to nation's economy as Pakistan is the 8th prime exporter of the textile products to regions including The European Union, USA and the Gulf. Textile sector of Pakistan provides add to 8.5% in total GDP. Contribution of textile industry of Pakistan in world trade is about 32.8% in cotton yarn and 8.1% in cotton clothes (Khan, & Brabazon, 2016; Khan, 2014).

Besides all such abundance of cotton and comparatively low-cost labor, textile sector still struggling to exploit its full capacity. To attain a leading position in global textile supply chain Pakistan textile industry must overcome its challenges and capture further market share (Stotz, 2015; Siddique, Shaheen, Akbar, & Malik, 2011). Further, the swelling labor costs in China and rise in the domestic markets of India and China provide a greater opportunity to competing textile exporting countries including Pakistan to fill such vacuum (Hamid, Nabi, & Zafar, 2014). Subhan, Mahmood and Sattar (2014) infer that 87% Industrial sector in Pakistan is comprised of small to medium sized organizations and there exists an immense opportunity for such

organizations in terms of process innovation and further development. However, exploitation of such opportunities could only be possible if the AMEOs make best use of the factors referred in the following table.

Code	Factors	Literature
PRM	Planning & Resource management	Chaudhry, Macchiavello, Chaudhry, T & Woodruffhttps, (2016), Ma, Lee, & Goerlitz (2016), Kodithuwakku & Wickramarachchi (2015), Taplin (2014), Giri & Rai (2013), Noor, Saeed & Lodhi (2013), Shetty, Kiran, Dash (2013), Monsur, & Yoshi (2012), Babar & Bilal (2012), Ramesh & Bhanipati (2011), Saxena, & Salze-Lozac'h (2010), Abdelsalam, & Fahmy (2009), Cao, Zhang, Man To, & Po Ng (2008), Christopher, Peck, Towill (2006)
COLLAB	Collaboration	Tuntariyanond, Anuntavoranich, Mokkhamakkul, & Wichian (2014), Chen & Fung, (2013), Jawad & Memon (2013), Giri & Rai (2013), Nguyen (2013), Shetty, Kiran, Dash (2013), Smadi (2012), Saxena, & Salze-Lozac'h (2010), Cao, Zhang, Man To, & Po Ng (2008), Lam & Postle (2006), Teng & Jaramillo (2005), Chen & Paulraj (2004)
TD	Training & Development	Chaudhry & Faran (2015), Shetty, Kiran, Dash (2013), Saeed (2011), Saxena, & Salze-Lozac'h (2010), Rasiah (2009), Abdelsalam, & Fahmy (2009), Lam & Postle (2006)
TECH	Technology	Hishan, Ramakrishnan, Alwethainani, Kazi, & Siddique (2016), Chaudhry & Faran (2015), Hamid, Nabi, & Zafar (2014), Caridi (2013), Caridi, Perego, & Tumino (2013), Monsur, & Yoshi (2012), Ramesh & Bhanipati (2011), Saxena, & Salze-Lozac'h (2010), Rasiah (2009), Cao, Zhang, Man To, & Po Ng (2008), Teng & Jaramillo (2005)

Exhibit. 1 Factors affecting the SC performance of AMEOs in a leagile environment

Research Design

A focused literature search was conducted specifying Management, Business & General categories of databases comprised of Business insight global, Business Source complete, EBSCO, Elsevier, Emerald, ebrary, Passport, Taylor & Francis, Gale virtual, Cambridge, Credo, DOAJ, JSTOR, ALA, ProQuest, Sage, Web of knowledge, Springer, Science Direct, Scopus, Wiley, & so on. Search was made using Boolean approach; applying filters of scholarly research papers & online texts in business discipline with no time limits. Initially, search began with the terms focusing on apparel, garments, textiles, fabric, supply chain, logistics quality, export in Pakistan etc., keeping the truncation in consideration. Then, search was further broadened to apparel, garments, fabric, textiles, supply chain, logistics & quality, export terms. Some 71 scholarly papers were identified & around 63 scholarly papers then downloaded based on their proximity to the search titles.

The descriptive research method was selected to carry out this study. Primary data was collected through the 5 point likert scale using questionnaire developed and drawn from the literature and its resulted hypothetical model based of four factors namely Planning & Resource Management (PRM), Collaboration (COLLAB), Training & Development (TD) and Technology (TECH). Questionnaires were sent through emails initially for a validity check before being sent on the larger scale. Questionnaire were distributed through the email addresses shown on the Pakistan Readymade Garments Manufacturers and Exporters Association (PRMGEA) website with an attached consent form. However, only around 47% (n=59) responses were obtained despite repeated requests to overall 126 apparel organizations. Moving forward to analysis, the internal consistency among the questions in relation to each factor was checked by reliability test using Cronbach's alpha. Further, using SPSS 19.0, Exploratory Factor Analysis (EFA), ANOVA and multiple Regression were performed.

Assessment Summary

Reliability Statistics

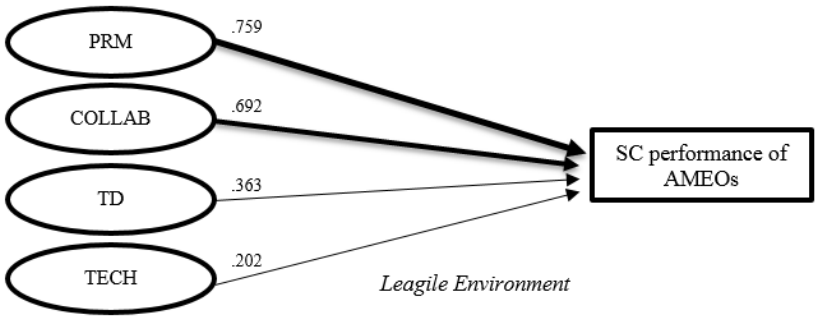
Model Factors		Factor loading	Mean	Cronbach's α
1	PRM	0.90	1.5	0.93
	COLLAB	0.89	1	0.90
	TD	0.84	1	0.92
	TECH	0.88	1.5	0.91
Overall Reliability of the model		0.92		

Model Summary				ANOVA[a]	
Model	R	R Square	Adjusted R Square	F	Sig.
1	.762[a]	.576	.557	32.38	.000
Predictors: PRM, COLLAB, TD, TECH					

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	**87.608**	**6.413**		13.661	.000
PRM	14.645	1.441	.759	10.162	.000
COLLAB	.403	.046	.692	8.761	.000
TD	.110	.029	.363	3.774	.000
TECH	.145	.071	.202	2.031	.010
a. Dependent Variable: SC Performance of AMEOs					

Discussion

Reliability statistics in relation to overall model reliability is calculated as 0.92 which is excellent according to Cronbach & Shavelson, (2004). A multiple regression was run to predict SC performance of AMEOs in relations to factors planning & resource management (PRM), collaboration (COLLAB), training & development (TD), and technology (TECH). Statistically these factors significantly predicted SC performance of AMEOs as F=32.38, $p < .0005$, R2 = .576 with sig .000. Thus, all above stated factors contribute significantly to the prediction, $p < .05$. Similarly, it can be analysed that factors such as PRM and COLLAB are highly significant in relation to other factors in terms to supply chain performance of AMEOs, thus, overall model (Fig. 1) is a good predictor.



Following the analysis of results, it can be established that in the given leagile environment, *planning, collaboration, training and technology* can significantly help improve supply chain performance of AMEOs in developing nations in general and Pakistan in particular.

Planning and resource management

Both the literature review and the survey commonly identified this factor as one of the most influential factors needed to be improved for better supply chain performance.

Satish and Vivek (2014) stress that planning is the fundamental part of the SCM process. It enables management to assess historical trends and estimate market settings for developing strategies.

As identified in literature review and survey, apparel and textile organizations both in Pakistan & competing nations could greatly benefit from planning for increased automation, involvement of employees, suppliers and customers, offering training programs, better sourcing, and developing vertical integration. However, Islam and Adnan (2016) in relation to the role of top management in planning criticize that inefficient management is a major cause of outdated processes and resulting poor capacity utilization and limited value addition in the AMEOs.

To have effective planning and resource utilization, top management of the AMEOs must have a vision and required commitment to systematically integrate quality in products and processes. However, it's important that such plans and associated strategies be based on realistic knowledge. In the same line Coyle, Langley, Novack, and Gibson (2012) stress that organizations need to develop the supply chain performance metrics for all functional levels to supply chain levels for better planning and resource utilization.

Further, successful planning and resources optimization require developing internal communication channels for sharing timely, accurate, fact based information and suggestions. Especially, to cater to leagile nature of apparel industry Sardar, Lee, and Memon (2016) noted that, 'to address increasing flexibility issue caused by fluctuating demands, tactical level production planning is quite important'….. however, owing to huge gap in social status and inherent fear there exists a huge power vacuum between top management and lower level supervisors including line workers in apparel manufacturing industry in developing nations. In this relation, Deming (1986) argue that fear does not improve anything and causes economic loss, workers would only tell management what it likes to listen and won't share reality in the presence of fear…fear of reprisal…fear of unknown.

Collaboration

Next to planning, collaboration is identified as an extremely important factor to achieve greater flexibility in terms of responsiveness and visibility in apparel supply chain, especially when the nature of demand is leagile. However, in the current business settings of apparel marketplace and supply base, collaboration is a challenge. Kuei, Madu, and Lin (2008) in relation to this note that each supply chain partner could have diverse priorities such as increased innovation by a buyer and operational efficiencies by a supplier. Such variances can be resolved by developing a shared value. However, describing the inherent challenges to develop collaboration and long term relationship between SC partners especially in lean set-up, Neu, Rahaman, and Everett, (2014) state that the low-price apparel market is characterized as having short leadtime and tough price competition. Such situation leads to lack of trust and strains in developing alliance.

The results of the study identifies that poor responsiveness such as the lack of two-way information sharing between shop-floor garment workers, floor supervisors and top management of the apparel organizations is one of the main source of lack of internal collaboration. Similarly, literature review related to Pakistani apparel organizations highlights a lack of coordination between yarn/fabric suppliers and apparel manufacturers in Pakistan. Yarn/Fabric manufacturers operate in mainly technology and capital intensive industry having variety and large number of buyers including apparel

manufacturers, towel makers, home textile manufacturers, local & foreign fabric buyers and more importantly some of them run their own outlets. Besides that, in majority of the cases fabric vendors are directly pre-qualified by the retailers or brands…. leaving a very little motivation for fabric vendors to develop a close and direct relationship with apparel manufacturers. This business setting has developed an implied hierarchy of power, beginning from the top including the affluent retailers & brands and swirling down to fabric vendors and apparel manufacturers respectively. As a result, some large knits and denim garment manufacturers have developed their own fabric processing units to gain collaboration. Caridi (2013) notes that such collaboration improves visibility, facilitates flexibility, speed and innovation.

Training and Development

Unskilled contractual workforce and poorly educated managerial staff are considered prime hindrance in improving the performance of labour-intensive the AMEOs. Saxena, and Salze-Lozac'h, (2010) in relation to the apparel manufacturing unit in a developing nation state that apparel organizations need to improve their productivity by providing training to both managers and line workers in latest engineering techniques and technology. However according to both survey and literature review, training and development initiative in the organizations is considered as a burden in the apparel manufacturing organizations in developing nations and never taken seriously when it comes to developing improvement strategies in apparel manufacturing organizations.

Fawcett, Magnan, and McCarter (2008) in the same regard observe that, organizations gladly invest on technology and associated systems however, they ignore to invest in their human capital necessary for innovation and optimization of the decisions. Describing the prevailing situation in apparel manufacturing organizations in Pakistan, Chaudhry and Faran (2015) report that to counter lack of training programs workers resort to develop multiple skills mainly through on-job informal training.

Technology

In comparison to the survey, literature review raised this factor as an important one to improve supply chain performance of apparel manufacturing organizations. It can be observed from the analysis of both above stated studies, that although textile mills (Fabric producers) are no short of latest technologies, apparel organizations still need to realize the importance of technology in decision-making, production process, inspection, communication, storage and handling of apparel products. Similarly, as noticed in survey the reliance on technology between some vertical units & apparel only manufacturers was quite noticeable. Unlike vertical units, apparel only manufacturers in Pakistan have a lesser reliance on technology in terms of fabric inspection, cutting, trimming, and stitching. However, Hamid, Nabi, and Zafar (2014) note that some large woven apparel organizations have invested in advanced washing systems especially for denim products.

In current business settings supply chains are spread globally and demand excessive visibility, however such visibility is not possible without the effective use of information and communication technologies such as RFID systems (Caridi, 2013). Wu, Yeniyurt, Kim, and Cavusgil (2006) while referring to the benefits of such technologies in managing supply chain process, note that information technology can help enhance supply chain agility, decrease cycletime, ensure timely delivery and attain improved efficiency. Taplin, (2014) for instance note that Wal-Mart requires its suppliers to equip

themselves with information technologies for exchanging production and sales data for responding to demand uncertainty. In addition to that, Hamid, Nabi, and Zafar (2014) note that besides using information technology to improve production planning, management and order tracking mechanism some organizations are using IT for letting foreign buyers monitor factory operations via video link for ensuring compliance on real-time basis. Describing the challenges to adopt technology in apparel manufacturing units in Pakistan, Chaudhry and Faran, (2015) note that when it comes to adopt a new technology, piece-rate system causes workers to resist innovation as their productivity slow down resulting in lesser wages. Management need to adopt different strategy to compensate employees and smooth adoption of technology during learning period.

Conclusion

From apparel supply chain perspective, the nature of apparel market is an amalgamation of both lean and agile namely referred as leagile. Apparel manufacturers producing basic to fashion oriented garments serve both cost-sensitive retailers such as Walmart, Tesco, and fast-fashion differentiation oriented and time-sensitive brands such as H&M, Primark, and Zara. Thus, Rahiminezhad Galankashi, & Helmi (2016) and Bruce et al. (2004) stress that the AMEOs striving to improve their performance need to be more leagile rather than being merely lean or agile.

Leagile approach ensures short leadtime, lower costs and better customer service (Singh, & Pandey, 2015). However, becoming a leagile apparel manufacturer & exporter in a complex SC environment is not an easy task. To exploit global market opportunities in a leagile environment, apparel manufacturing organizations need to resynchronize their resources and processes to offer competitive price and resilience to withstand demand fluctuation. Thus, understanding of the factors such as planning, collaboration, training and technology, affecting leagile environment is quite important for improving supply chain performance of AMEOs operating in developing nations.

The proposed model intends to assist researchers and management of global apparel organizations at various levels of supply chain in understanding the dynamics of the factors affecting the SC performance of AMEOs particularly in leagile environment. This study further intends to expand to other factors critical for developing a comprehensive model necessary for improving the SC performance of AMEOs in Pakistan.

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