American Journal of Industrial and Business Management, 2022, 12, 365-375
https://www.scirp.org/journal/ajibm
ISSN Online: 2164-5175
ISSN Print: 2164-5167

A Company Production Management Optimization Research

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How to cite this paper: Omar, Z. S., & Bo, H. G. (2022). A Company Production Management Optimization Research. *American Journal of Industrial and Business Management, 12,* 365-375.
https://doi.org/10.4236/ajibm.2022.123020

Received: February 10, 2022
Accepted: March 25, 2022
Published: March 28, 2022

Abstract

The purpose of this study is to look at the important aspects that influence the execution of a company's production management optimization. The most important aspects found are: Effective Human Resource Management System (EHRMS), Integrative Planning and Scheduling (IPS), Internal Operations Synchronization and Effective Management Role (IOSMR), and Quality Governance and Strategic Process Control (QGSPC). All of these variables were considered independent variables in this study, whereas the Implementation of a Company Production Management Optimization (ICPMO) was considered a dependent variable. The study used a quantitative technique, and the participants were chosen at random. The primary data was then gathered using a survey method that contained all of the questions from the defined measurement constructs. All of the submitted hypotheses were found to be significant based on the outcomes of this investigation. The optimization of a production management system is strongly advised for all organizations looking to optimize earnings, achieve maximum productivity, grow sales, and gain market share.

Keywords

Implementation of a Company Production Management Optimization (ICPMO), Effective Human Resource Management System (EHRMS), Confirmatory Factor Analysis and Structural Equation Model

1. Introduction

The purpose of this research is to determine the efficacy of the Human Resource Management System (EHRMS), Integrative Planning and Scheduling (IPS), Internal Operations Synchronization and Effective Management Role (IOSMR), and Quality Governance and Strategic Process Control (QGSPC) in the implementation of a company production management optimization (ICPMO).

Production management, often known as operations management, is the process of planning, organizing, and optimizing a production process from raw materials to completed goods. The goal of production management is to establish the optimal balance of quality, quantity, time, and cost (Katana, 2020).

The day-to-day functioning of the firm is managed by operations management, which ensures that operations and production are carried out efficiently and seamlessly. Production management, like operations management, encompasses administrative, factory-level, and service management. The client is the focal point of operations and production management. If the consumer is satisfied, then the business is on the correct track. Production and operations management are not only suggested for improving certain aspects of a firm, but they are also required (Katana, 2020).

An organization is working towards accomplishing its business objectives by effectively producing goods and services that fulfill the demands of the consumer by doing a production and operations management analysis. As a result, consumer satisfaction will rise, resulting in increased sales and profits. Analysis of production and operations management also aids in improving brand image and lowering manufacturing expenses (Katana, 2020).

Although production management can be done in a tedious spreadsheet, it is not ideal since there is so much to accomplish that no one can afford to waste time on routine administrative activities. This is when automation enters the picture. As a result, businesses must automate their production management systems (Katana, 2020).

2. Literature Review

Production management has the ultimate objective of optimizing the manufacturing efficiency with the current production capacity. In other words, it involves the most efficient and effective ways of running a business. Production management is almost similar to operations management (Katana, 2020). Essentially, the function of a production management system is to achieve lean manufacturing. So, by optimizing the manufacturing output, a company can expect to lower its manufacturing costs either by not having resources waiting idly by or by figuring out the best way to store inventory, such as using ABC inventory (Katana, 2020).

Lean is a systematic approach to reducing waste in all of its forms on an assembly line in a practical, dependable, and cost-effective manner. It defines waste as anything that increases the cost of a product, such as unused worker hours, excessive movement, or unnecessary steps in the manufacturing process (Ghodrati & Zulkifli, 2012; Rolland, 1998). Implementing this methodology has been shown to have a number of potential benefits, including reducing work-in-process inventory (partially finished goods awaiting completion) and shortening the time required to produce each screen (lead-time) (Abdulmalek & Rajgopal, 2018; Kasher et al., 2018). In other words, in order to avoid all costs, all systems must be functional, efficient, and effective.

Toyota Motor Corporation (Toyota) is widely credited with inventing lean (Kasher et al., 2018).

Jidoka: The Japanese word Jidoka means "automation with a human touch," according to Toyota Global (Toyota, 2018; Kasher et al., 2018). It represents the idea of a well-designed machine that can make decisions on its own and thus requires less human supervision. It was inspired by the automatic loom, which was designed by one of Toyota's engineers to stop automatically when a broken thread was detected. Because one man can keep track of several looms, this type of machine requires less human supervision. This is an important pillar of TPS because it drastically reduces the need for human labor, allowing a company to save money on wages.

Just-in-Time (JIT) inventory is a method of organizing production by delivering and receiving materials and parts "right when they are needed" (Norwich University Online, 2018). Materials are not only not allowed on the production floor until they are needed, but they are also kept away from stations until production is active. As a result, inventory is reduced, and thus storage costs are reduced. Starting the JIT implementation process is a multi-step process. The first step is to evaluate and document existing inventory. The results are then used by managers to determine what the firm will require in the future. Finally, managers implement JIT in the workplace by stocking only what is required and purchasing new materials only when a specific order from a customer requires it. Logistical costs and inventory waste are reduced because factories must store fewer materials. Furthermore, a flexible inventory that is based on customer orders allows for customer responsiveness. However, any delays from the suppliers of a factory's parts can seriously impact the factory's bottom line. Furthermore, fluctuations in the market price of certain parts have a greater impact on JIT systems because they are more reliant on other companies and thus less reliant on their own stock of these parts (Kasher et al., 2018).

The 5S system is one method for identifying and addressing inefficiencies in manufacturing. The 5S system, which was originally conceived as part of the Toyota Production System, provides numerous benefits to the operation of a workplace, including improved performance, better health, and increased safety (Rahman, 2010). Each "S" in 5S represents a step in a process that improves a business's function. In English, the five "S"s stand for Sort, Set in Order, Shine, Standardize, and Sustain (Lean Enterprise Institute, 2018).

Sorting a workspace's inventory removes all excess items from the workstation. This includes storing less frequently used items in a different location while keeping more important items close at hand. Set in Order, on the other hand, is dedicated to organizing materials in the most logical way possible, taking into account the role of each item in each step of the process. Shine starts the company's and each individual employee's responsibility to clean up his or her office. Following the implementation of Sort, Set in Order, and Shine, a company must standardize the process so that the workplace does not revert to its previous state. Standardization entails assigning regular tasks, creating schedules, and posting instructions to help these activities become habitual. Sustain, the final step of the 5S system, refers to keeping the entire process running smoothly and keeping everyone in the system involved; it establishes 5S as a long-term program rather than a quick fix. Companies in Hong Kong have successfully increased product quality and employee satisfaction by implementing 5S principles. The use of the 5S system has also been shown to facilitate the integration of other management tools. Ho & Fung (1994) found that 5S was one of the most effective tools for increasing the success factor of Total Quality Management implementation, which is another lean manufacturing principle, in their research (Ho & Fung, 1994). 5S has also been demonstrated to be a catalyst for the successful implementation of other quality tool applications (Khanna, 2009).

According to the 5S System (Womack, Jones, & Roos, 2007), there are seven categories of waste in a factory:

1) Overproduction: Overproduction occurs when an item is manufactured in excess of the necessary demand, resulting in a stockpile of unused product. This generates waste since the product accumulates quicker than it is moved out, resulting in high storage costs and a reduction in product quality as quality control checks become more difficult at bigger sizes.

2) Waiting: A period of time during which a product is not being transported or undergoing a transformative process is known as waiting. In an assembly line system, much of a product's life is spent waiting to be processed further, resulting in lost period. Processes should ideally feed directly into one another, allowing for a smooth transition from one stage to the next.

3) Transportation: it is inherently inefficient because it consumes time, energy, and money while adding nothing to the value of a product. Manufacturing processes should be compact so that the finished item does not have to be carried over great distances during or after the process. Also, control and transportation present potential for product damage and degradation.

4) Inappropriate Processing: it refers to the misuse of resources in the performance of tasks. Tools and equipment should be tailored to the specific work at hand, thus when a machine is capable of far more than it is being used for, it represents inefficiency and waste. Investing in smaller, more specialized equipment is thus preferable, with a more powerful machine reserved for sufficiently tough jobs.

5) Unnecessary Inventory: it is frequently associated with overproduction and waiting. Excess inventory costs money and space, as well as cluttering the production area, which makes it difficult to continue producing. Unnecessary inventory is a waste that should be avoided or eliminated.

6) Excess Motion: it is an example of operator waste; needless movements waste time and energy, contributing to overall manufacturing process inefficiency. This is connected to ergonomics, and it can lead to health and safety concerns over

time as excessive motion leads to tiredness and injury.

7) Defects: they are a simple, direct, and quantifiable kind of waste. Every fault discovered results in one fewer product being sold, and every defect that is not discovered damages the brand's image and reputation. As a result, it is critical to reduce failure frequency at every stage of the process and whenever practicable (Kasher et al., 2018).

The systems and processes at the confluence of human resource management (HRM) and information technology are referred to as a Human Resource Management System (HRMS). It combines HRM as a subject, and particularly its basic HR activities and processes, with the field of information technology, whereas data processing system programming grew into standardized routines and packages of enterprise resource planning (ERP) software (Navaz et al., 2013). Human resources are one of an organization's most significant assets. Human resources must be involved in order to accomplish production management optimization.

3. Research Model

According to the current study, the Human Resource Management System (EHRMS), Integrative Planning and Scheduling (IPS), Internal Operations Synchronization and Effective Management Role (IOSMR), and Quality Governance and Strategic Process Control (QGSPC) must be effectively integrated and managed in order to achieve the effective implementation of a Company Production Management Optimization (ICPMO). As a result, the following model was created: (**Figure 1**).

3.1. Proposed Hypotheses

Hypothesis 1: Effective Human Resource Management System has a positive effect on the Implementation of a Company Production Management Optimization.

Hypothesis 2: Integrative Planning and Scheduling has a positive effect on the

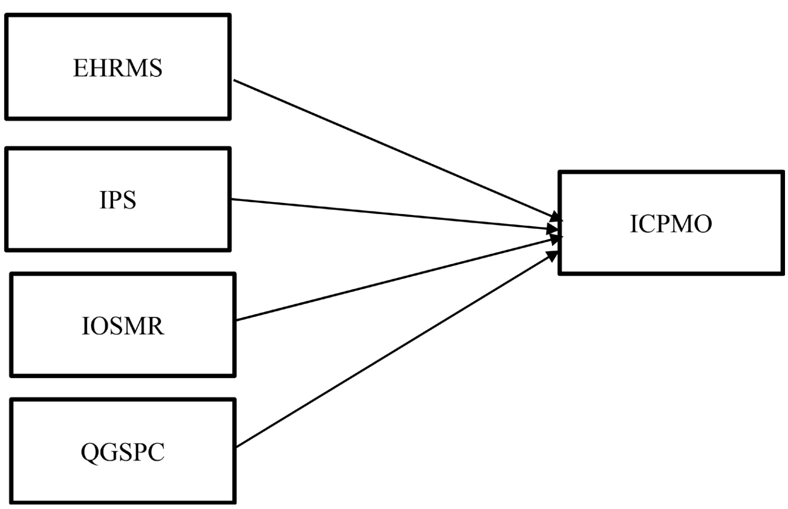

Figure 1. Research model.

Implementation of a Company Production Management Optimization.

Hypothesis 3: Internal Operations Synchronization and Effective Management Role have a positive effect on the Implementation of a Company Production Management Optimization.

Hypothesis 4: Quality Governance and Strategic Process Control have a positive effect on the Implementation of a Company Production Management Optimization.

3.2. Regression Model

- Use This research seeks to assess the effectiveness of Human Resource Management System (EHRMS), Integrative Planning and Scheduling (IPS), Internal Operations Synchronization and Effective Management Role (IOSMR) and the Quality Governance and Strategic Process Control (QGSPC) in the Implementation of a Company Production Management Optimization (ICPMO). As such, EHRMS, IPS, IOSMR, QGSPC, were regressed on ICPMO.
- The model is illustrated as follows:

$$\text{ICPMO} = f\left(\text{EHRMS}, \text{IPS}, \text{IOSMR}, \text{QGSPC}\right).$$

The model was expanded into a linear mathematical relationship as follows:

$$\text{ICPMO} = \beta_0 + \beta_1 E\text{HRMS} + \beta_2 \text{IPS} + \beta_3 \text{IOSMR} + \beta_4 \text{QGSPC} + \varepsilon .$$

3.3. Research Methodology

The researcher used a quantitative technique in this study, and primary data was collected by a questionnaire survey that included all of the study's measurement constructs. The self-administered surveys were delivered using the drop-off/pick-up (DOPU) method among the targeted respondents. Hand delivery of self-administered questionnaires is frequently promoted as an alternative to other ways for reducing non-coverage error, such as the mail method and face-to-face interviews (Steele et al., 2001). The participants in this study were chosen at random based on their likelihood of participating in the execution of a Company Production Management Optimization (ICPMO). The independent variables in this study were the Effective Human Resource Management System (EHRMS), Integrative Planning and Scheduling (IPS), Internal Operations Synchronization and Effective Management Role (IOSMR), and Quality Governance and Strategic Process Control (QGSPC), while the dependent variable was the Implementation of a Company Production Management Optimization (ICPMO). The preceding research was used to construct all of the measurement items for this study. For data entry and analysis, including reliability analysis using Cronbach's Alpha, a Statistical Package for Social Sciences (SPSS version 20) was utilized, while statistical software called AMOS (version 20) was used for the creation and computation of the Structural Equation Modeling (SEM). The structural model was also subjected to a Confirmatory Factor Analysis (CFA), the findings of which were utilized to examine the validity of the internal consistency of the study's created measuring items, as well as the outcomes of hypotheses testing.

4. Data Analysis and Results Interpretation

4.1. Reliability

To test the internal consistency of the measurement constructs in this study, a reliability analysis was performed on SPSS Version 20 using Cronbach's alpha. According to the findings, all internal consistency levels are satisfactory. The values ranged from 0.774 to 0.892. According to Nunnally (1978), an appropriate alpha should be more than 0.70. To be more specific, Effective Human Resource Management System had a score of 0.892, while Integrative Planning and Scheduling received a score of 0.807. Internal Operations Synchronization and Effective Management Role contributed for 0.791, while Quality Governance and Strategic Process Control accounted for 0.774. The implementation of Production Management Optimization yielded a result of 0.801. Each developed variable had 5 elements.

4.2. Confirmatory Factor Analysis

The validity of the study's constructed measuring constructs was assessed using confirmatory factor analysis (CFA). It was carried out using AMOS version 20 using a structural equation model that included all of the study's measurement items. According to the findings of confirmatory factor analysis, all of the factor loadings are acceptable, since they all fall within 0.55 and 0.87. As a result, all of the research's established constructs are valid (**Table 1**).

Table 1. Variables, items and factor loadings.

Developed Constructs	Items	Factor Loadings	Number of Factors	Results of Reliability Analysis
Effective Human Resource Management System	EHRMS1	0.77	5	0.892
	EHRMS2	0.78		
	EHRMS3	0.86		
	EHRMS4	0.67		
	EHRMS5	0.87		
Integrative Planning and Scheduling	IPS1	0.69	5	0.807
	IPS2	0.64		
	IPS3	0.62		
	IPS4	0.64		
	IPS5	0.78		
Internal Operations Synchronization and Effective Management Role	IOSMR1	0.71	5	0.791
	IOSMR2	0.64		
	IOSMR3	0.64		
	IOSMR4	0.60		

Continued

	IOSMR5	0.70		
Quality Governance and Strategic Process Control	QGSPC1	0.69	5	0.774
	QGSPC2	0.55		
	QGSPC3	0.60		
	QGSPC4	0.61		
	QGSPC5	0.74		
Implementation of Production Management Optimization	IPMO1	0.76	5	0.801
	IPMO2	0.67		
	IPMO3	0.66		
	IPMO4	0.67		
	IPMO5	0.57		

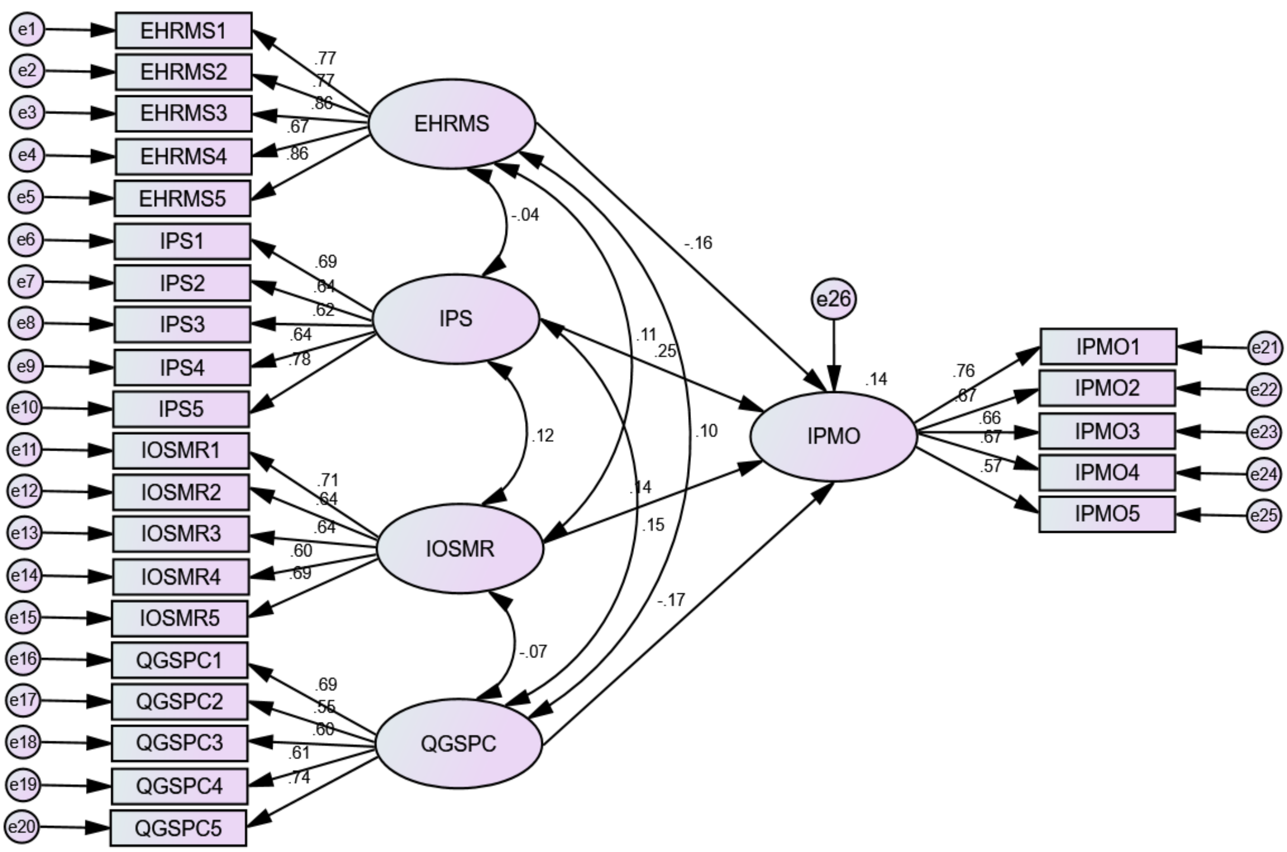

Figure 2. Structural equation model.

4.3. Structural Equation Model

A structural equation model (SEM) was then constructed on AMOS Version 20. The model achieved a good fit, giving the value of Chi-square = 647.095, Degrees of freedom = 265, GFI = 0.882, AGFI = 0.855, TLI = 0.873, CFI = 0.888, RMSEA = 0.062 (**Figure 2**).

Notes for Model (Default model).

Computation of degrees of freedom (Default model).

Number of distinct sample moments:	325
Number of distinct parameters to be estimated:	60
Degrees of freedom (325 - 60):	265

Result (Default model).

Minimum was achieved.

Chi-square = 647.095.

Degrees of freedom = 265.

Probability level = 0.000.

Table 2. Results of hypotheses testing/regression weights: (group number 1: default model).

Hypothesized Effect			Estimate	S.E.	C.R.	P	Label
IPMO	<---	EHRMS	−0.122	0.046	−2.641	0.008	Positive
IPMO	<---	QGSPC	−0.134	0.051	−2.607	0.009	Positive
IPMO	<---	IPS	0.185	0.049	3.815	***	Positive
IPMO	<---	IOSMR	0.109	0.050	2.201	0.028	Positive

Based on the results of hypotheses testing, all the independent variables of this study have a positive effect on the dependent variable. In other words; Effective Human Resource Management System, Integrative Planning and Scheduling, Internal Operations Synchronization and Effective Management Role and the Quality Governance and Strategic Process Control have a positive effect on the Implementation of a Company Production Management Optimization (Table 2).

5. Results Discussion

The findings show that an effective HRM system has a favorable impact on the implementation of a company's production management optimization: (standardized estimates = −0.122, t − value = −2.641, p = 0.05). (standardized estimates = −0.134, t − value = −2.607, p = 0.05) Quality Governance and Strategic Process Control have a beneficial influence on the Implementation of a Company Production Management Optimization. Integrative Planning and Scheduling also has a favorable influence on the Implementation of a Company Production Management Optimization: (standardized estimations = 0.185, t − value = 3.815, p = 0.05). Internal Operations Synchronization and Effective Management Role, according to the findings, have a favorable impact on the implementation of a Company Production Management Optimization: (standardized estimates = 0.109, t − value = 2.201, p = 0.05).

Improvements are divided into three categories: 1) Making better judgments, which essentially means not optimizing, which results in sub-optimization. 2)

Application of optimum solutions to a limited group of problems, such as a subset of feasible options, a subset of the process, or a subset of alternative goals. As a result, sub-optimization occurs. 3) Full optimization, or the implementation of the optimum solution for the entire scope (Moreno, 2006). According to the current study, implementing a human resource management system, integrative planning and scheduling, internal operations synchronization and effective management roles, as well as quality governance and strategic process control, all have a positive impact on the successful implementation of a company's production management optimization.

6. Conclusion & Limitation

The current study looked into how a company's production management may be improved. To be more precise, the research looked at the important aspects that influence the performance of a company's production management optimization system. The Effective Human Resource Management System (EHRMS), Integrative Planning and Scheduling (IPS), Internal Operations Synchronization and Effective Management Role (IOSMR), and Quality Governance and Strategic Process Control are among the most important elements highlighted by the study (QGSPC). These characteristics were considered independent variables, whereas the implementation of a company's production management optimization was considered a dependent variable. The respondents were chosen at random and the study used a quantitative technique. The primary data was then gathered using a survey technique that included all of the questions from the measuring constructs that had been constructed. All of the submitted hypotheses were found to be significant based on the outcomes of this investigation. All organizations looking to optimize profitability, achieve optimum productivity, grow sales, and gain market share should consider optimizing their production management systems. Future research could focus on automating steps of the framework so that businesses can utilize it even if they lack in-depth simulation knowledge. An overarching optimum of the system under examination may be found by automating the entire simulation process. Another, more far-reaching element is that the model might be combined with other models of the digital factory and even with the engineering's digital twin.

Acknowledgements

The Researcher would like to thank associate professor Bo Hongguang and academics from Dalian University of Technology's School of Economics and Management.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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