

Homomorphic Conceptual Framework for Effective Supply Chain Strategy (HCEFSC) within Operational Research (OR) with Sustainability and Phenomenology

Al-Salamin Hussain, Elias O. Tembe

Abstract—Supply chain (SC) is an operational research (OR) approach and technique which acts as catalyst within central nervous system of business today. Without SC, any type of business is at doldrums, hence entropy. SC is the lifeblood of business today because it is the pivotal hub which provides imperative competitive advantage. The paper present a conceptual framework dubbed as Homomorphic Conceptual Framework for Effective Supply Chain Strategy (HCEFSC). The term Homomorphic is derived from abstract algebraic mathematical term homomorphism (same shape) which also embeds the following mathematical application sets: monomorphisms, isomorphism, automorphisms, and endomorphism. The HCEFSC is intertwined and integrated with wide and broad sets of elements.

Keywords—Automorphisms, Homomorphism, Monomorphisms, Supply Chain

I. INTRODUCTION

SUPPLY chain is defined as management of activities that procure materials and services, transform them into intermediate goods and final products, and deliver them through a distribution system. It includes determining: transportation vendors, credit and cash transfers, suppliers, distributors, account payable and receivable, warehousing and inventory, order fulfillment, sharing customer, forecasting, and production information. As the OM function supports the firm's overall strategy, the supply chain must support the OM strategy [2].

Many scholars had presented different conceptual framework for the supply chain such as supply chain decision-making framework and global framework network design decisions [1] and conceptual framework for supply chain competitiveness [4]. However, a conceptual framework was developed which it seems a homomorphism conceptual framework for effective supply chain and integrated one. This study targeted toward a developing (designing) a conceptual framework that include all variables which might affect the supply chain. It includes 10 OM strategic decisions, Sustainability and related to 4 R's, logistical and cross functional drivers of supply chain, 4 C's, stakeholders, triple bottom line, risk analysis, act of god, and phenomenology and all these variables should be measured using metrics and

mathematics formula in order to maximize the profit for the organizations.

This paper is organized as follows: the rest highlighted statement of problem, purpose of study, hypotheses development, conceptual framework, limitations and assumptions. The remaining part emphasized the summary of this paper, in addition to definitions of terms and future prospect of research.

A. Statement of Problem

The potential benefits of homomorphism conceptual framework for effective supply chain strategy sometimes are not related by researchers. Developing a schematic conceptual framework by scholars might not be realized.

B. Purpose of Study

The purpose of this research is to develop a conceptual framework and of homomorphism conceptual framework for effective supply chain and integrate one.

C. Hypotheses Development

- H0. There are no potential benefits of developing a schematic homomorphism conceptual framework of supply chain.
- H1. There are potential benefits of developing a schematic homomorphism conceptual framework of supply chain.

II. CONCEPTUAL FRAMEWORK

There are many studies and many scholars have developed conceptual framework such as supply chain decision-making framework [1] as it is seen in Fig. 1, and conceptual framework for supply chain competitiveness [4]-[6] as it is seen in Fig. 2. However, in this conceptual framework it is more homomorphism with additional variables which other conceptual frameworks have not incorporates it as it is seen in Fig. 3.

The next two sections are devoted for a discussion of each of the phases of this conceptual framework to maximize the profit.

Al-Salamin Hussain and Elias O. Tembe are with the King Faisal University (e mail: asser11@hotmail.com).

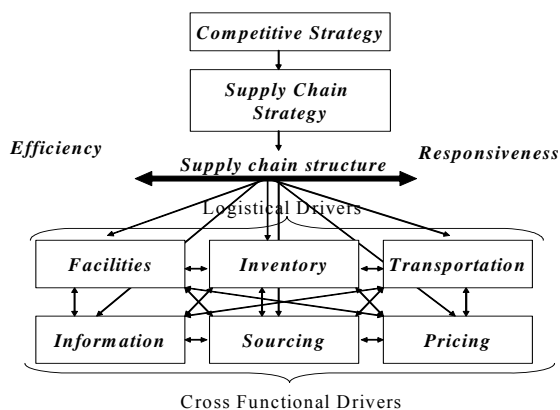


Fig. 1 Supply Chain Decision-Making Framework [1]

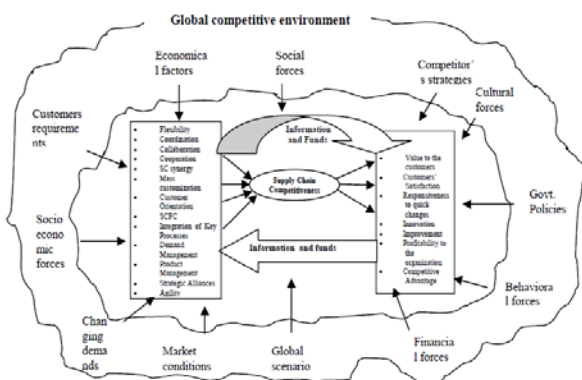


Fig. 2 A conceptual framework of supply chain competitiveness

Fig. 2 A conceptual Framework of supply chain competitiveness [4]

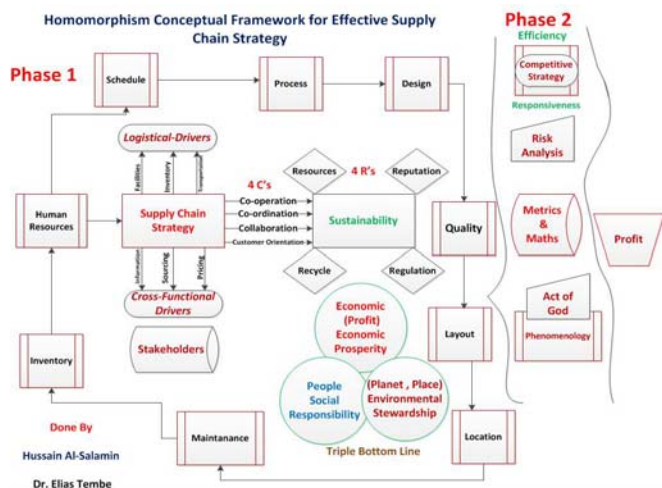


Fig. 3 Holomorphic Conceptual Framework for Effective Supply Chain Strategy

A. Phase I

It includes the 10 OM decisions with its most important variable is the supply chain with coordination of 4 C's. According to Heizer and Render [2] the 10 decisions of operations management are :1) design of goods and services, 2) managing quality, 3) processing and capacity design, 4)

location strategy, 5) layout strategy, 6) human resources and job design, 7) supply chain management, 8) inventory, material requirements planning, and JIT (just in time), 9) intermediate and short-term scheduling, 10) maintenance. According to Ajay Verma and Nitin Seth [4] four C's of supply chain coordination are: Coordination, Cooperation, Collaboration and customer orientation. Supply chain management includes the use of logistical and cross-functional drivers to increase surplus. Cross-functional drivers have become increasingly important in raising the supply chain surplus in recent years according to Chopra, Meindl [1] and the logistical drivers are: 1) facilities, 2) inventory, 3) transportation and the cross-functional drivers are: 1) information, 2) sourcing, 3) pricing. Also, in this phase sustainability is introduced and interrelated as a current issue to all variables in supply chain. Sustainability is the state of art where operation managers enhance their production in an ethical and environment friendly manner. Sustainability against the triple bottom line concepts are also related to the 4 R's in production process which are: 1) resources, 2) regulations, 3) recycle, and 4) regulations as per Heizer and render [2]. The triple bottom line was considered to evaluate firms for economic, social, and environmental principles. Ethics is also included as part of the social responsibility as part of triple bottom line as it mentioned in Jacobs and Chase [3]. Finally, the stakeholders should be engaged to all operations in order to satisfy the overall goals, mission, and vision of their organizations.

B. Phase II

The supply chain drivers to achieve the right balance between responsiveness and efficiency so that its competitive strategy and supply chain strategy are in harmony. [1]. It must be considered that risk analysis should be in all 10 OM decisions because there is no exact forecasting. Another issue that organizations should take cares of it is the act of god or phenomenology which comes out of control of the organizations and anybody else. Finally and the most important variable is to measure all the drivers and 10 OM decisions with use of metrics and mathematics. If you cannot measure it, you cannot control it. It recommended that in order to maximize the profit of any organization, they should use this homomorphism conceptual framework for effective supply chain strategy.

C. Limitations

This section was dedicated to the limitations of the study. The limitations were as follows:

1. The area of study was limited with time within supply chain class this semester 2013.
2. The purpose of this study is only to develop (design) this conceptual framework and there was no questionnaire or survey was conducted.

D. Assumptions

This section is devoted to the assumptions made in this study:

1. It is assumed that this conceptual framework is

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homomorphism and integrated one.

- It is assumed that this conceptual framework can be used before appropriate fit to this one.

E. Summary

The purpose of this paper was to develop (design) a homomorphism Conceptual Framework for Effective Supply Chain Strategy which is an integrated one. This conceptual frame work was divided into two phases. The first phase was included the 10 OM decisions, Sustainability with related 4 R's, triple bottom line, 4 C's, and logistical and cross-functional drivers, and stakeholders. The second phase was included the competitive strategy, acts of god or phenomenology, risk analysis, and metrics and mathematics. The integration of these two phases leads to maximize the profit for the organizations.

F. Definition of Terms

1. Homomorphism

A homomorphism is a map that preserves selected structure between two algebraic structures, with the structure to be preserved being given by the naming of the homomorphism. In abstract algebra, a homomorphism is a structure-preserving map between two algebraic structures (such as groups, rings, or vector spaces). The word homomorphism comes from the ancient Greek language: ὁμός (homos) meaning "same" and μορφή (morphē) meaning "shape". Isomorphisms, automorphisms, and endomorphisms are special types of homomorphisms.

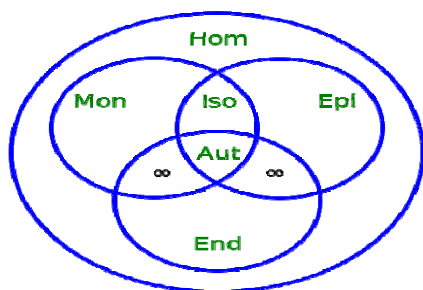


Fig. 4 Homomorphism

Act of God or Phenomenology

Is a legal term for events outside human control, such as sudden floods or other natural disasters, for which no one can be held responsible.

2. Automorphisms

It is, in some sense, symmetry of the object, and a way of mapping the object to itself while preserving all of its structure. The set of all automorphisms of an object forms a group, called the automorphisms group. It is, loosely speaking, the symmetry group of the object.

In mathematics, an isomorphism (from the Greek: ἴσος "equal", and μορφή "shape") is a homomorphism (or more generally a morphism) that admits an inverse.

3. Monomorphisms

Monomorphisms is injective homomorphism in mathematics. A monomorphism from X to Y is often denoted with the notation $X \rightarrow Y$. In the more general setting of category theory, a monomorphism (also called a monic morphism or a mono) is a left-cancellative morphism, that is, an arrow $f: X \rightarrow Y$ such that, for all morphisms $g_1, g_2: Z \rightarrow X$,

$$f \circ g_1 = f \circ g_2 \rightarrow g_1 = g_2$$

Monomorphisms are a categorical generalization of injective functions (also called "one-to-one functions"); in some categories the notions coincide, but monomorphisms are more general.

G. Future Prospect of Research

This study was conducted with limited time within supply chain class this semester 2013. There were many limitations mentioned as part of the paper. The conceptual framework cannot be considered a complete because there were no test was conducted to study the hypotheses. This conceptual framework can be a potential tool for further research and development (R&D) in the future if adapted.

III. CONCLUSION AND RECOMMENDATIONS

A. Conclusion

As it was explained in this study, this homomorphic conceptual framework was divided into two integrated phases that work together to achieve maximized profit or benefit for firms and organizations. There were no previous conceptual frameworks which were designed to be effective and integrated one. There was no evidence in this paper to accept or reject the hypothesis because the purpose of this paper was only to design a conceptual framework which authors were work to include all the elements and variables which may affect firms and organizations operations in daily bases which they are related to supply chain management. In this conceptual framework, authors were include the most important tools to measure operations in supply chain in means of profits or benefits by using metrics and mathematics tools. Also, they were included risk analysis, and act of god or phenomenology which can't be avoided or forecasted with accepted errors. Finally, authors believed that firms and organizations can get benefits if applied Homomorphic Conceptual Framework for Effective Supply Chain Strategy (HCEFSC) within Operational Research (OR) with Sustainability and Phenomenology.

B. Recommendation

After completing this study, authors recommended the following:

- Apply proper methodology to test the hypothesis.
- Arrange a workshop with supply chain professionals who worked in big firms and organization to explain this conceptual framework and its benefits.
- Make interviews with supply chain specialists who have a degree in this filed in different universities around the

worlds.

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