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Supply Chain and Inter-Cost (Cost Management Across Organizational Boundaries) Using ERP System in Diwaniyah Textile Factory

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Abstract. *ERP software has become an essential tool for managing and organizing vast amounts of data within institutions, especially with the rise of big data concepts. As a relatively new innovation, ERP falls under the umbrella of digital transformations shaping the modern world. These systems, along with their associated applications, offer capabilities that facilitate integration and coordination among departments and processes within organizations. This, in turn, supports better strategic decision-making. Additionally, ERP systems play a crucial role in enhancing production processes and improving customer interaction, provided that the technology and the data it generates are utilized effectively*

Keywords: *Cost Management, ERP System, Textile Factory*

1. INTRODUCTION

ERP software has become an indispensable tool for managing and organising large amounts of data in institutions, in light of the growing concepts of big data, and ERP software is a relatively recent phenomenon, and falls within the digital transformations that the world is witnessing today, because these systems and associated applications can provide capabilities that help achieve integration and coordination between departments and processes and different in institutions, which contributes to enhancing appropriate strategic decision-making, and play systems (ERP) plays an important role in improving the production process and interaction between customers if the technology and the data it produces are used well. (Hafez, 2024, p. 145).

The repercussions imposed by the modern business environment played an important role in the trend towards adopting the concept of supply chain by many establishments involved in providing a specific product with the aim of supporting their competitive position and achieving their goals. This requires the participation of supply chain members in the goal of reducing costs in order to reduce prices in the market and enhance the profit margin. Coordination between supply chain members is a strategic response to this goal through a set of methods used to manage the various activities between establishments involved in a single supply chain, which necessitates the search for cost management tools to support cost reduction efforts throughout the supply chain. (Chen, Sohal, Prajogo, 2013)

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Study Problem

In light of the great expansion of companies and the complexity of supply chains, organisations face great challenges in managing their interdisciplinary costs between different parties within the supply chain, especially when there are overlaps between the regulatory boundaries of companies, which leads to an increase in total costs as well as poor efficiency and difficulty in achieving transparency of operations, so it requires the adoption of enterprise resource management (ERP) as a means to improve coordination between parties, reduce inter-costs, and enhance the efficiency of supply chains across organisational boundaries.

Accordingly, the following question can be formulated as a research problem: "How to employ the ERP system as a tool to improve, coordinate and reduce inter-costs across the supply chain?".

2. LITERATURE REVIEW

Research Hypotheses

H1: "There is no statistically significant effect of using the ERP system on reducing inter-operability costs across the supply chain."

The following hypotheses emerge from the main hypothesis of the research:

1. The use of the ERP system does not lead to improving transparency in operations between different parties in the supply chain.
2. The use of the ERP system does not lead to improving the efficiency of managing operational costs.

The importance of Research

The importance of the research lies in shedding light on the mechanism of using the Enterprise Resource Planning (ERP) system to reduce costs within supply chains with the aim of improving operational efficiency and coordination between different companies, thus leading to a reduction in total costs.

Research Limits

The study was limited to the production processes of the Diwaniyah Textile Factory, the subject of the research, through supply chains and the application of the (ERP) system to reduce costs and the possibility of considering the applied results of this research as general results that can be applied to the products of other institutions.

3. METHODOLOGY

Study Limits

The research was prepared in light of the following limits: The study will be applied to the textile sector in the Republic of Iraq (Diwaniyah Textile Laboratory).

First axis: the Theoretical Aspect of Research

Introduction

The intensity of competition led countries to form alliances and blocs to secure their existence and ongoing pursuit of economic growth, which also requires businesses to create alliances and blocs to maintain their presence in the markets and achieve growth. This highlights the importance of managing these types of blocs to deliver a product at the right cost and quality in a timely manner. (Ibrahim, 2017)

The concept of Supply Chain

Loads of studies have shown that the rise of supply chain management is the biggest game changer, and it's had a massive impact on how well businesses run since the early eighties when the US started using the Just in Time approach. (Gohari, 2013, p. 55). The idea of supply chain management has really taken off in the last twenty years thanks to quick advancements in planning, buying, manufacturing, and logistics, but getting these functions to work together both inside and outside the company is still a big challenge for businesses. (El Gohary, 2013, p. 55). This really shows how important it is to adopt a supply chain management approach that considers how to integrate supply chain functions and teams to achieve effective management, which helps in delivering top-notch products and services to the end customer. (Gohari, 2013, p. 55).

The supply chain is defined as a series of establishments starting with the supplier's suppliers through the facility and ending with the customer and the breadwinner's customers. It aims to achieve specific goals that help the members of the chain compete by coordinating activities among themselves and considering the benefits for all members of the chain.

The objectives of Supply Chain

The supply chain is a key part of developing how well its members perform to serve customers, and its importance comes from the goals it aims to achieve, which are as follows:

1. Providing the right product at the right time and at the right price while trying to meet customer desires.
2. Minimising inventory and cutting down on costs.
3. Helping to coordinate the flow of products or information between supply chain members and then working to improve the efficiency of chain performance.

Supply Chain Management

reckon that (Lambert&Cooper) supply chain management is "the management of the relationship between the beginning and end of the supply chain from raw material suppliers to customers,and say that (Waart&Kemper) supply chain management is all about managing relationships between the parties in the supply chain. think that (Benita&Beamon) the supply chain is "the phrase of planning and coordinating activities from the procurement of raw materials to the distribution of products through the facility. believe that (Ray&Jeffrey) supply chain management is "a set of methods that are used for effective and efficient cooperation and integration between an enterprise that is involved in the production and delivery of the product, with the aim of reducing costs throughout the system, while maintaining the desired level of quality from customers."

The concept of Cost Management

Managing the study of the facility's cost structure, planning and controlling these costs to cut them down without sacrificing quality and making good use of available resources is all about gaining competitive advantages for the facility, which leads to better customer satisfaction. It's basically how the administration uses cost info to prepare, develop, and lower costs to get a solid competitive edge for the facility. In today's manufacturing world, cost management does this job well throughout the product life cycle.

The cost management approach gives management the info they need, whether it's financial or not, and it brings loads of benefits, like boosting productivity, doubling production, increasing profits, improving the efficiency of economic and human resources, creating a way for ongoing performance and cost improvement, and ensuring quality control, which makes the facility more competitive. There's a strong link between the decisions made by management and the costs of those decisions. (Cooper, Slagmulder, 2004, p15).

Cost management is all about managing things from a smart and behavioural angle, aiming to deliver a product that meets consumers' ever-changing tastes, whether it's about looks or how easy it is to use, all while keeping costs low and prices real. The product should also have various alternative uses, and it's about picking the best mix of products based on the resources available. This relies on using advanced technical tools and methods. This makes (Horngren et al) cost management a key part of the organisation's overall management strategies and how they put them into action.

Cost Management System

It's part of the management info and control system and involves creating formal methods for planning and keeping an eye on the activities of the cost-generating organisation related to short-term goals and long-term strategies. A good cost management system should give managers the info they need to make a profit in the short term and stay competitive in the long run. (Soldier, 2006).

The basic objectives of the cost management system can be summed up in six points: (Gohary, 2013, p.78):

1. Explain the costs of products logically, especially by using the causes of cost factors
2. Activities that have a direct causal and affective relationship with costs
3. Evaluate the performance of the stages of the product or service life cycle
4. Improve understanding of processes and activities
5. Cost control.
6. Performance measurement.
7. Allow managers to achieve the organization's strategy.

Inter-Cost Management

The development of economic life, the openness of the market, and the introduction of modern communication methods have ramped up competition, increased the supply of goods, and provided a ton of alternatives. This has made it trickier to attract customers and keep them satisfied with their desires, as well as to maintain their ongoing interest in acquiring products over a longer period. So, cost management isn't just about the internal costs of the organisation anymore; the evolution of economic life has added a new challenge. Now, there's a need to manage costs beyond the organisation's boundaries, working with commercial partners and suppliers in the economic environment, and forming alliances with them. This is all about boosting performance and achieving the lowest production costs while offering the best quality to grab a bigger market share. This leads to the emergence of shared costs between companies that need to be managed, which is known as managing common costs that arise from the exchange of interests, referred to as inter-cost management. (Cooper, Slagmulder, 2004, p15)

The Concept of Inter-Cost (Joint Cost Management)

The basic idea of supply chain management is that organisations need to look beyond their own limits to think about their relationships with suppliers and customers along the value chain. For over a century, the norm for how organisations behave with each other has been that each company keeps its independence, making it tough for them to benefit from synergies in managing costs that could come from working together with business partners. Plus, achieving

synergy or collaboration needs extra coordination between organisations to manage costs beyond their own boundaries to aim for the lowest possible costs compared to if each organisation was on its own.

As defined, "it's a collaborative cost management process that involves other organisations besides the company itself and aims at the competitive advantages of the value chain." We can define shared cost management as "the process of managing and controlling costs that arise as a result of a supplier contracting partnership for the purpose of reaching the target cost and quality of the partnership process."

The interrelationship between member organisations in the supply chain goes through the following four stages (Ibrahim, 2010, p. 215):

1. The stage of autonomy of companies.
2. The stage of dependence of some companies on other companies in a sequential manner, where the production of one company enters directly into the production line of another company.
3. The stage of dependence and mutual influence between companies and influence on each other's behaviour.
4. The stage of deepening interdependence.

The success factors of shared cost management (intersectoral) depend on five factors (Ibrahim, 2010, p.215):

1- **Products**: When it comes to products, there are two things to look at (profit margin and function).

The first thing: profit margin: You should check out the gross profit margin or contribution margin, which is better for products that have lower margins. This is compared to the target margin you get by managing costs beyond the organisation's limits and finding ways to optimise costs, which can help improve the margin towards your goal.

The second thing: the function: You need to break down the functions by different characteristics or attributes of the product. The more posts there are, the better the chances of managing costs beyond the organisation's limits, which means more opportunities to apply common management successfully to various product jobs.

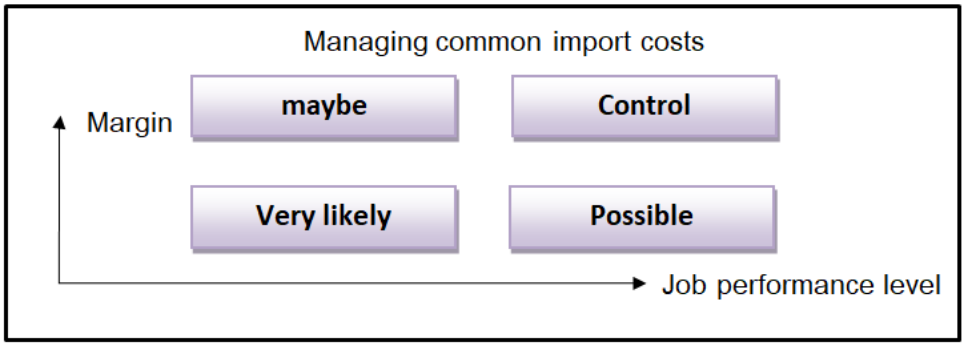


Figure (1) Inter-cost manageability in product analysis

2- Product components: Managing the common costs of product components might not apply to all suppliers for every product component, but it's important to pinpoint the preferred components for shared cost management.

There are two things about variables that need to be looked at here (tech limits and value ratio).

The first thing: is about how much tech restriction there is: whether it's strategic and if the company wants to keep it under wraps or not. If not, R&D candidates for partner use could be a good way to push tech forward.

The second thing: the value ratio: the drop in the value ratio and the growing need for cost management, to make sure the cost doesn't hit the highest level of benefit from the component function. Then check how they can be applied to shared cost management through characteristics analysis.

3- Relationship levels: The next stage of the joint cost management process is to analyze partnership relationships and classify suppliers (joint, auxiliary, or main family). To successfully implement joint cost management, there must be a positive relationship between companies. This involves interdependence, stability, cooperation, mutual benefits, and trust. The more intense the relationship level, the more suitable it is for joint cost management. The most important points for achieving relationship levels are:

a. **Mutual dependence**: It is important between the organization and its suppliers if the former cannot dispose of its products without the latter's entry, and at the same time it represents a risk because losing the supplier causes the producer to lose a large part of its production volume. Therefore, the higher the level of interdependence and joint management, the greater the reassurance.
b. **Trust**: It is the certainty that the deal is real. Trust is generally built over time, through knowledge of situations, transactions, and information.

c. **Stability**: It is the achievement of a stable, solid, permanent, secure, and constant relationship, by increasing the chances of the partnership continuing (Cooper & Slagmulder)

d. **Cooperation and mutual assistance between entities to achieve common goals**: This requires interaction, cooperation, and reciprocity with common goals, and coordination of common activities and procedures. According to the existence of a cooperative relationship, which is the characteristic that allows companies to work together to manage costs and solve problems raised by the pressures of difficult external circumstances.

e. **Mutual benefit**: It is the sharing of the gains obtained between organizations, and encouraging the maintenance of this relationship.

4- Value chain categories: There are three categories of value chains: Kingdom, Barony and Republic. This classification is determined by the number of holding companies that have power in the value chain and the aim is to determine where they are favorable for the application of joint cost management.

a. **Kingdom chain type**: in this type only one company controls by issuing orders.

b. **Barony chain type:** in this type two or more companies share dominance and leadership power among the barony companies and one of them has enough power to negotiate and control the others.

c. **Republic chain type**: in this type there is no single group or few organizations in the command, and companies should build alliances, because they are all at about the same level of power. Similar conditions negotiate instead of companies, customers and suppliers. This type of value chain structure reduces the possibilities of joint cost management, but in the case of strong negotiating power between the two companies,

We find that the most suitable type for managing joint costs in companies of the kingdom type and then the barony type.

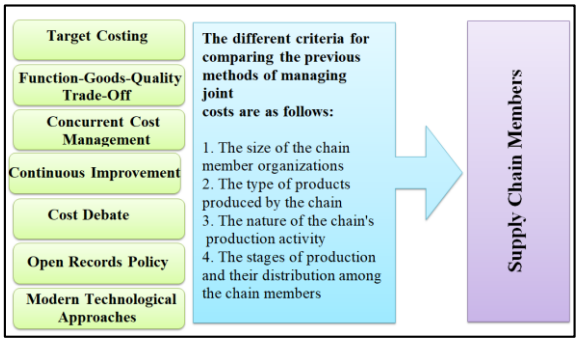
5- Governance mechanisms: Mechanisms are administrative tools that provide support for the process of managing costs between companies in order to direct, monitor, measure, report, and provide data, as a guide for institutions, which makes it possible to manage joint costs. These mechanisms are divided into two types: discipline and empowerment. There are many methods used in managing the joint cost between organizations (inter-cost) that are affected by them, which are the following: (Al-Jawhari, 2013).

1. **Target Costing:** These are the costs that aim to determine the costs at which products should be manufactured, which are represented by the expected selling price derived from the market price minus the expected profit. (Ibusuki and Kaminsk 2007) believe that determining the target cost at the component level is one of the most important elements that help manage the inter-productive cost.
2. **Trade-off between functionality, price and quality:** This method helps in trade-off between price and quality to solve the problems of slight cost overruns and minor changes in specifications.
3. **Simultaneous Engineering Management:** This means addressing problems that require reducing cost levels, and this requires high levels of interaction between the buyer and the supplier's design engineers and leads to fundamental changes in the product.
4. **Continuous Improvement:** Activities related to developing and improving the product are often crucial, but during the process of cooperation between buyers and sellers, they can be completely hidden, as the impact of costs is hidden during the pre-production stages, and as a result, most of the efforts are directed to determining the target cost and adhering to it during the design of the product or its components.
5. **Cost Table:** It was defined by (Tanaka, et al.) as databases that include measuring the actual costs of current products, in addition to detailed data on the estimated costs of products expected to be produced.
6. **Open Books Policy:** It means cost transparency, and thus it can be considered an expression that two organizations are converging through increasing transparency, and its purpose is for the buyer to help the supplier reduce costs by identifying critical areas.

The target cost is seen as a way of managing costs across the board, and they use a method to differentiate between function, price, and quality through value engineering. If the design changes are simple, they stick to that differentiation method, but if the changes are big, they need good communication and teamwork between the design teams using simultaneous engineering. Basically, the lowest cost for supply chain members can be reached when companies in Japan start improving from the top of the supply chain, especially if some members can’t hit the target cost. Plus, cost tables can give the needed data to measure and report on actual product costs, which helps keep control over the previous stage and add estimated values for products under each alternative.

Keeping track of open records helps make the supply chain more cost-effective and builds trust between customers and suppliers. Plus, modern tech like fuzzy estimates and neural networks can help manage costs by finding the right alternatives in a tech-savvy way.

The earlier presentation can be shown in the following figure:



Second Axis: the Practical (Applied) Aspect of Research

Study Community and Sample This is Represented in Following

- **Study population:** The study population includes the textile sector in the Republic of Iraq
- **Study sample:** The study sample is one of the subsidiaries of the textile sector in the Republic of Iraq and the researcher's choice of this factory is due to the importance enjoyed by the textile sector, as well as the possibility of applying the idea of research in this as it works in the required production method, and to try to find solutions to the problems facing the textile sector and try to solve them through the application of the idea of the study.

Diwaniyah Textile Factory was set up in 1975 and is one of the biggest places for spinning and weaving in Iraq and the Middle East. It's located in the city of Diwaniyah, which is a key spot for making cotton fabrics and other textile products. The factory kicked off its production in the late seventies and has several sections like spinning, weaving, and finishing, which help turn raw cotton into ready-made fabrics. It has different areas, including the spinning department and its prep, the textile department and its prep, and the finishing department. Production starts with raw cotton and ends with dyed and printed cotton fabrics.

Section One: The Impact of Factors on Costs (2021-2023)

Employee	2021	2022	2023	Analysis
Lack of transparency between partners	4.5	4.0	3.5	Significant improvement after adopting ERP systems.
Poor planning between parties	4.3	3.8	3.2	Coordination gradually improved between partners.
High transportation and service costs	4.0	3.9	4.2	Impact of rising fuel prices.
Volatility in raw material prices	4.7	4.6	4.5	Relatively more stable factor.

- **Analysis**: In 2021, a lack of transparency and poor planning were the main challenges faced by the organisation with the implementation of the ERP system, the impact of the lack of transparency decreased by 22% by 2023. Transport costs remained a challenge due to external factors such as high fuel prices, as well as the cost of spare parts and other factors.

Section Two: The Role of Digital Tools (2021-2023)

Tool	2021	2022	2023	Analysis
ERP Systems	Not used	4.0	4.7	ERP implementation in 2021 improved integration and efficiency.
Financial Analysis Software	3.5	4.2	4.5	Helped improve cost decisions and resource management.
Artificial Intelligence Technologies	Not used	3.0	3.8	Still in pilot for demand analysis.

- **Analysis**: The use of ERP has boosted inter-cost management by 15% by 2023, and using financial analysis software has helped improve decision-making based on data from the facility. Plus, artificial intelligence tools are still being developed, which shows there are chances to enhance demand forecasting even more, potentially leading to greater cost reductions and, in turn, better profits for the business.

Section Three: Cooperation between Parties (2021-2023)

Party	2021	2022	2023	Analysis
Suppliers	3.5	4.0	4.3	Improved relationships through long-term contracts.
Manufacturers	4.0	4.2	4.5	Collaboration within the factory has become more effective.
Distributors	3.2	3.8	4.0	Coordination with distributors has been improved using ERP systems.

- **Analysis:** From the table above, working with suppliers went up by 20% thanks to transparency and good planning, and this collaboration with distributors has shown a slow but steady improvement.

4. RESULTS

From the above, and after reviewing the answers and statistical analyses from the tables for the study period of three years (2021-2023), the challenges facing the facility can be summarized as follows:

1. Fluctuations in the prices of raw materials are a permanent and major challenge.
2. Transportation costs remained high due to external factors beyond the control of the facility.
3. Negligence in the use of artificial intelligence disrupted or slowed down the improvement in predicting supply and demand, which reduced the opportunities for reducing inter-costs.

5. CONCLUSIONS AND RECOMMENDATIONS

As for the positives that were monitored through the research, they are as follows:

Using ERP systems: Enterprise resource planning has contributed significantly to reducing total costs by a significant percentage, which is (15%), and has also contributed directly to increasing transparency between partners, as it helps in:

1. Improving the efficiency of operations by reducing manual labor and thus reducing human errors.
2. Reducing inventory costs by improving inventory management and forecasting demand and thus reducing the costs of stockpiling or shortage.
3. Improve supply chain management by improving communication with suppliers, improving process transparency, improving the flow of materials from suppliers to customers, and reducing costs resulting from delays or logistical problems.
4. Reduce administrative costs and enhance data-driven decisions
5. Increase productivity and reduce product life cycle time.

Recommendations

1. The study suggests looking into how to use artificial intelligence to help cut down on wasting money and to analyse demand.
2. The study suggests boosting transport efficiency by providing transport options for the facility or teaming up with transport service providers.

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