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Integration Between JIT and ABC 11 Systems and Their Role in Cost Reduction

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Abstract
The objective of this research is to illustrate the integration of the Just-In-Time (JIT) system with the ABC 11 system, as both aim to minimize costs. The JIT system seeks to eliminate storage costs by striving for zero inventory levels, both in warehouses and during production stages. This approach mitigates production inefficiencies by adopting a pull-based methodology, where materials are procured based on actual demand rather than forecasted needs. In contrast, the ABC 11 system focuses on demand-driven cost management and activity-based costing, optimizing resource allocation according to specific customer requirements and utilizing unused energy. The integration of these systems fosters a complementary relationship through their shared goal of cost reduction.

Keywords: JIT, ABC11, Cost Reduction, Integration and Systems.

Introduction

The rapid and substantial advancements in technology, coupled with the expansion of global markets due to globalization, have generated intense competition on a global

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scale, beyond local markets. Companies are increasingly focused on securing a significant market share and attracting a large customer base. Additionally, technological progress has resulted in shorter product lifecycles, prompting many firms to conduct extensive research aimed at enhancing product quality while reducing costs. To achieve these objectives, companies are implementing modern systems designed to minimize expenses while offering specialized features and maintaining high quality. Notable among these systems are the JIT and ABC 11 systems. The JIT system primarily addresses cost reduction through the elimination of storage costs, whereas the ABC 11 system focuses on cost reduction through the efficient utilization of energy.

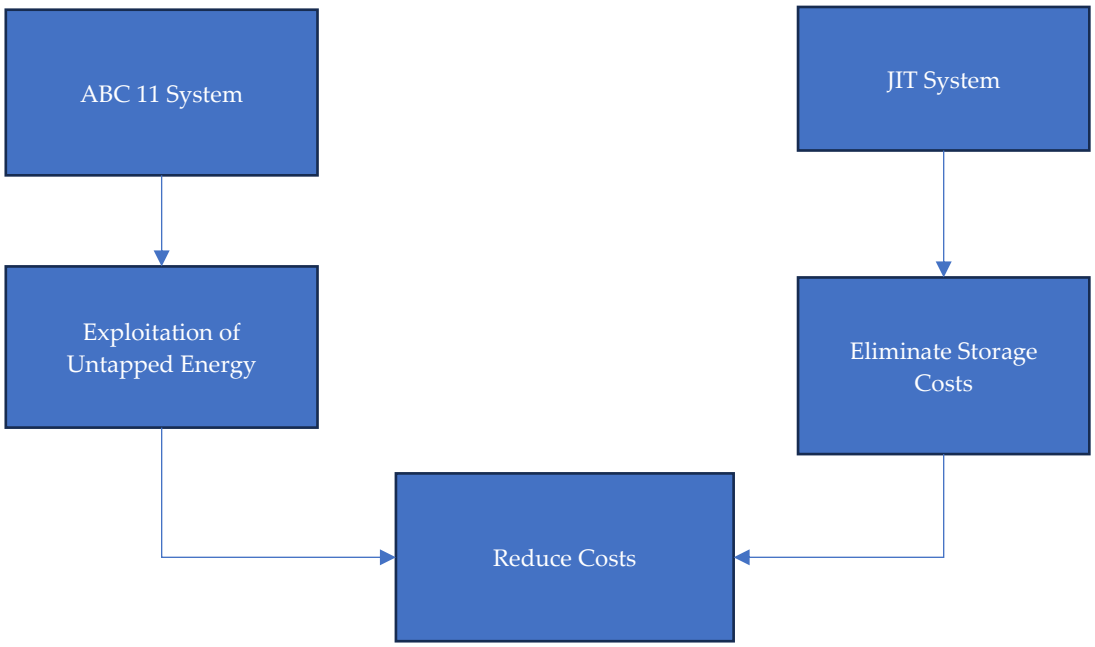

Figure 1: Procedural Scheme.

Research Objective

The research seeks to elucidate the integration of the JIT system with the ABC 11 system and to examine their respective roles in cost reduction, based on their fundamental principles.

Research Hypothesis

The research is predicated on the fundamental premise that the integration of the JIT system with the ABC 11 system leads to a reduction in costs.

Previous Studies

First: PourAsiabi and PourAsiabi (2012) Study Entitled "Supply Chain Management"

This study elucidated the significance and effectiveness of enhancing production processes and optimizing the supply chain. It highlighted the critical role of the

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JIT system in improving both productivity and operational quality within the supply chain. The comparative analysis between the JIT system and traditional systems in terms of planning, production, and marketing revealed that the adoption of the JIT system facilitates the delivery of high-quality products at reduced costs. The study concluded that the implementation of the JIT system is essential for improving supply chain efficiency, increasing production flexibility, and meeting customer demands.

Second: Al-Karaawi and Al-Baaj (2014) Study Entitled "Integration Between (JIT-ABC) System in Reducing Costs for Industrial Companies

This study aimed to elucidate the integration between the Activity-Based Costing (ABC) system and the JIT system within the context of the modern manufacturing environment. It emphasizes the necessity of organizing the factory into manufacturing cells, developing JIT skills, incorporating technical elements, fostering strong supplier relationships, minimizing waiting times, and implementing comprehensive quality management. The goal is to achieve zero defects through continuous improvement across all production processes, thereby reducing costs and damage expenses. The study illustrates how JIT technology and ABC activity-based costing confer a competitive advantage. The ABC system facilitates the identification and classification of core activities involved in product manufacturing, enabling the aggregation and allocation of costs associated with these activities. ABC provides technical insights into distinguishing value-adding activities from non-value-adding and inefficient ones, aiming to eliminate unnecessary costs and reduce effort. The research finds that the complementary relationship between JIT and ABC systems enhances factory objectives by improving production efficiency, customer satisfaction, and cost reduction. It concludes that successful integration of ABC and JIT systems can improve operational performance, increase production capacity, and emphasize the importance of strong supplier relationships for ensuring timely access to raw materials and operational components.

Third: Mahal and Hossain (2015) Study Entitled "Activity-Based Costing (ABC)-An Effective Tool for Better Management"

This study aimed to explore the theoretical development of the ABC system and its applicability across different countries. It detailed the advantages and justifications for implementing this system within industrial and governmental institutions. The study also examined the interplay between ABC and other management accounting concepts, including activity-based budgeting, the theory of constraints, supply chain management, total quality management, and product lifecycle cost. Applied to companies in Bangladesh, the research highlighted the critical importance of adopting ABC over traditional methods. It demonstrated that ABC provides accurate cost measurement and serves as a vital tool for performance evaluation.

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Fourth: Kadhim and Al-Ghezi (2021) Study Entitled "Using Attribute-Based Costing to Conduct Efficient Customer Profitability Analysis in Small and Medium -Sized Manufacturing Business"

This study aimed to elucidate the role of ABC11 acquisitions and customer profitability analysis as essential management tools for performance enhancement. It emphasized ABC technology as a method for organizing and analysing customer profitability. The research was conducted at a men's clothing manufacturing factory in Najaf, where it compared traditional systems with contemporary ones, including ABC11. The findings indicated that the adoption of modern systems facilitates optimal resource utilization and enhances customer profitability.

Fifth: Mashkoor and Jassim (2022) Study entitled "The Importance of Applying the Production System on Time (JIT) in Public Companies

This study aimed to reduce product costs by lowering inventory expenses. It investigated the feasibility of applying this approach in companies, hypothesizing that its implementation would enhance profitability under normal operational conditions, optimize available resources, and improve product quality. The research emphasized the necessity of full coordination among the production, procurement, and sales departments. Given the significant advantages of this system for companies, the study proposed examining its application in public enterprises that utilize a standardized accounting system. The State Company for Engineering Industries was selected as the case study. The research concluded that local companies could successfully implement this system, given its potential benefits in reducing product costs and improving performance. The study recommended that all local companies consider adopting this system to achieve their operational goals effectively.

The Concept and Importance of the JIT System

In response to globalization and intensified competition, many companies are adopting modern strategies to reduce costs in order to attract a larger customer base and capture a significant market share. Two critical factors influencing the global market are customer satisfaction and product quality. Companies must proactively enhance product quality to address the evolving needs and expectations of customers while simultaneously reducing production costs to remain competitive. As noted by Bon and Garai (2011), most research emphasizes the importance of balancing quality and cost to achieve customer satisfaction. One such strategy is the JIT production method, which aims to eliminate inventory costs entirely. This Japanese management philosophy focuses on acquiring production resources with the appropriate quality and quantity at the right location and time. By minimizing inventory and reducing waste, the JIT method enhances productivity and reduces overall costs, as it is driven by customer demand and efficient production control. The JIT system is a fundamental component of the Toyota Production System and generally encompasses

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two key systems. The first is Just-In-Time Purchasing, which involves processing raw materials, components, and other production necessities precisely when needed, in the exact quantity, at the specified location, and within the designated timeframe. This approach ensures that finished products are delivered to customers punctually and in the required quantities. In essence, production processes and the movement of materials are aligned with actual demand, leading some to view this method as a means of minimizing inventory by matching production quantities with delivery needs. This approach effectively reduces excessive storage costs.

Achieving zero inventory implies that production operates through a pull-based system, which in turn minimizes worker downtime by redirecting their efforts towards other productive activities. For instance, workers may engage in tasks such as machine changes, preventive maintenance, or machine setup and adjustment, rather than dealing with excess inventory. This approach contributes to a reduction in labour costs (PourAsiabi & PourAsiabi, 2012).

Researchers conclude that the JIT system is a method for managing inventory. Since excess inventory increases costs, companies focus on addressing the "seven wastes" to drive continuous improvement in their production processes. These seven wastes, as detailed by Franco and Rubha (2017), are as follows:

Surplus Production: Eliminate it by reducing preparation times, synchronizing quantities, aligning processes, and adjusting planning and visibility, focusing solely on current necessities.

Waste Waiting: Eliminate it by optimizing workflow synchronization, which involves addressing imbalances caused by uneven neglect of workers and equipment.

Transport Waste: Develop plans to eliminate transportation and handling when feasible, and, if unavoidable, streamline the transportation and handling of materials that must be managed.

Process Waste Itself: Expand the perspective beyond economies of scale or speed by critically evaluating whether the part or product should be manufactured at all, and subsequently assessing the necessity of each process involved.

Inventory Waste: Minimize waste by shortening preparation times, synchronizing workflows, enhancing business capabilities to manage fluctuations in product demand, and reducing inventory-related waste.

Waste of Movement: The study examines how economic dynamics and quantities influence productivity and how improvements in quantities contribute to enhanced quality.

Waste Making Defective Products: Enhance production processes to prevent defects,

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thereby eliminating the need for inspection at each stage, ensuring that no defects occur and that all processes meet quality standards.

Additional financial benefits of the JIT system are outlined as follows.

1- Low investments in factory and warehouse space.
2- Reduce the risk of obsolescence in inventory.
3- Reducing recycling.
4- Reducing paperwork.
5- Reduce direct material costs through the purchase of specific quantities

The Development of the ABC System and the Concept and Importance of the ABC System

Continuous advancements in the industrial sector have necessitated the exploration of various methods for accurately determining and reducing costs. The ABC system has emerged as a solution to the limitations of traditional cost accounting systems, which often fail to provide the required precision due to the diversity and complexity of products. Additionally, rapid technological progress and shifting customer preferences have transformed the business environment, intensifying both local and global competition. These factors have driven economic units to seek methods that ensure competitive pricing and high-quality goods that meet customer requirements and expectations.

According to Kadhim and Al-Ghezi (2021), several concepts underpin the ABC system. One key concept is that ABC serves as a method for determining costs by allocating expenses to cost objectives, such as products or customers, based on the activities performed in relation to these objectives. Drury (2013) asserts that ABC technology focuses on tracking indirect industrial costs through primary activities rather than departmental allocations, with most activities categorized into cost pools. The system has further evolved to include methodologies such as Time-Driven Activity-Based Costing (TDABC), introduced by Kaplan and Anderson (2004). TDABC emphasizes the study of time requirements for each activity, enhancing the accuracy of cost allocation (Gervais, Levant, & Ducrocq, 2010). Additionally, the Fuzzy-Activity-Based Costing (PEABC) system represents the third generation of ABC, incorporating fuzzy logic to address cost estimation challenges. The objective of this system is to uncover latent resources associated with activities and determine their costs through the identification of nine distinct steps for each cost element (Sarokolaei, Bahreini, & Bezenjani, 2013).

1- Identify the main activities.
2- Determine the actual resources required for each activity.
3- Determine the actual rate of each activity resources.
4- Determining the cost of each activity.

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5- Calculating the standard average for each activity.
6- Calculating the deviation price of the activity.
7- Calculating the cost of implementing each activity.
8- Calculating the deviation value.
9- Calculating the profitability of each activity

Traditional cost systems have struggled to adapt to the evolving business environment, leading to diminished competitive and financial performance among companies. This situation has necessitated the exploration of alternative techniques and methods, as traditional systems are inadequate for advancing and enhancing company performance. Among these alternatives is the ABC method, which serves as a modern strategic approach for improving performance. By providing precise information on production and accurate cost allocation for products, ABC enhances operational performance and financial competitiveness (Almashkor, Abdulahad, & Albazooni, 2023). According to Sandborn, ABC is defined as a method for measuring product costs by identifying key product specifications and cost drivers. The cost of each product feature is then calculated, providing a comprehensive assessment of the overall product cost. According to Sandborn (2017), Pirretti defines the approach as one that determines and allocates costs based on activities and processes associated with product characteristics, aiming to measure and allocate product costs with greater precision (Pirretti et al., 2006). The term "ABC11" is used to differentiate it from traditional Activity-Based Costing (ABC), with "11" signifying a distinction. Differences between ABC and ABC11 are outlined in Table 1 (Azeez, Kadhim, & Kadhim, 2020).

Table 1: Differences between ABC and ABC11.

Activity-Based Cost ABC	Cost Based on Attributes ABC 11
Focused on the internal environment	Focused on the external environment
Products consume activities, activities consume resources and cost arise	Product attributes consume activities and activities consume resources and create cost
Cost object is activity	The cost object is the product
Product as an entity	A product is a set of attributes
The cost drive is the activities	Cost drive is customer preferences
The cost of the product is calculated by combining the costs of activities	The cost of the product is calculated by the cost of qualities
Do not rely on the idea of producing what is sold	It depends on the idea of producing what is sold
Does not provide direct measures of quality	Provides direct measures of quality
Part of ABC 11	It's wider than ABC.

The ABC11 technology is characterized by the following key components:

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1. ABC11 technology aligns with contemporary marketing practices by emphasizing customer orientation. It involves identifying both tangible and intangible specifications that reflect the customer's perspective.

2. ABC11 technology utilizes scientific methods, such as joint analysis and value engineering, to determine product specifications. It employs the value chain analysis based on market realities to assess costs associated with achieving each attribute, thereby allowing precise determination and measurement of costs and benefits for each product unit (Barfield, Raiborn, & Kinney, 2020).

3. ABC11 technology focuses on analysing the relationship between cost and benefit for each product unit. This enables the determination of multiple pricing levels and the utilization of product units by grouping costs and benefits to meet the required specifications (Brogan et al., 2019).

4. ABC11 technology involves allocating resource costs based on their relationship to the achievement of each attribute and product unit. It facilitates cost-based planning using a hierarchical model that displays costs and benefits according to each level of achievement, attribute, and product unit (Maelah et al., 2017).

Moreover, the adoption of ABC11 technology can facilitate the achievement of sustainable development goals by enhancing decision-making processes to secure competitive advantages. This is accomplished through the production of products tailored to customer demands, their enhancement, or the modification of production techniques. Industrial companies are increasingly focusing on maintaining and expanding their competitive edge in the market by leveraging advanced technologies and contemporary production methods. Additionally, achieving sustainability has become a critical objective for these companies to sustain their competitiveness in the modern business environment. It is posited that contemporary management accounting techniques, such as ABC11, play a significant role in advancing sustainable development goals (Ahmad & Sulaiman, 2023).

The concept of cost technology based on ABC11 features arises from the understanding that product attributes are the set of characteristics and features that provide value to the customer, thereby influencing their purchasing decision and reducing the likelihood of considering competing alternatives. The specifications are categorized as follows:

1. Basic Specifications refer to the fundamental requirements that a product must meet to be offered in the market. These specifications represent the minimum standards anticipated by customers and are generally expected across all competing products within the target sector.

2. Distinctive Specifications are the attributes that set the product apart from those offered by competitors. These specifications differentiate the product provided by the

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economic unit and highlight its unique features.

3. Incentive Specifications are pivotal not only in differentiating the product offered by the economic unit from those of competitors but also in influencing the purchasing decision. These specifications are the primary factors that motivate customers to choose one product over others. Economic units should prioritize the value proposition of their products, recognizing it as a critical source of profitability. This focus involves attracting market competitors by ensuring customer satisfaction through products that offer superior value and quality compared to those of competitors. The effectiveness of this approach is contingent on aligning with the customer's perception and evaluation of the product's features. Based on this premise, the cost technology based on ABC attributes is regarded as a significant method for product cost measurement. This approach aims to achieve precise identification and allocation of product costs, providing valuable information to support decision-making. Referred to as ABC, this technique relies on product characteristics to determine and measure costs effectively, thereby facilitating informed decision-making.

Fourth Theme: Integration between JIT and ABC 11 Systems

The integration of the JIT and ABC11 systems is driven by their mutual objective of cost reduction. In the context of intense market competition, companies strive to capture a larger market share by attracting more customers. The integration of JIT and ABC11 systems is facilitated through their complementary functionalities within the contemporary manufacturing environment. The JIT system emphasizes the organization of production into cells, the enhancement of skills, and the establishment of effective technical and supplier relationships. It is crucial for companies to engage with local suppliers to minimize lead times and transportation costs, while ensuring comprehensive quality management to achieve zero defects through continuous process improvement. This integration not only reduces damage costs but also contributes to overall cost reduction.

The integration of JIT and ABC activity costing systems confers a competitive advantage to the factory. The ABC system identifies key activities involved in product manufacturing, allowing for the aggregation and allocation of costs based on these activities. This system focuses on aligning activities with customer preferences, thereby enabling the identification and elimination of non-value-added and inefficient activities. This process not only facilitates cost reduction but also emphasizes the complementary nature of JIT and ABC systems. By working together, these systems aim to streamline operations, enhance production efficiency, improve customer satisfaction, and further reduce costs. The integration and its benefits can be illustrated in Figure 2.

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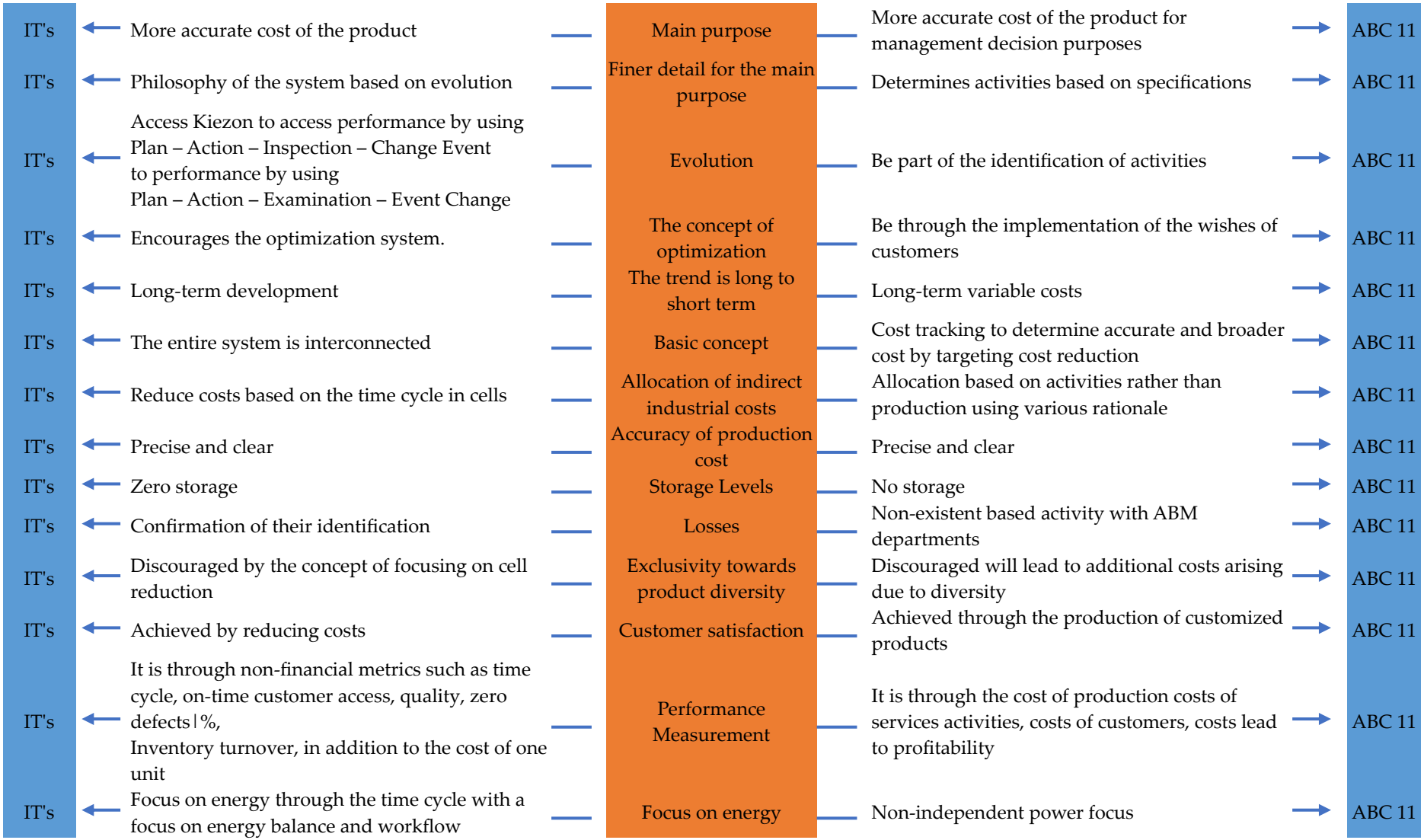

Figure 2: Integration between ABC11 and JIT Systems.

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This study can be applied to a medium-sized enterprise, specifically the Prince's Press. Established in 2019, Prince's Press is a printing facility that produces a diverse range of products. Recently, the press has implemented an integrated approach utilizing two systems: JIT and ABC11. These systems operate without inventory, as production is based on real-time requirements and customer specifications. Due to its focus on customized specifications, the printing press offers a variety of prominent products, which are as follow:

1. Brooches
2. Incense Burners
3. Shields
4. Like Graduation
5. T-Shirts
6. Carpets Printing Pictures
7. Embroidery Rugs
8. Wood Boards
9. Acrylic Certificates
10.Restaurants Menu
11. Restaurants Uniforms
12. Desk Boards

Previously, the company relied on traditional cost determination methods, incurring expenses related to warehousing, such as rent, salaries for warehouse staff, electricity, and other associated costs. Table 2 is a comparative analysis between the traditional system involving warehousing and the modern systems, including JIT and ABC11.

Table 2: Lists of Costs of Al-Amir Press for the Year 2023 According to the Integration of the JIT & ABC11 System.

T-Shirts	Like Graduation	Shields	Incense Burners	Brooches	Statement
3000000	15000000	2500000	3150000	400000	Direct materials
225000	2025000	225000	675000	11250	Direct wages
200000 200000 60000	2500000 1800000 450000	100000 200000 60000	300000 600000 180000	120000 10000 3000	T.S.G.M. Direct G Materials Direct expenses Rent electricity
3685000	21775000	3085000	4905000	544250	Total cost
200	600	100	300	300	Number of pieces
18425	36292	30850	16350	1814	Piece cost

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Office Panels	Uniform Employees	Menu Restaurants	Embroidery Rugs	Acrylic Certificates	Wood Boards	Printed Carpets
2600000	3060000	40000	1200000	1200000	1200000	1200000
112500	303750	225000	450000	337500	270000	225000
83335 100000 30000	204000 270000 81000	80000 200000 60000	63000 400000 120000	150000 300000 90000	84000 240000 72000	300000 200000 60000
2925835	3918750	605000	2233000	2077500	1866000	1985000
100	180	200	300	150	240	100
29258	21771	3025	7443	13850	7775	19850

Annual Profit Statements

Tables 3 and 4 present the annual financial summaries for Al-Amir Press, which operates utilizing the JIT production system and the ABC11 system. The integration of these systems eliminates the need for inventory storage, with both systems functioning based on customer-specific requirements. This integration facilitates cost reduction by combining specification-based costing with timely production. As a result, Al-Amir Press experiences increased sales and product diversity, leading to a broader distribution of fixed costs across a larger volume of products and sales. Consequently, this results in a reduction in the per-unit cost of products.

Table 3: Lists of Prince Printing Press costs for the year 2023 according to the integration of the JIT & ABCII system.

T-Shirts	Like Graduation	Shields	Incense Burners	Brooches	Total	Statement
4000000	27000000	3500000	6000000	1800000	61650000	Sale price
3685000	21775000	3085000	4905000	544250	49585335	Product cost
315000	5225000	415000	1095000	1255750	12064665	Profit

Table 4: Lists of Prince Printing Press costs for the year 2023 according to the integration of the JIT & ABCII system.

Office Panels	Uniform Employees	Menu Restaurants	Embroidery Rugs	Acrylic Certificates	Wood Board	Printed Carpets
3500000	4500000	700000	3000000	2250000	2400000	3000000
2925835	3918750	605000	2233000	2077500	1866000	1985000
574165	581250	95000	767000	172500	534000	1015000

Comparison of Lists in Case of Stores and In Case of No Stores

In traditional systems, the presence of inventory storage results in elevated product costs due to increased expenses such as electricity, rent for storage facilities, and wages for

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warehouse personnel. These factors collectively contribute to higher product costs. However, the integration of specification-based costing with the JIT production system mitigates these costs by eliminating the need for inventory storage. This integration reduces or eliminates storage-related expenses, including warehouse worker wages and electricity costs, thereby decreasing overall product costs. The details are summarized in Table 5.

Table 5: Annual Profit Lists.

(Presence of Stores)	JIT & ABC11 System Integration (Lack of Stores)	Statement
34550000	34550000	Direct Materials
5085000	5085000	Direct Wages
4184335	4184335	T.S.G.M. Direct G Materials
8020000	4520000	Direct Expenses Rent
2346000	1266000	Electricity
4500000	_____	Wages of Warehouse Workers
58665335	49585335	Cost of Products

Conclusions and Recommendations

1. Integration between the JIT and ABC11 systems is feasible and can facilitate cost reduction.
2. Implementing the JIT production system alongside ABC11 costing improves the operational performance of the printing press and enhances production capacity.
3. Successful implementation of the JIT system is heavily dependent on maintaining strong relationships with suppliers to ensure timely acquisition of raw materials and operational components that meet established standards and specifications.
4. Adopting the JIT system, in conjunction with ABC11, contributes to increased profitability, cost reduction, decreased rates of damaged and returned products, and an expansion in product variety and sales.
5. Due to ongoing advancements in the industrial and competitive landscape, traditional cost systems have become inadequate. Research has led to the development of specification-based costing systems, which address many of the limitations and criticisms associated with traditional methods.

Recommendations

1. Companies should transition from traditional cost measurement systems to modern systems that are aligned with customer specifications and preferences.
2. It is crucial to enhance the awareness of managers and boards of directors regarding the importance of aligning product and service specifications with customer needs and desires while maintaining cost efficiency.

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3. Companies should invest in tools and resources that facilitate the implementation of an integrated framework combining specification-based cost measurement and JIT production systems. This integration provides valuable information that supports increased profitability and cost reduction.
4. Iraqi companies and institutions must prioritize the adoption of contemporary costing systems to stay competitive and effective in the evolving market environment.

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