

IDENTIFYING BARRIERS FOR IMPLEMENTING GREEN SUPPLY CHAIN MANAGEMENT (GSCM) IN FOOTWEAR INDUSTRY OF BANGLADESH: A DELPHI STUDY APPROACH

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ABSTRACT. The footwear industry is the second largest export earning sector of Bangladesh, contributing to earning \$1.234 billion in 2016-17. Despite its ample opportunity to value addition to national economy, the sector faces enormous image crisis at home and abroad because of non-existent green practices in the supply chain. The tenet of Green Supply Chain Management (GSCM) practices is to diminish or obviate wastages, greenhouse gas emission, and energy consumption and promotes reuse, recycle, remanufacture and reverse logistics. The study was designed to identify the barriers for implementing Green Supply Chain Management (GSCM) practices in Footwear Industry of Bangladesh. A two round Delphi study approach was conducted from five industrial experts and five academic experts to identify the common barriers. The study identified twenty two barriers whereas the lack of commitment of management is the paramount. Financial constraint, lack of energy management & wastage management as well as lack of source of eco-friendly materials are the second most important barriers. The internal barriers and regulations & awareness barriers were classified as the top source and features barriers respectively. The study result may provide insight to the management in formulating strategies and tactics to implement green practices in footwear industry for sustainability. **KEY WORDS:** barrier, GSCM, footwear industry, Bangladesh, Delphi

IDENTIFICAREA BARIERELOR PENTRU PUNEREA ÎN APLICARE A GESTIONĂRII LANȚULUI DE APROVIZIONARE ECOLOGICĂ (GSCM) ÎN INDUSTRIA DE ÎNCĂLȚĂMINTE DIN BANGLADESH: ABORDARE UTILIZÂND METODA DELPHI

REZUMAT. Industria de încălțăminte este cel de-al doilea sector ca mărime la nivelul veniturilor din exporturi din Bangladesh, contribuind la venituri de 1,234 miliarde de dolari în perioada 2016-2017. În ciuda oportunităților sale ample de a aduce valoare adăugată economiei naționale, sectorul se confruntă cu o criză imensă a imaginii în țară și în străinătate din cauza lipsei de practici ecologice în lanțul de aprovizionare. Principiul practicilor de gestionare a lanțului de aprovizionare ecologică (GSCM) este de a diminua sau de a evita pierderile, emisiile de gaze cu efect de seră și consumul de energie, promovând reutilizarea, reciclarea, recondiționarea și logistica inversă. Studiul a fost conceput pentru a identifica barierele în calea implementării practicilor de gestionare a lanțului de aprovizionare ecologică (GSCM) în industria de încălțăminte din Bangladesh. S-a realizat un studiu pe baza metodei Delphi în două etape, condus de cinci specialiști din industrie și cinci specialiști academici pentru a identifica barierele comune. Studiul a identificat douăzeci și două de bariere, dintre care lipsa angajamentului conducerii este cea mai importantă. Constrângerile financiare, lipsa gestionării energiei și gestionarea deșeurilor, precum și lipsa sursei de materiale ecologice sunt barierele de pe locul doi ca importanță. Barierele interne și cele privind reglementările și conștientizarea au fost clasificate drept sursa principală a acestora. Rezultatul studiului poate oferi managerilor o perspectivă referitoare la formularea de strategii și tactici pentru punerea în aplicare a practicilor ecologice în industria de încălțăminte pentru dezvoltarea sustenabilității. **CUVINTE CHEIE:** barieră, GSCM, industria de încălțăminte, Bangladesh, Delphi

IDENTIFICATION DES OBSTACLES À LA MISE EN ŒUVRE DE LA GESTION DE LA CHAÎNE D'APPROVISIONNEMENT ÉCOLOGIQUE (GSCM) DANS L'INDUSTRIE DE LA CHAUSSURE AU BANGLADESH: UNE APPROCHE DE LA MÉTHODE DELPHI

RÉSUMÉ. L'industrie de la chaussure au Bangladesh est le deuxième secteur en ce qui concerne les gains à l'exportation, ayant une contribution de 1.234 milliards de dollars pendant 2016-2017. En dépit de ses nombreuses possibilités d'apporter une valeur ajoutée à l'économie nationale, le secteur fait face à une énorme crise d'image dans le pays et à l'étranger en raison du manque de pratiques environnementales dans la chaîne d'approvisionnement. Le principe des pratiques chaîne d'approvisionnement gestion écologique (GSCM) est de réduire ou d'éviter les pertes, les émissions de gaz à effet de serre et la consommation d'énergie, et de promouvoir la réutilisation, le recyclage, la rénovation et la logistique inverse. L'étude a été conçue pour identifier les obstacles à la mise en œuvre des pratiques de gestion de la chaîne d'approvisionnement écologique (GSCM) dans l'industrie de la chaussure au Bangladesh. On a approché la méthode Delphi en deux étapes, conduite par cinq experts de l'industrie et cinq experts universitaires pour identifier les obstacles communs. L'étude a identifié vingt-deux obstacles, notamment le manque d'engagement de la direction est le plus important. Les contraintes financières, le manque de la gestion d'énergie et la gestion des déchets, le manque de la source de matières écologiques sont les obstacles seconde en importance. Les obstacles internes et les obstacles concernant les règlements et la sensibilisation ont été considérés comme leur principale source. La conclusion de l'étude peut donner aux directeurs un aperçu quant à la formulation des stratégies et des tactiques pour mettre en œuvre des pratiques respectueuses de l'environnement dans l'industrie de la chaussure pour le développement durable. **MOTS CLÉS:** obstacle, GSCM, industrie de la chaussure, Bangladesh, Delphi

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INTRODUCTION

The leather and footwear industries are playing a pivotal role in Bangladesh export earnings where each of these industries are largely interrelated with each other. The leather industry is the second largest export earning sector of Bangladesh. According to Export promotion Bureau (EPB) in 2017-18 it has reached 709.51 million USD, which is 34.26 million USD less from the previous year, with a negative growth rate of 4.61%. The overall leather industry is classified into three broad categories such as finished leather, leather products, and footwear. In these three categories, only footwear industry is showing a positive growth rate with export earnings of 357.98 million USD, which is 22.12 million USD higher than the same period of the previous year. The non-leather footwear industry is also showing an upward trend with export earnings of 150.14 million USD and growth rate 7.26% accordingly. Experts are claiming that due to lack of environmental sustainable practices, the industry is facing problems to export market. Bangladesh has a great opportunity to grasp the international leather-footwear market where it is contributing less than 1% at present. So, sustainable manufacturing practice and green

supply chain management are gaining crucial factors for this industry's survival and uplifting.

Rapid industrialization with the help of high technology influenced the higher energy consumption and more utilization of resources in order to satisfy human needs that are increasing total supply chain activities. These activities are major significant factors in the depletion of natural resources, arousing climatic problems, more waste generation, emission of harmful gases, and breaking down the ecosystem. GSCM is the sustainable environmental practice whose mantra is to overcome environmental disruption, it corroborates environmental management principles with supply chain activities in order to either improve the environmental performance or to preserve the natural ecosystem with efficient use of natural resources. Therefore, GSCM is an important and emerging 21st century trend among all industrial activities; competitive regulatory and community pressures address these serious environmental issues by greening their supply chains, controlling waste in all forms comprising energy emissions, chemical, hazardous substances, and solid waste in the supply chain [1].

$$\begin{aligned} & \text{Green Supply Chain Management (GSCM)} \\ & = \text{Green Purchasing} + \text{Green Manufacturing/Materials Management} \\ & \quad + \text{Green Distribution/Marketing} + \text{Reverse Logistics [1]} \end{aligned} \quad (1)$$

Equation 1 shows this GSCM equation graphically, where reverse logistics "closes the loop" of a generic forward supply chain and comprises reuse, remanufacturing, and/or recycling of materials into new materials or other products creating value to the market. The main aim is to eliminate or optimize waste (energy, resources, emissions of chemicals and hazardous substances and solid wastes).

GSCM is a structured closed loop approach to upgrade performance of the products and operations/processes paying special attention to the requirements of the environmental regulations predefined by legislation and focuses at limiting the wastes within the industrial system so that energy resources are optimally preserved and hinder the dissemination of detrimental materials into the environment, comprising all

aspects of product's life cycle which covers the design phase, manufacturing phase and the distribution phase to the end users of the product including reuse, recycle, recovery and also its final disposal. The focal point of GSCM tends to be integrated and ecologically optimized, while traditional SCM that focuses more on the final product without considering human toxicological effect and environmental disruptions [2]. As day proceeds global manufacturing systems are upgrading, rapidly changing and environment and social issues are becoming more important as well as compulsory in managing any business [3]. That is why, nowadays it is very important to implement green supply chain practices for any kind of industry. At present, Bangladeshi government is paying more focus on successful tannery relocation with Effluent treatment plant

(ETP) and providing cash incentive for leather & footwear export in order to uplift this industry. So it is the right time to implement green supply chain practices to attract international buyers and preserve the ecosystem. The main aim of this research work was to identify the common barriers for implementing GSCM practices in footwear industry of Bangladesh through two round Delphi study with the help of industrial and academic experts.

LITERATURE REVIEW: BARRIERS OF GSCM

Green supply chain management is a paradigm to new industrial sustainability both in terms of environment related problems and efficiency. The aim of GSCM is to consume the energy and resources effectively for making environment friendly supply chain while reducing the impact at each stage with a strategy for meeting the challenge to minimize carbon emission and enhance sustainability followed by green purchasing, green manufacturing, green packing, green distribution and marketing [2]. GSCM is duly defined as “integrating environmental thinking into supply chain management, includes product design, material sourcing and selection, manufacturing process,

delivery of the final product to the consumers as well as end-of-life management of the product after its useful life” [4].

There are many barriers that are responsible for implementing GSCM in different industries. Many articles were observed in order to get a comprehensive idea about the considered most frequent barriers. The identified barriers are listed such as commitment from top management, lack of govt. rules & regulations, lack of knowledge on sustainability, society’s awareness on Environment, nature of raw materials, buyers outsourcing strategy, market competition & uncertainty, lack of training on GSCM, financial constraint, interest in investment, lack of acceptance of new technology, lack of energy management & waste management, lack of integration of IT system, customer unawareness towards GSCM, lack of availability of skilled human resource, poor supplier commitment, lack of experience, poor organizational culture in implementing GSCM and lack of poor transport & logistics system. On the other hand, there are several factors which are involved during footwear purchasing such as style, comfort, price, colour, upper materials, outsole materials that may have also a significant effect on GSCM practice [5].

Table 1: Enlistment of barriers of GSCM observed from different articles

| S. No. | Listing of barriers | Resources |
|--------|--|---------------------------|
| 1 | Lack of commitment from top management | [6,7,8,9,10,11,12,13] |
| 2 | Lack of govt. rules and regulations | [4,7,10,11,15,16] |
| 3 | Lack of knowledge and experience | [4,7,10,11,13,17] |
| 4 | Market competition and uncertainty | [11,18,19,20,21] |
| 5 | Lack of training on GSCM | [7,17,22,23] |
| 6 | Financial constraint | [3,7,11,15,17,24,25,26] |
| 7 | Lack of acceptance of new technology | [6,7,9,15,17,27,28,29,30] |
| 8 | Lack of energy management and waste management | [9,12,31] |
| 9 | Lack of integration of IT system | [6,7,9,17,32] |
| 10 | Customer interest towards GSCM | [7,11,13,22,32] |
| 11 | Lack of availability of skilled human resource | [7,8,10,17] |
| 12 | Poor supplier commitment | [4,7,8,11,22] |
| 13 | Poor organizational culture in implementing GSCM | [18,19,33,34] |
| 14 | Lack of management initiatives for transport and logistics | [9,12] |

Recently a research study revealed the most critical success factors in implementing GSCM practices in footwear industry which are

support & commitment of top management, customer awareness, long-term economic benefit, govt. legislation towards GSCM

implementation, SC members' awareness and literacy, involvement of suppliers in green practice, global competitiveness, pressure from NGOs and society, encouragement to technology advancement, organizational policy supporting GSCM [34]; support and commitment of top management was identified as the most important driver in greening the SC of leather footwear industry [34]. To the best of our knowledge there was no Delphi study approach to identify the barriers of GSCM in Bangladeshi footwear study. Moreover, since experts' opinion may differ from one to another, this study will surely contribute a lot to identifying the probable

barriers which will contribute to controlling the barriers.

COMPONENTS OF GREEN SUPPLY CHAIN MANAGEMENT

Green procurement, Green design and Manufacturing and Green Distribution and Reverse Logistics are the generic components of GSCM as mentioned Figure 1 [35]. This figure represents a single organization's internal supply chain, its major operational elements and the relation to external organizations.

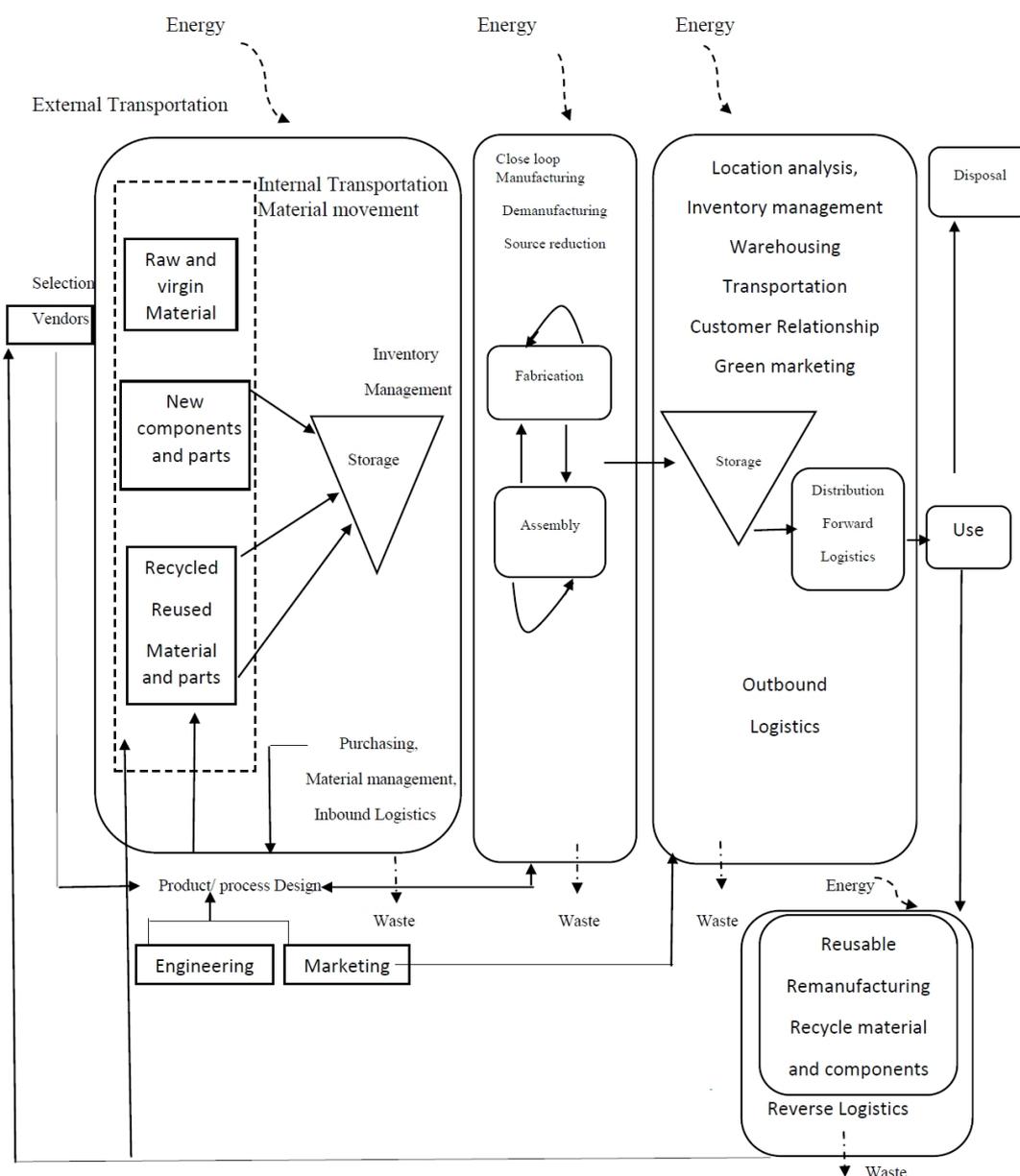


Figure 1. Processes involved in green supply chain management [35]

Green Procurement

Green procurement can be termed as a set of approaches followed by an organization to select suppliers who are maintaining eco-friendly methods and environmental legislations when manufacturing practices. The focus of it is to reduce the source of wastage, expedite recycling, reuse and reduce the uses of resources, and searching alternative eco-materials [36].

Design for Environment (DFE) – Green Design

DFE is a systematic and structured approach where environmental impact of a product is considered through its entire life cycle at the time of designing a product. Green designing is a very important factor in GSCM which intends to develop more environmentally amiable products and processes. The ultimate goal of green design is to diminish the damage in the whole designing process [7].

Green Manufacturing

Green manufacturing is an integration of multidisciplinary approach which focuses on reducing energy consumption and material used by using green energy, developing and selling green products and incorporating green processes in the business operations [37]. Remanufacturing is a vital element of GSCM practices which comprises three phases: collection, remanufacturing and redistribution processes of returning a used product to like-new condition with a warranty to match [36].

Green Marketing

Nowadays green marketing has gained a paramount importance to the consumers as a part of environmental awareness. The green consumers are those who avoid any product which may harm any living organism, cause disruption to the natural eco-system at any phases of the product. Green product can be used for several reasons, comprising manufactured through a green way or products when consumed for a greener way of life.

Green Distribution and Reverse logistics

Green distribution system consists of green packaging and green logistics. Packaging features have an impact on distribution; better

packages help to rearrange the loading patterns can minimize the material usage and increase the warehouse space efficiency and minimize the double handling [38]. The reverse supply chain demonstrates the activities of recycling, remanufacturing, reclamation and reverse logistics which are inter-related to the closed supply chain loop as depicted in Figure 1.

RESEARCH METHODOLOGY

‘Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem. To accomplish this “structured communication” the following is provided: some feedback of individual contributions of information and knowledge; some assessment of the group judgment or view; some opportunity for individuals to revise views; and some degree of anonymity for the individual responses’ [39]. In this method, a group of experts exchange views and each independently provides their feedbacks and assumptions to a facilitator who reviews the data and issues a summary report. The group members discuss and review the summary report, and give updated forecasts to the facilitator, who again reviews the material and issues a second report. This process continues until all participants reach a consensus. The experts at each round have a full record of what forecasts other experts have made, but anonymity does not permit to know who made which forecast. This method allows the experts to express their opinions freely.

Table 2: Composition of Delphi panels

| Round | Respondents | |
|-------|--------------|------------|
| | Academicians | Industrial |
| 1 | 5 | 5 |
| 2 | 5 | 5 |
| Total | 10 | 10 |

In this research work five academic and five industrial experts were selected for the survey round. There were some minimum requirements to select the expert panels. The academic experts were selected who have had a teaching career on footwear supply chain

management more than 5 years and industrial experts were also chosen who have more than 5 years experience in supply chain and logistics management at reputed footwear companies. The survey was carried out in two phases whereas some frequently identified barriers of GSCM for any industry from thorough literature review; data were supplied to the expert panel in order to provide a score according to Likert scale rating system with an additional scope to introduce new barrier.

Table 3: Likert scale ranking system

| | |
|-------------------------------------|---|
| Strongly disagree | 1 |
| Disagree | 2 |
| Neither agree or disagree (Neutral) | 3 |
| Agree | 4 |
| Strongly agree | 5 |

A total of fourteen barriers were identified from literature review that were enlisted in the survey format and another option was there to add extra barriers conceived by the experts. In the second phase all barriers were subdivided into different categories such as internal and external barriers based on their sources. Again all identified twenty two barriers were fragmented into regulations & awareness barriers, financial barriers, technology & expertise barriers, product barriers and others based on features of barriers in order to know the most probable sources of barriers which will aid to identify and

control the barriers with the help of pie chart, bar chart, Pareto diagram along with statistical analysis.

RESULTS AND DISCUSSION

At the first phase of the survey total 14 barriers were supplied to the expert panels, identified from literature review to make a score as per Likert scale ranking system with an additional option to add new barriers whereas additional 8 barriers were found from the experts. From Table 4, it is seen that lack of commitment from top management was identified as the most important barrier. But there is a significant difference of mean value between academic and industrial experts in case of B1 and B13 barriers whereas industrial experts are giving them comparatively less importance than academic experts. We have found extra eight barriers from this study such as Lack of source of eco-friendly materials (B4), Nature of raw materials (B8), Society’s awareness on Environment (B12), Interest in investment (B13), Type of footwear manufactured in Bangladesh (B16), Lack of global value chain integration (B17), Buyers outsourcing strategy (B20) and Sea port congestion (B22) as mentioned in Table 4. The industrial experts are demanding sea port congestion (B22) as a barrier to GSCM whereas academic experts are giving it less importance comparatively.

Table 4: Enlisted total 22 barriers with Likert scale scoring from the final round of the study

| ID. NO. | Barriers list | Academic Panel | Industrial panel | Combined mean | M1-M2 | Grand total score |
|---------|--|----------------|------------------|---------------|-------|-------------------|
| | | Mean (M1) | Mean (M2) | | | |
| B1 | Lack of commitment from top management | 5 | 4.4 | 4.7 | 0.6 | 47 |
| B2 | Financial constraint | 4.4 | 4.6 | 4.5 | 0.2 | 45 |
| B3 | Lack of energy management and waste management | 4.6 | 4.4 | 4.5 | 0.2 | 45 |
| B4 | Lack of source of eco-friendly materials | 4.6 | 4.4 | 4.5 | 0.2 | 45 |
| B5 | Customer interest to buy GSCM sourced goods | 4.4 | 4.2 | 4.3 | 0.2 | 43 |
| B6 | Lack of govt. rules and regulations | 4.4 | 4 | 4.2 | 0.4 | 42 |
| B7 | Lack of training on GSCM | 4.2 | 4.2 | 4.2 | 0 | 42 |

| | | | | | | |
|-----|--|-----|-----|-----|-----|----|
| B8 | Nature of raw materials | 4.2 | 4 | 4.1 | 0.2 | 41 |
| B9 | Poor supplier commitment | 3.8 | 4.2 | 4 | 0.4 | 40 |
| B10 | Poor organizational culture in implementing GSCM | 4.2 | 3.8 | 4 | 0.4 | 40 |
| B11 | Lack of management initiatives for transport and logistics | 3.8 | 4 | 3.9 | 0.2 | 39 |
| B12 | Society's awareness on Environment | 3.8 | 4 | 3.9 | 0.2 | 39 |
| B13 | Interest in investment | 4.2 | 3.6 | 3.9 | 0.6 | 39 |
| B14 | Market competition and uncertainty | 3.6 | 4 | 3.8 | 0.4 | 38 |
| B15 | Lack of acceptance of new technology | 3.8 | 3.8 | 3.8 | 0 | 38 |
| B16 | Type of footwear manufactured in Bangladesh | 3.8 | 3.8 | 3.8 | 0 | 38 |
| B17 | Lack of global value chain integration | 3.8 | 3.6 | 3.7 | 0.2 | 37 |
| B18 | Lack of knowledge and experience | 3.6 | 3.6 | 3.6 | 0 | 36 |
| B19 | Lack of integration of IT system | 3.8 | 3.4 | 3.6 | 0.4 | 36 |
| B20 | Buyers outsourcing strategy | 3.6 | 3.6 | 3.6 | 0 | 36 |
| B21 | Lack of availability of skilled human resource | 3.4 | 3.2 | 3.3 | 0.2 | 33 |
| B22 | Sea port congestion | 2.8 | 3.8 | 3.3 | 1 | 33 |

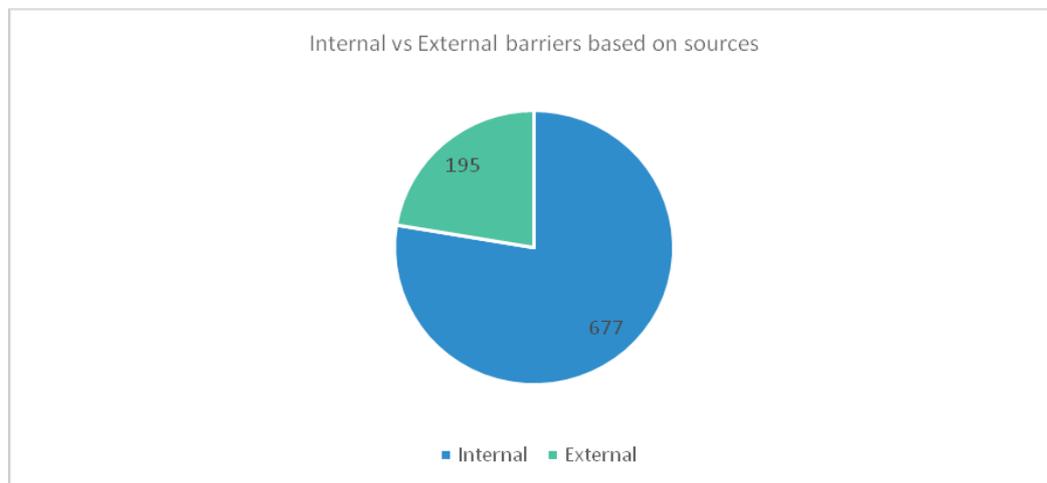


Figure 2. Internal & External barriers score comparison obtained from Likert scale

All barriers were classified as internal and external based on their sources from the supply chain. The barriers which are related directly with the manufacturer and supplier end, were termed as internal barriers and the barriers which are out of control of manufacturer and supplier were termed as external barriers. Total seventeen

internal barriers were identified as B1, B2, B3, B4, B7, B8, B9, B10, B11, B13, B15, B16, B17, B18, B19 and B20. On the other hand, B5, B6, B12, B14, B22 were identified as external barriers. So it can be concluded that manufacturer and supplier are mostly responsible for maximum barriers of GSCM.

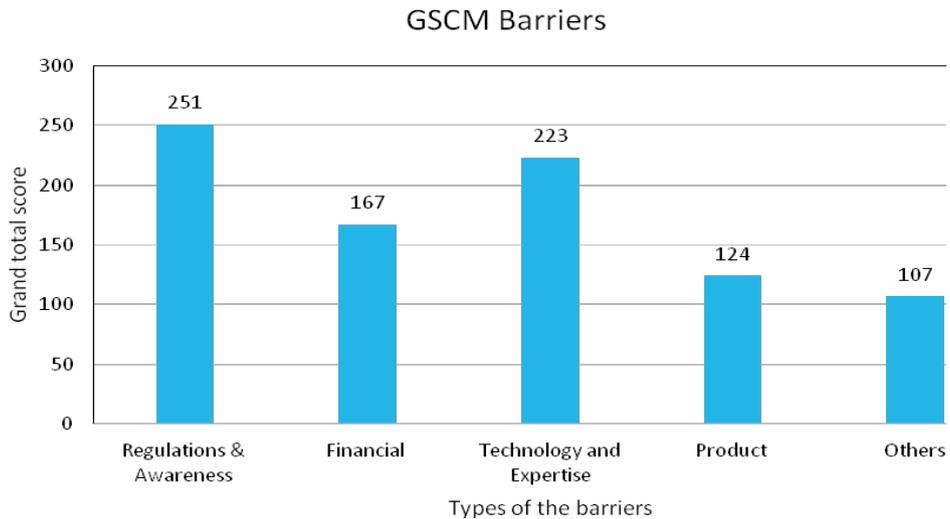


Figure 3. Score of five classified barriers of GSCM based on features

Then total barriers were also classified into five categories based on their features. These are Regulations & Awareness barriers (B1, B5, B6, B9, B10, B12), Financial barriers (B2, B3, B13, B15), Technology and Expertise barriers (B7, B11, B17, B18, B19, B21), Product barriers (B4, B8, B16) and Others (B14, B20, B22). From the Figure 3, it is observed that Regulations and Awareness barriers are the first hindrance to implement GSCM, then Technology and Expertise Barrier, Financial barriers, Product barriers and others

respectively. In this research product barrier came to light as a new barrier as it was not found in any previous literature. Footwear is mainly produced from leather and synthetic materials and various chemicals are also involved in manufacturing a pair of footwear. Since these components and chemicals are mostly have a significant environmental impact, it is very necessary to find eco-friendly materials and chemicals.

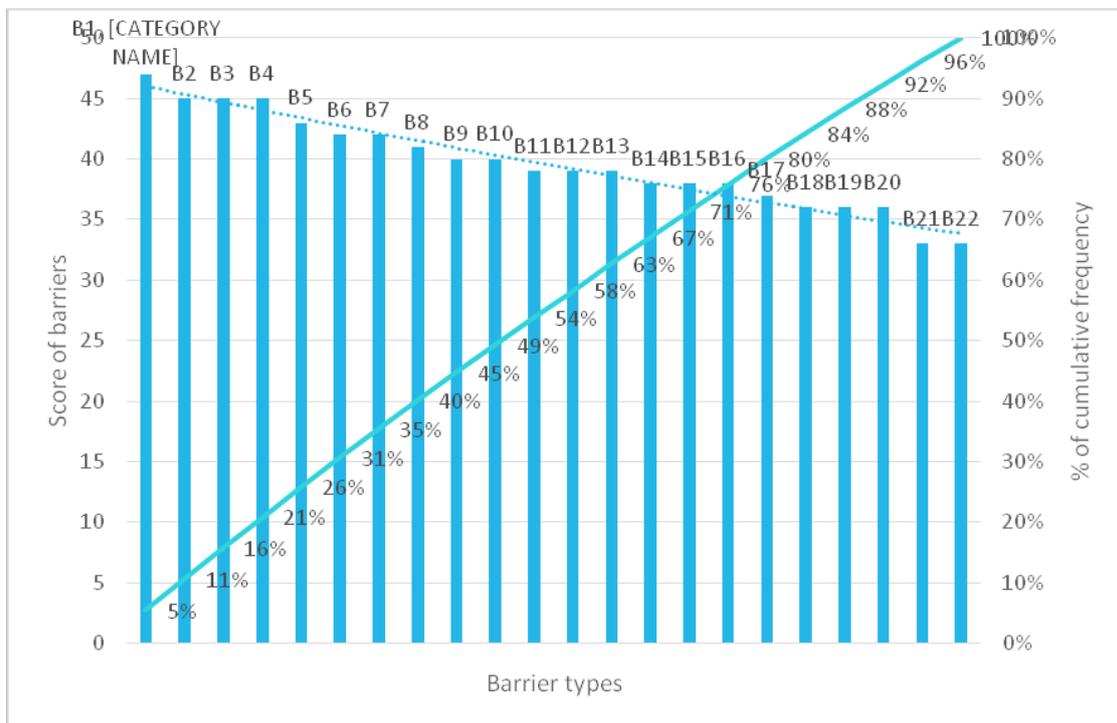


Figure 4. Pareto diagram for barrier (B1 to B22) analysis

In order to find the barriers' contribution to the total impact, Pareto analysis was carried out which is generally known as the 80/20 principle. It is observed from the Figure 4 that there is a straight linear relationship between

the cumulative score and first 18 barriers (B1 to B18) were responsible for 80% impact. So it can be summarized that all of the individual barriers have a significant impact towards GSCM.

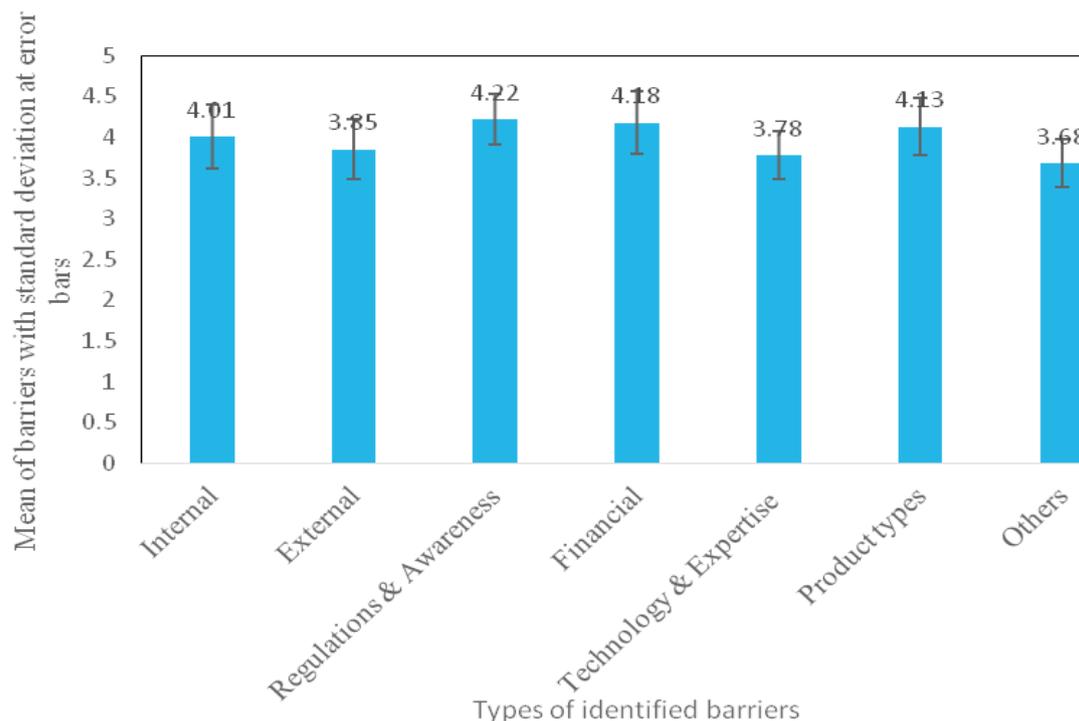


Figure 5. Mean and standard deviation of total classified barriers

Regulations and awareness barriers such as Lack of commitment from top management (B1), Customer interest to buy GSCM sourced goods (B5), Lack of govt. rules and regulations (B6), Poor supplier commitment (B9), Poor organizational culture in implementing GSCM (B10) and Society's awareness on Environment (B12) were identified as the most crucial factors for implementing green supply chain management.

CONCLUSION

It has gained a burning issue to implement GSCM practices to get competitive advantages in export market as well as domestic market for Bangladeshi footwear industry. Top management, monitoring of govt. rules & regulations, raising awareness through green marketing may play a pivotal role in case of GSCM implementation. All of these identified twenty two barriers are not the impediments for all factories. The top management of factories

should investigate their present conditions and find out their probable barriers and its effect and relationship towards other barriers. Then applying a PDCA (Plan, Do, Check and Act) cycle, the barriers may be controlled. The relationship among the barriers were not identified in this study which may be investigated in a future study. Since the Delphi study is highly based on the experts' decisions, the results may vary from one to other industrial experts. It would be more effective, if we could manage more experts' opinions. GSCM tools identification and its performance measurement system may be investigated in the future research.

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