ANALYSING LARG SUPPLY CHAIN MANAGEMENT COMPETITIVE STRATEGIES IN IRANIAN CEMENT INDUSTRIES

Gholamreza Jamali, Elham Karimi Asl, Sarfaraz Hashemkhani Zolfani, Jonas Šaparauskas

Introduction

Supply chain refers to the complex network of relationships that organizations maintain with trading partners in order to procure manufacture and deliver products to services (Maleki & Cruz-Machado, 2013). From the supply chain as a network is expected to provide the right products and services on time with the required specifications at the right place to the customer.

In order to establish a strategic direction, planning for available and future opportunities requires a complete analysis of the whole chain. Today's dynamic and very variable, companies need to design and adopt their supply chain strategies that can assist them in improving their performance increased. Therefore, supply chain management (SCM) is considered a strategic factor for the better attainment of organizational goals such as enhanced competitiveness, improved customer service and increased profitability (Cabral et al., 2011b). Recently, the Lean, Agile, Resilient and Green (LARG) SCM paradigms had been adopted to improve the SC performance (Cabral et al., 2011b). In the other hand, in dynamic and changing markets, supply chain sustainability requires tools that can overcome environmental challenges and should be able to identify strengths, weaknesses, opportunities and threats in such competitive markets. The purpose of this article is to analyse LARG SCM competitive strategies in Iranian cement industries. These competitive strategies include Lean, Agile, Resilient, and Green (LARG) that could be implemented simultaneously.

1. LARG SCM Strategies

SCM is a value chain management from the supplier of a supplier to the customer of a customer of a company with the aim of attaining an overall value. Lean, Agile, Resilient and Green are now at the forefront in management methods and SCM (Espadinha–Cruz et al., 2011). The trade-offs between this managerial paradigms (LARG) are actual issues and may help supply chains to become more efficient, streamlined and sustainable. In a lean supply chain, profits maximize through cost reduction, while an agile supply chain maximizes profits through providing exactly what the customer requires (Carvalho et al., 2011). Lean focused on process improvements through the reduction or elimination of all "wastes" i.e., non-value adding operations, it embraces all the process through the product life cycle, starting with the product design to the product selling, from the customer order to the delivery. The agile supply chain paradigm intends to create the ability to quick respond and cost effectively to unpredictable changes in markets and increasing levels of environmental turbulence, both in terms of volume and variety. In the resilient supply chain may not be the lowest cost, but it is more capable of coping with the uncertain business environment. Also, environmental practices must be addressed to assure that the management system is sustainable (Carvalho et al., 2011).

Much has been written focusing on a single or integration a couple paradigms in SCM (Naylor et al., 1999; Christopher & Rutherford, 2004; Kleindorfer & Saad, 2005; Vonderembse et al., 2006; Kainuma & Tawara, 2006; Rosič et al., 2009). However, it seems that integration of lean, agile, resilient, and green paradigms in a SCM may help supply chains to become more efficient, streamlined, and sustainable (Carvalho et al., 2011).

Organizations must implement a set of LARG practices that will have impact in the SC's competitiveness; the choice of which LARG practices are adequate is a complex problem to managers in the SC. It is important

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Tab. 1: Some of the studies related to the practices of LARG SCM

LARG SCM Practices	Strategy	Reference
Supplier relationships	Lean/Agile	Anand & Kodali, 2008; Gurumurthy & Kodal, 2009; Espadinha-Cruz et al., 2011; Azevedo et al., 2011
Responsiveness improving speed to change market needs	Agile	Swafford et al., 2008; Carvalho et al., 2011; Azevedo et al., 2013
Using total productive maintenance system (TPM)	Lean	Anand & Kodal, 2008; Gurumurthy & Kodal, 2009; Modi & Thakkar, 2014; Bortolotti et al., 2015
Processes standardization	Lean	Anand & Kodal, 2008; Gurumurthy & Kodal, 2009, Barac et al., 2010
Energy consumption	Green	Gonzalez et al., 2008; Holt & Ghobadian, 2009; Aksoy et al., 2014 Ahi et al., 2016
Environmental waste	Green	Paulraj, 2009; Carvalho & Cruz-Machado, 2011
Filters and control for emission and discharges	Green	Gonzalez et al., 2008;
Suppliers' ISO14000 certification	Green	Holt & Ghobadian, 2009; Hu & Hsu, 2010
Supply chain risk management	Resilience	Carvalho et al., 2012; Wildgoose 2016;
To use 3PL for transportations	Resilience	Anand & Kodali, 2008; Jayaram & Tan, 2010
New product development (NPD)	Lean/Agile/ Resilience	Carvalho & Cruz-Machado, 2011; Hasan et al., 2014

Source: authors

to analyse how interoperable they are in order to guarantee successful deployment (Cabral et al., 2011a). Some of the most important studies related to the LARG SCM practices are summarized in Tab. 1.

In addition to the factors identified in the literature review, based on the 21 cement experts' opinions, 13 factors were scanned and selected using Delphi method (DM). Delphi is a decision making technique based on judgments of experts that concentrate on a special issue (Dalkey & Helmer, 1963) for analysing, evaluating and finally forecasting the solution (Coates, 1974). It also called 'expert evaluation method' or 'expert grading method' and supposes that several experts are more unlikely to make a wrong decision rather than an expert over an issue (Hasson et al., 2000). It is also defined as ''allowing a group of individuals, as a whole, to deal with a complex problem while avoiding their direct confrontation and retaining their interactions" (Linstone & Turoff, 1975). DM applies procedure for developing a manageable strategy collecting scores for all factors in the strategy formulation so that the experts integrate their opinions, give feedback, and modify the score. This process is repeated until a satisfactory view is reached by each expert (Wang, 2011). Tab. 2. summarizes LARG requirements of SCM in Iranian cement industries derived from the Delphi method.

2. Methodology

2.1 SWOT Analysis

Identifying opportunities and threats, strengths and weaknesses (SWOT), organizations can

Tab. 2: LARG requirements of SCM in Iranian cement industries derived from Delphi Method

Row	LARG SCM Practices
1	Operating profit and company's liquidity index
2	Cement grinding capacity comparison with production capacity of clinker
3	Suggestions system implementation
4	Lack of technology, advanced and modern machinery
5	Cement exports
6	Increasing international cement price
7	Investments in construction projects
8	The effect of economic sanctions
9	Government policy changes
10	Number of competitors local in the cement industry
11	Intensified competition in overseas markets
12	Costs of fuel and transportation
13	Orders size

Source: authors

develop strategies based on their strengths, weaknesses, gain maximum profit using opportunities and neutralize threats. Strengths and weaknesses are often internal to the organization, while opportunities and threats generally relate to external factors.

SWOT analysis is a powerful tool to aid decision-making and systematically analyzing the external and internal environment of an organization.

Generally, SWOT analysis works as a straightforward model that provides direction and serves as a basis for the development of marketing plans, accomplishing by assessing an organization's strengths (what an organization can do) and weaknesses (what an organization cannot do) in addition to opportunities (potential favorable conditions for an organization) and threats (potential unfavorable conditions for an organization) (Romero-Gutierrez et al., 2016).

Changes in weight of SWOT factors can cause changes in strategic priorities. It is important to use a method that measures the importance of each factor. This study offers a new method to prioritize the strategies including SO, ST, WO and WT using a decision making model (SWARA method). Generally, SWOT analysis does not provide complete measures and evaluations. However, it represents a basic reference for a valid strategy formulation. The main shortcoming of SWOT is that it provides only qualitative evaluations (Tavana et al., 2016). So, it seems we can overcome this problem through integrating SWOT analysis and SWARA technique.

2.2 Step-Wise Weight Assessment Ratio Analysis (SWARA)

One of the latest methods for evaluating criteria is SWARA which has been developing in different studies and applications since 2010 (Kersuliene et al., 2010). SWARA likes other MADM methods, is expert based and completely structured by experts' rules. Most other related MADM methods are based on pairwise comparisons like: AHP (Saaty, 1980), ANP (Saaty, 2001), FARE (Ginevicius, 2011) and BWM (Rezaei, 2015) but SWARA is completely different in this item.

SWARA method applied in different studies about decision making for expert and personnel selection (Kersuliene & Turskis, 2011; Hashemkhani Zolfani & Agha Banihashemi, 2014; Nabian, 2014); business issues (Hashemkhani Zolfani et al., 2013a); optimal alternative of mechanical longitudinal ventilation in tunnel pollutants (Hashemkhani Zolfani et al., 2013b); success factors of online games based on explorer (Hashemkhani Zolfani et al., 2013c); design of products

(Hashemkhani Zolfani et al., 2013d Stanujkic et al., 2015; Karabašević et al., 2015); Building Structures Based on Local Climate (Hashemkhani Zolfani & Zavadskas, 2013); machine tool selection (Aghdaie et al., 2013); prioritizing Sustainability Assessment Indicators of Energy System (Hashemkhani Zolfani & Saparauskas, 2013); investment for high-tech industries (Hashemkhani Zolfani & Bahrami, 2014); Evaluation of real-time intelligent sensors for structural health monitoring of bridges (Bitarafan et al., 2014); glasshouse locating (Haghnazar Kochaksaraei et al., 2015); Planning the priority of high tech industries (Ghorshi Nezhad et al., 2015); Technology Foresight about R&D Projects Selection (Hashemkhani et al., 2015a); evaluation of strategies and scenarios (Hashemkhani Zolfani et al., 2015b; Hashemkhani Zolfani et al., 2016); Green supply chain management (Yazdani et al., 2016).

Mathematical part of SWARA is structured as the following: (Zavadskas et al., 2010; Yazdani et al., 2016).

***Step* 1** – Criteria ranked and sorted based on experts' attitudes.

***Step* 2** – From the second criterion, comparative importance of average value S_j should be done as follows: the relative importance of criterion j in relation to the previous (j – 1) criterion (Stanujkic et al., 2015).

***Step* 3** – Determine the coefficient k_j

$$k_j = \begin{cases} 1 & j = 1 \\ s_j + 1 & j > 1 \end{cases} \quad (1)$$

***Step* 4** – Determine the recalculated weight q_j

$$q_j = \begin{cases} 1 & j = 1 \\ \dfrac{k_{j-1}}{k_j} & j > 1 \end{cases} \quad (2)$$

***Step* 5** – Final step in calculating criteria' weights

$$w_j = \frac{q_j}{\sum_{k=1}^{n} q_j} \quad (3)$$

where w_j denotes the relative weight of criterion j.

3. Results

In this study, the following phases were used:

I) Designing external and internal factors matrix.
II) Analyzing SWOT matrix.
III) Positioning suitable strategy in the SPACE matrix.
IV) Designing Quantitative Strategic Planning Matrix (QSPM) and prioritization identified strategies.

3.1 Designing External and Internal Factors Matrix

The internal factors may be viewed as strengths or weaknesses depending upon their impact on the organization's objectives. What may represent strengths with respect to one objective may be weaknesses for another objective. A firm's strengths are its resources and capabilities that can be used as a basis for developing a competitive advantage. The absence of certain strengths may be viewed as a weakness. External environmental factors are normally outside our control, but can have a major impact on performance. It is important, therefore, that they are monitored and, where possible, forecast, and incorporated into strategic planning. As shown in Tab. 3., according to the internal factors (strengths and weaknesses) and external factors (opportunities and threats) weights for Iranian cement industries (derived from SWARA technique) and existing situation degree (based on experts opinion), existing situation weighted score for each factor have been calculated. So we can determine total weighted score for both internal and external factors.

3.2 Analyzing SWOT Matrix

One of the important purposes of SWOT analysis is to generate feasible alternative strategies. SWOT analysis shows the election possibility of four different strategies SO (Aggressive); WO (Conservative); WT (Defensive) and ST (Competitive) through a combination of internal factors and external factors matrix. However, in practice some of the strategies overlap with each other or simultaneously and harmoniously with each other and come into force. SWOT analysis for Iranian cement industries is shown in Tab. 4 according to the implementation of LARG SCM approach.

3.3 Positioning Suitable Strategy in the SPACE Matrix

Based on total scores of internal and external factors, we can evaluate Iranian cement

Tab. 3: Analysis of internal and external factors in Iranian cement industries

Strength	Weight	Existing Situation Degree	Existing Situation Weighted Score
Operating profit and company's liquidity index	0.085	3	0.255
Filters and control for emission and discharges	0.090	4	0.360
Using total productive maintenance system (TPM)	0.070	4	0.281
responsiveness improving speed to change market needs	0.090	3	0.269
Processes standardization	0.092	4	0.366
Cement grinding capacity comparison with production capacity of clinker	0.083	4	0.332
New product development	0.085	3	0.256
Suggestions system implementation	0.088	3	0.263
Total	**0.682**		**2.382**
Weakness			
Energy consumption	0.09	2	0.181
Environmental waste	0.10	1	0.095
Costs of fuel and transportation	0.04	1	0.042
Lack of technology, advanced and modern machinery	0.09	2	0.179
Total	**0.318**		**0.498**
Total weighted score	**1**		**2.880**
Opportunity			
Cement exports	0.103	4	0.410
Increasing international cement price	0.081	3	0.244
Investments in construction projects	0.092	2	0.184
Supplier relationships			
To use third-party logistics for transportations	0.105	1	0.105
Suppliers' ISO14000 certification	0.084	3	0.251
Total	**0.567**		**1.603**
Threat			
The effect of economic sanctions	0.049	1	0.049
Orders Size	0.042	1	0.058
Supply chain risk management	0.099	4	0.167
Government policy changes	0.058	3	0.296
Number of competitors local in the cement industry	0.093	2	0.186
Intensified competition in overseas markets	0.093	2	0.187
Total	**0.433**		**0.942**
Total weighted score	**1**		**2.545**

Source: authors

Tab. 4: SWOT matrix for Iranian cement industries – Part I

	Opportunity	Threat
	O_1: Cement exports	T_1: The effect of economic sanctions
	O_2: Increasing international cement price	T_2: Orders size
		T_3: Supply chain risk management
	O_3: Investments in construction projects	T_4: Government policy changes
	O_4: Supplier relationships	T_5: Number of local competitors in the cement industry
	O_5: To use third-party logistics for transportations	T_6: Intensified competition in overseas markets
	O_6: Suppliers' ISO14000 certification	
Strength	**SO (max-max)**	**ST (max-min)**
S_1: Operating profit and company's liquidity index	SO_1: Increase production capacity	ST_1: Costs reduction
S_2: Filters and control for emission and discharges	SO_2: Export markets development	ST_2: Continuous improvement in operational processes
S_3: Using total productive maintenance system (TPM)	SO_3: Develop new local markets	ST_3: Energy audit projects
S_4: responsiveness improving speed to change market needs	SO_4: Diversification in product	ST_4: Fuel switching from mazut to gas
S_5: Processes standardization		
S_6: Cement grinding capacity comparison with production capacity of clinker		ST_5: R & D development
S_7: New product development		
S_8: Suggestions system implementation		
Weakness	**WO (min-max)**	**WT (min-min)**
W_1: Energy consumption	WO_1: Study for development the waste fuel or alternative fuels unit	WT_1: Transportation operations outsourcing
W_2: Environmental waste		WT_2: Outsourcing required fuel and energy
W_3: Costs of fuel and transportation	WO_2: Development of distribution channels in neighbour provinces	WT_3: Eliminate all non-value added processes

Tab. 4: SWOT matrix for Iranian cement industries – Part II

Weakness	WO (min-max)	WT (min-min)
W_4: Lack of technology, advanced and modern machinery	WO_3: Customer orientation and customer relationship management (CRM)	WT_4: Reviews and improve organizational structures and operational processes
		WT_5: Improve cement industry holding activities according to the international standards in order to expand market share
		WT_6: Outsourcing non-major activities using strategic alliances

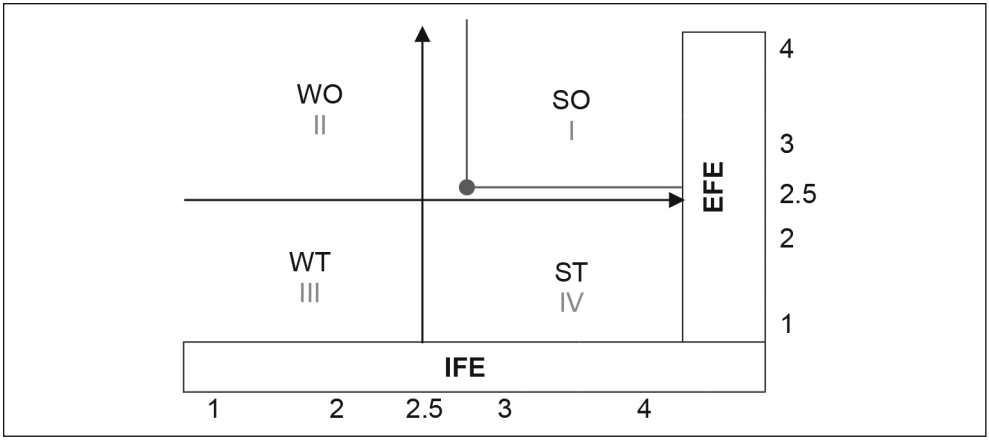
Source: authors

industries strategy position. So we use the Strategic Position and Action Evaluation Matrix (SPACE MATRIX) to select an appropriate strategy. In the SPACE matrix we assessed Iranian cement industries across four dimensions include: Industry Attractiveness (IA), Environmental Stability (ES), Competitive Advantage (CA) and Financial Strength (FS). The SPACE diagram showed favourable positions in all four dimensions. Based on the results (derived from Tab. 3), scores of the internal factors evaluation (IFE) and external factors evaluation (EFE) was 2.88 and 2.55 respectively. That means Iranian cement industries can pursue an aggressive strategy as it leverages its strengths into the opportunities. In the other word Strengths-opportunities (SO) strategies are based on using a firm's internal strengths to take advantage of external opportunities and threats. Fig. 2 shows the appropriate strategy position for the Iranian cement industries.

3.4 Designing QSPM Matrix and Prioritization Identified Strategies

The next stage in the strategy-formulation framework for the Iranian cement industries involves the Quantitative Strategic Planning Matrix. To objectively evaluate feasible alternative strategies identified in SWOT analysis, the QSPM uses input information derived from former stage. In the first step,

Fig. 2: SPACE Matrix for the Iranian cement industries



Source: authors

weights assigned to each external and internal factor. Total attractiveness scores are defined as the sum of the attractiveness scores in a given column of the QSPM and are calculated in the second step of the QSPM as shown in Tab. 5 a positive feature of QSPM is that sets of strategies can be examined sequentially or simultaneously. Finally, as it seen in Tab. 6, based on the Total Attractiveness Score (TAS), each strategy could be prioritized.

Tab. 5: Quantitative Strategic Planning Matrix (QSPM) – Part I

Strength	Weight	Strategy SO_1		Strategy SO_2		Strategy SO_3		Strategy SO_4	
		AS	TAS	AS	TAS	AS	TAS	AS	TAS
S_1: Operating profit and company's liquidity index	0.085	4	0.340	4	0.340	4	0.340	4	0.340
S_2: Filters and control for emission and discharges	0.090	4	0.360	4	0.360	4	0.360	4	0.360
S_3: Using total productive maintenance system (TPM)	0.070	4	0.280	4	0.280	4	0.280	4	0.280
S_4: responsiveness improving speed to change market needs	0.090	4	0.360	4	0.360	4	0.36	4	0.360
S_5: Processes standardization	0.092	4	0.368	4	0.368	4	0.368	4	0.368
S_6: Cement grinding capacity comparison with production capacity of clinker	0.083	4	0.332	3	0.249	3	0.249	3	0.249
S_7: New product development	0.085	4	0.340	4	0.340	4	0.340	4	0.340
S_8: Suggestions system implementation	0.088	2	0.176	2	0.176	2	0.176	2	0.176
Weakness		**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**
W_1: Energy consumption	0.091	4	0.364	4	0.364	4	0.364	3	0.273
W_2: Environmental waste	0.095	2	0.190	2	0.190	2	0.190	2	0.190
W_3: Costs of fuel and transportation	0.042	3	0.126	4	0.168	4	0.168	2	0.084
W_4: Lack of technology, advanced and modern machinery	0.090	4	0.360	4	0.360	4	0.360	4	0.360
Total scores of internal factors	**1**		**3.595**		**3.555**		**3.555**		**3.380**
Opportunity		**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**	**AS**	**TAS**
O_1: Cement exports	0.103	4	0.412	4	0.412	4	0.412	3	0.309
O_2: Increasing international cement price	0.081	4	0.324	4	0.324	4	0.324	4	0.324
O_3: Investments in construction projects	0.092	4	0.368	1	0.092	4	0.368	2	0.184
O_4: Supplier relationships	0.102	3	0.306	3	0.306	3	0.306	1	0.102
O_5: To use third-party logistics for transportations	0.105	3	0.315	4	0.420	4	0.420	1	0.105
O_6: Suppliers' ISO14000 certification	0.084	3	0.252	4	0.336	4	0.336	2	0.168

Tab. 5: Quantitative Strategic Planning Matrix (QSPM) – Part II

Threat	Weight	Strategy SO_1		Strategy SO_2		Strategy SO_3		Strategy SO_4	
		AS	TAS	AS	TAS	AS	TAS	AS	TAS
T_1: The effect of economic sanctions	0.049	4	0.196	4	0.196	4	0.196	4	0.196
T_2: Orders size	0.042	4	0.168	4	0.168	4	0.168	3	0.126
T_3: Supply chain risk management	0.099	4	0.396	4	0.396	4	0.396	4	0.396
T_4: Government policy changes	0.058	3	0.174	4	0.232	3	0.174	2	0.116
T_5: Number of local competitors in the cement industry	0.093	4	0.372	2	0.186	4	0.372	3	0.279
T_6: Intensified competition in overseas markets	0.093	4	0.372	4	0.372	3	0.279	2	0.186
Total score of external factors	**1**		**3.655**		**3.440**		**3.751**		**2.491**
Total scores of strategies			**7.251**		**6.995**		**7.306**		**5.871**

Source: authors

Tab. 6: Strategies priority

Strategic choice with QSPM method	Total score of the attractiveness of each strategy	Priority of each strategy
SO_1: Increase production capacity	7.251	2
SO_2: Export markets development	6.995	3
SO_3: Develop new local markets	7.306	1
SO_4: Diversification in product	5.871	4

Source: authors

Conclusions and Recommendations

Internal and external environments of the organization are both important factors in determining strategies. Changes in each environment will cause changes in demands for products and services and also affect the supply chain. The internal environment includes weaknesses and strengths and the external environment includes opportunities and threats for the organization which can affect the organization's road map.

This study proposes a strategic analysis for LARG SCM competitive strategies in Iranian cement industries. We used the SPACE matrix to check if which strategy is appropriate. The results showed that the proper strategy was the aggressive strategy. In the SPACE matrix we assessed Iranian cement industries across four dimensions include: industry attractiveness, environmental stability, competitive advantage and financial strength. The SPACE diagram showed that Iranian cement industries can pursue an aggressive strategy as it has a strong competitive position in the market with rapid growth. The two big concerns in this competitive position are: 1) Avoid complacency – it seems that business is too easy but threats may come from new markets or as technology makes different sectors converge and 2) Avoid running foul of anti-competition policies. A business that is too strong may be able to attract the attention of regulators and especially if it uses predatory pricing aimed at driving competitors out of business.

Based on the SPACE analysis we recommend that Iranian cement industries in this position take the following actions:

1. To use the internal strengths to develop market strategy. This can include product development, integration with other companies, and acquisition of competitors.
2. Iranian cement industries have a competitive advantage and can protect it, a key factor is the possible of new competitors' entry into the industry, it may be considered new acquisitions, increasing market share and focusing on competitive products.
3. Invest in innovation to sustain and develop the competitive advantage which exists.
4. Monitor any moves made by competitors to develop alternative competitive advantages. Create the opportunities to reach a diversified value proposition so that attractive to segments of the market.
5. To innovate new products and reduce prices to levels that competitors find difficult to match.

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Assist. Prof. Gholamreza Jamali, Ph.D.
Persian Gulf University
Department of Industrial Management
gjamali@pgu.ac.ir

MSc. Elham Karimi Asl
Persian Gulf University
Department of Industrial Management
Elh.karimiasl@gmail.com

PhD candidate Sarfaraz Hashemkhani Zolfani
Amirkabir University of Technology
Department of Management, Science and Technology
Technology Foresight Group
and
Kerman University of Medical Sciences
Health Services Management Research Center
Institute for Futures Studies in Health
sa.hashemkhani@gmail.com

Assoc. Prof. Jonas Šaparauskas, Ph. D.
Vilnius Gediminas Technical University
Faculty of Civil Engineering
jonas.saparauskas@vgtu.lt

Abstract

ANALYSING LARG SUPPLY CHAIN MANAGEMENT COMPETITIVE STRATEGIES IN IRANIAN CEMENT INDUSTRIES

Gholamreza Jamali, Elham Karimi Asl, Sarfaraz Hashemkhani Zolfani, Jonas Šaparauskas

In the contemporary highly competitive international business environment companies have to exercise great care in devising entry strategies for foreign markets. Therefore, supply chain management (SCM) is considered a strategic factor for the better attainment of organizational goals such as enhanced competitiveness, improved customer service and increased profitability. Because the, Supply chain management as a vital challenge to the Cement industry and developing infrastructure as a whole has been posed by scholars. This article analyses Lean, Agile, Resilient, and Green (LARG) supply chain management competitive strategies in Iranian cement industries. The lean, agile, resilient and green SCM paradigms had been adopted to improve the SC performance. We used Step-wise Weight Assessment Ratio Analysis (SWARA) technique to weighting strengths, weaknesses, opportunities and threats (SWOT) based on LARG supply chain management practices for 11 Iranian cement companies. Then the Strategic Position and Action Evaluation (SPACE) matrix used to check if which strategy is appropriate. In the SPACE matrix we assessed Iranian cement industries across four dimensions include: Industry Attractiveness (IA), Environmental Stability (ES), Competitive Advantage (CA) and Financial Strength (FS). The results showed that Iranian cement industries can follow an aggressive strategy as it leverages its strengths into the opportunities. Iranian cement industries are also blessed because it has a good competitive advantage in an industry which is considered to be attractive. Among the strategic choices, develop new local markets strategy has the first priority, followed by the; Increase production capacity, Export markets development, Diversification in product with QSPM method. Finally, some actions recommended for Iranian cement industries in such a strong position.

Key Words: *LARG SCM, SWARA, SWOT Analysis.*

JEL Classification: *L1.*

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