Analyzing the Production System and Redesign it. Case Study in Company state of IBN-Majid.

Iman Asker Hawi
Assistant Dean
Southern Technical University / Technical Institute Basra/ Iraq Iman.hawi@stu.edu.iq

Article History: Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 4 June 2021

ABSTRECT
The research aims to improve the reality of the production system in the Ibn Majid Public Company by comparing its production method with the two methods (Just-in-time (JIT)) and (Materials Requirement Planning (MRP)) to find a method that can contribute to improving the production process in the company. In fact, the production system is one of the important systems at the industrial company, and any defect in the industrial organization and weak of its internal performance, or in the market is due to the defects and weaknesses in the production system.

1. Introduction

The production system is considered as the core of industrial organizations and companies, and it exchanges influence with most of the organization's functions and activities, as well as the environment that deals with it, and it has a clear and effective role in the overall level of the organization and its long-term goals. Handling these industrial organizations to manage production and develop them according to the nature of environmental change in the fields of (technology and competition).

Whereas the Iraqi industrial companies desire a rapid development and improvement, and strive to be the precedent in production with acceptable quality and cost, and to enter the global competition market, which are registered with an effective competitive advantage, and seriousness began to go through the competition in the qualification processes for the quality management system ISO 9001 Edition 2000, Therefore, it became necessary to pay attention to its strategies, to scientific renewal of its orientations, as well as to search for more advanced methods to improve the performance of its internal processes in relation to its performance at the comprehensive level.

Interest in the production system and its review is the correct and important starting point in the comprehensive and continuous improvement processes, and any review and improvement of the production system has positive and significant results at the level of the industrial company.

2. Literature review

Concept of (MRP)

Production systems work on planning to get rid of wastes and most of them are directed to getting rid of loss in time, or in inventory, and from the systems that have been developed for the purposes of approaching response in time, especially the time of keeping the stock, which is the planning system for material needs (MRP), as it is known (MRP) is a statement (a tool for specifying information scheduling the time of ordering materials, parts and components and when it should be ordered or produced) [1], as it is intended (logically planning material requirements to determine the number of parts and components and the

needs to produce a particular product) [2] , ((Aquilano) refers to the timing method and determining the requirements from the materials of the derivative demand according to the requirements of the production process, and thus it is a system for planning priorities for parts of the product, so that the date of their provision coincides with the date of the actual need of these parts) [3] ,It is also known as(production planning and scheduling and inventory control system and is used for managing manufacturing operations. Most MRP systems are software- based, while material requirements planning can be done manually)[4].

The MRP system is used for scheduling components that are not independent of each other, which means, in cases of derivative demand, the difference may constitute the quantity of parts required for the stages of the production process, and the periods of receipt thereof, a difference in the need for stock, and the consequent accumulation of additional unnecessary stock, so the trend was towards a system that controls the quantity of required parts, and they can be obtained for the purposes of their use at the required time of the production process. Both method and components of building and operating an MRP system can be summarized as follows [5]: -

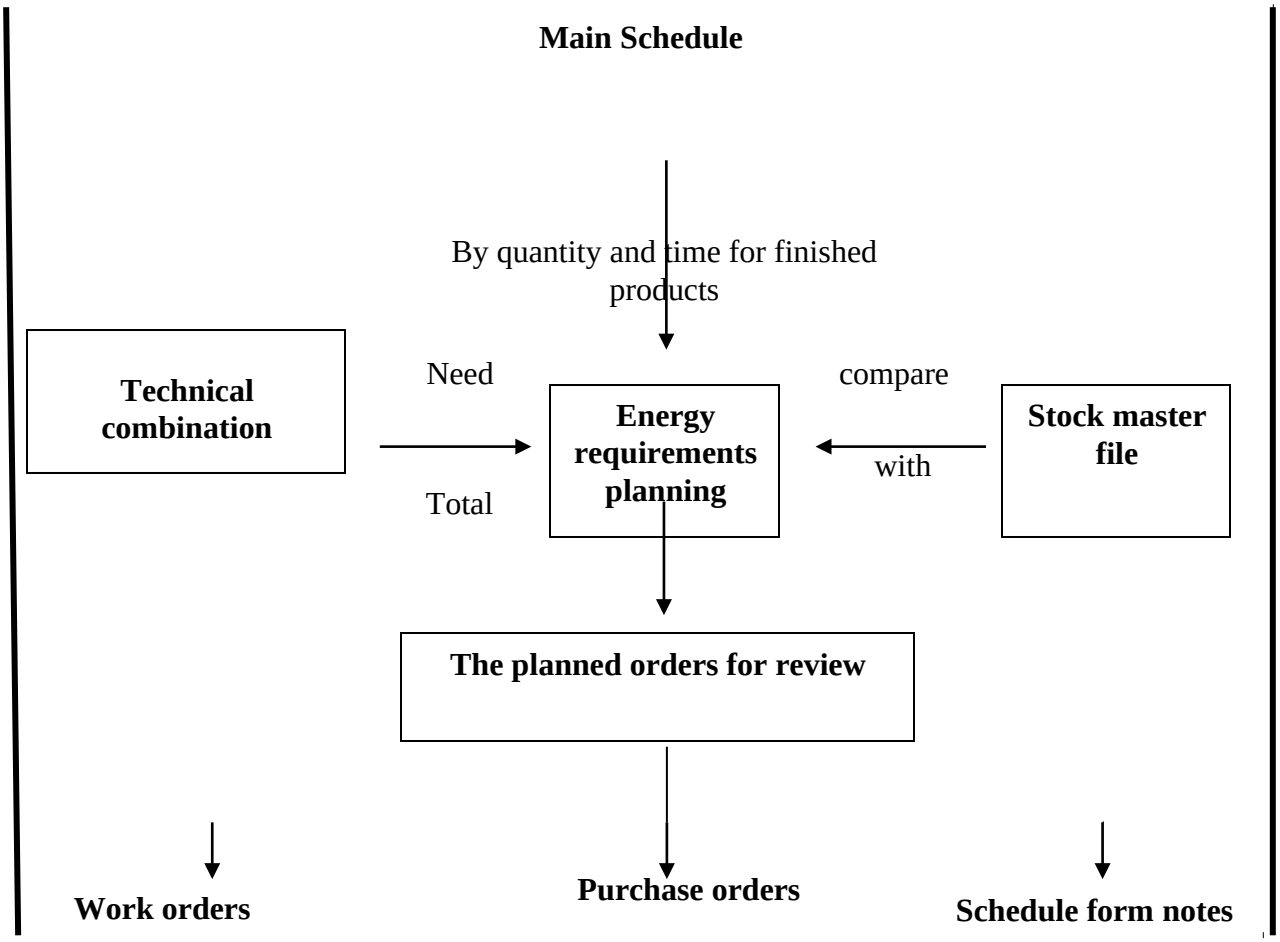

Figure: 1 Material required planning (MRP)

The concept of (JIT)

The system (simultaneous production) is measured on the premise (producing only the necessary units in the necessary quantities and the necessary time). This means that any item is required to be prepared exactly when it is needed, i.e. at the time, and if the system was designed initially to reduce stock levels, it has eventually become a system Continuous

improvement of all aspects of the production process. By getting rid of (waste), as waste is defined according to the concept of (JIT) philosophy (that is, anything in addition to the minimum amount of equipment, materials, parts, and time that is necessary and rewarding to add value to the product) [6].

The (Instant Production) system (JIT) is defined as referring to farther from controlling the inventory to include the whole production system where work is done to remove all sources of waste and any activity that does not add value to production by providing the appropriate part in the right place and at the right time.[7], as it is defined more broadly in terms of (the production system in which the processes and movement of materials and products are carried out ... etc. When they are required, the result is very little stock and very large production according to the production pattern from hand to mouth) [8], Likewise, (JIT) points out that it is a Japanese management philosophy applied in manufacturing, which includes obtaining the right elements with the right quality and quantity in the right place at the right time.[9].

The (JIT) system consists of a set of major components (flexible resource, cellular arrangement, production withdrawal system, control by kanban, small batch production, rapid configuration and installation, standardized production, quality at source, network of suppliers, continuous improvement) [10] , As the interpretation of these processes and the relationship between them indicates the ability of the system to respond in time, whether in the order of the finished product, or the needs of the successive operations related to the product, and there is an important issue specific to the (JIT) system, it is a matter of addressing system problems from outside the system Processes.

Both the withdrawal and control processes through the cardiac alkaloid card are located in the work of the JIT system, because the first allows the response method as needed, and the second organizes the response process from one stage to another.

The withdrawal system depends on the customer's requests. Any subsequent station moves to take its needs from the previous station, and then handles it quickly. Every worker at a later station takes his need from the previous station, and every previous station is available only as much as the next station needs it, and this It makes the operations in successive stages because the coordination of work with each other. Then comes the kanban card to control the check movement between the stations, because the card is designed to respond to a standard production quantity. It allows controlling the amount of materials or parts between the stations and according to their needs, because the container of materials or parts that carry the card is limited to a certain level and as shown in the figure Next [11]:

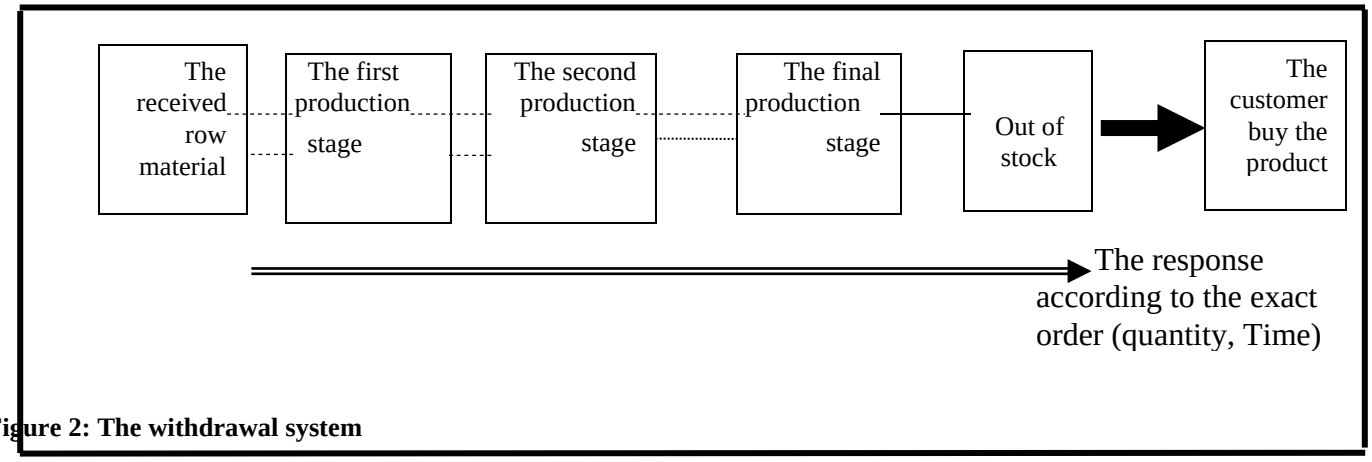

Figure 2: The withdrawal system

T

he production process flow differs according to the (JIT) system, from the normal production flow or what is called (by payment) begins with scheduling the first stage of production, and pushes the successive operations towards the system's output, or in response to the customer's order, while the withdrawal system starts scheduling from the last stage of production, which converges with the customer's order, then retreats towards the other previous stages and first stage, as each previous stage assesses its need according to the subsequent stage. Thus, the process of withdrawing the flow from the previous stages takes place in light of the needs of the later stages. This means the simultaneous needs of the stations.

The important point remains in practically controlling this synchronization in a way that leads to the equality of the need with the response, and this state is achieved from the mechanism of action of the Kanban card, which balances its parameters and its movement between each two stations until this balance is achieved in its actual possible state, is how to benefit from the compatibility between the principles of the simultaneous production system (JIT) and (material requirements planning MRP), in improving the production process in Ibn Majid Company (the subject of the study).

Comparison between (JIT) and (MRP)

Despite the importance of the MRP system, and its benefits in reducing or eliminating waste time, it remains limited to one type of demand (derived demand), and it is difficult to use in other cases. So the Japanese developed another model for the production system, which was more concerned with loss and more effective in getting rid of it, and this system was called (instantaneous production JIT), and it meets with the MRP system in general principles, such as the orientation towards reducing stock, or responding to some needs in time, However, it differs from it in terms of dealing with the stages of production, and the method of production flow from one stage to another. The following comparison reveals that [12].

1. The (MRP) system uses a planning philosophy based on building a correct materials plan according to the needs and then implementing according to the plan, unlike the (JIT) system, which emphasizes eliminating waste, and this is by reducing stock, detecting problems and withdrawing materials during manufacture.
2. The (MRP) calculator is used to process complex and detailed information, while the (JIT) system is a manual system that uses visual control. If the (MRP) that produces production orders and purchase orders requires extensive office work in order to control the factory, then (JIT) uses kanban cards that are used as production orders and purchase orders, reducing office work to a minimum.
3. The (MRP) system allows scheduling of a highly variable output. JIT scheduling can be used with the (MRP) system, but then the use of a calculator is not required. As for the (JIT) system, it requires stable and frequent production scheduling that is identical as in the mixed assortment of parts or products that are the same from day to day and hour to hour.
4. (JIT) system seeks to reduce the preparation times to a minimum, down to the one- minute or one-touch setup time, allowing the adoption of a small economic batch size. The (MRP) takes the preparation times as a parameter, so the large batch size is considered acceptable in the (MRP) input.
5. The JIT system considers suppliers as part of the team and encourages long-term relationships with them as well as with distributors, allowing for frequent small

supplies and orders. As for the (MRP) system, suppliers as well as distributors are treated more often as opponents, and they are keen on each other in order to obtain better prices.

6. In the (JIT) system workers are responsible for producing good quality parts to support subsequent operations and they also participate in solving problems and are tasked with increasing productivity and improving quality, while in the (MRP) system workers are part of the system and are subject to control, supervision and specialization in one job, as the role of the worker is follow and implement the plan.

From all above, we could easily observe that each of the two systems has advantages that differ from the other, but despite these differences, more benefits can be made by linking the two systems, which ensures more efficient control over production and inventory.

4. Research design

Problem Discussion

Ibn Majed Public Company in Basra suffers from a problem represented in the weakness of the production system and the failure to amend, change, and continuously review in a design with what suits and a cycle in the continuous development and improvement of the outputs of the industrial organization, which led to a weakness in the company's internal performance or in the market, as any defect The production system disrupts the entire company.

Objectives of the study:

The research aims to analyze the reality of the production system in the Ibn Majid Public Company and re-design it by reviewing and studying this system in an attempt to diagnose the weaknesses and the causes that lie behind them first, and then find solutions that contribute to improving it secondly by comparing the production method of Ibn Majed Public Company using (Automated Production System JIT) and (MRP).

Study hypotheses

Reviewing and analyzing the production system in Ibn Majid Company contributes to its improvement and re-design.

5. The empirical inquiry

Description of the technological sequence of the company's production system:

The study requires starting a brief presentation of the production process in Ibn Majid General Company, with its technical aspects (the technological path of the process) and the service (which represents production services and other supporting processes), as the company's production is characterized by being atypical and requires organization and coordination between all its activities. The main objective of the company is to enter the marine and oil industry, so it contains three basic factories, and its products focus on oil equipment (tanks, storage vessels), various structures, and the marine industry (boats). The sequence of stages of the production process can be summarized with all its requirements With the following :

1. Proc

edures for receiving orders from customers and contracting.

2. Preparing the employees.

3. Production processes (cutting, shell making, rolling, assembly, finished product).

4. Delivering the product to the customer.

Determining the extent of interpretation of the sub-variables for their main variables using (gradient regression) analysis:

A step regression analysis (STEP WISE REGRESSION) was performed between the main variables and their sub-variables for each paragraph of the questionnaire. The computer showed them in a series according to the strength of their interpretation of their main variables, and this is useful in knowing the sub-variables that are more expressive of their main variables, and the results were as in table (1):

Table 1: Shows the extent of interpretation of the sub-variables for their main variables

Main variable	**Paragraphs content**	**Symbol**	**STANT B**	**R***
Clarity and description of the production processes')stages C15	Often the stages process of production sequence in a company is clear3	C1	2336	2332
	Often the need for the previous and next stages of production is clear3	C2	2328	2348
	The top management determines a clear description of the stages of the production process3	C3	2317	2356
	The relationship between the size of the order and the specific need for it in the different stages of production is clear3	C4	2322	2361
	The company sets a time for completion ateach stage of production3	C5	2313	2367
	Often there is a specific description of the sequence of production processes3	C6	2332	2372
Documentation to describe the sequence of production processes)(C16	The top management in the company is interested in documenting and describing the sequence of production operations3	C7	2315	2354
	The top management in the company focuses on informing engineers, technicians and workers in describing the sequence of production processes3	C8	2322	2363
	The company often works according to the documented description of the sequence of production operations3	C9	2312	2377
Availability of technical and technological skills (C17	The company possesses some technical skills to manage production processes3	C10	2341	2374
	The company works according to a good technological sequence of the production process3	C11	2333	2381
Efficiency of the production system	The company has a good level of production system.	C12	2355	2373
	The company is committed to improving the production system .	C13	2363	2385

(dependent variable) (C18	The company works to meet the planned needs with actual work equirements at every stage of production .	C14	2338	2396

* A sequence of (R_2) values of the sub-variables for each main variable was computed on the basis of one variable, two variables, three variables, and so on in a sequence.

I

t is clear from the data of Table (1) containing the sequence of importance of the following main variables paragraphs:

1. The six variables showed (clarity of the sequence of stages of the production process (C1), clarity of the need for production stages for the previous and subsequent stages (C2), clarity and description of the stages of the production process (C3), clarity of the relationship between the size of the order and the specific need for it in the production stages (C4) Determine the completion time for each stage of production (C5), and a specific description of the sequence of operations

   The six variables showed (clarity of the sequence of stages of the production process (C1), clarity of the need of production stages for the previous and subsequent stages (C2), clarity and description of stages of the production process (C3), clarity of the relationship between the size of the order and the specific need for it in the production stages (C4), determining a time Achievement in each stage of production (C5), a specific description of the sequence of production processes (C6) Interpretation of the main variable (clarity and description of the stages of production processes) (C15), as it explained (72%) of the change in the main variable, which means clarity of the relationship and sequence In the stages of the production process, each stage has its limits, characteristics, and the extent of its need for the previous and subsequent stages, and the interdependence between them, and the idea is based on the description specified by the responsible authorities, but the practical reality may not help in the emergence of a state of differentiation between the stages, and the relationship between them And it may cause them to overlap or lose some of their independence, and the reason is due to the narrow area of the factory, or in other words to the poor harmony of the internal arrangement with the need of the stages and the flexibility of movement and the results of the review indicated that the relationship between the size of the order and the specific need for it in each of the stages is not Clear, especially with regard to it Besides the time or securing the materials required for the purposes of production in the specific process, since the need may be specified in the work order, but the procedures for requesting and programming the needs were not clear or specific, and this means the lack of scheduling and scientific methods related to its construction, and the context followed In the company, it sets a time for completion in each of the stages, but it is subject to evaluation or estimation on the basis of what is in place and is considered by them to be a record time, but in fact it is not a record time because it was not able according to scientific methods in estimating the standard time and not on The basis of the similarity of time in the company is similar and distinguished in its production, and despite the justification for not obtaining the raw materials or delaying them, this is not enough.

2. The three variables are clarified (interest in documenting the description of the sequence of production processes (C7), interest in informing engineers / technicians / workers in describing the sequence of production processes (C8), working on according to the documented description of the production process sequence (C9) as an explanation of the main variable (documentation to describe the sequence of production processes). (C16), where I interpreted (77%) of the main variable, and this indicates that there is a clear and specific description of the sequence of production operations, but the important issue is the extent of documenting the description, and whether the concerned persons (engineers / technicians / workers) are aware Knowing the description and then working on it according to this description and thus it is possible to monitor and determine the deviation or error on the basis of.

3. T

he two variables indicated (the company has some technical skills (C10), working according to a good technological sequence of the production process (C11), to an explanation of the main variable (availability of technical and technological skills) (C17), where they explained (81%) of the main variable and this indicates that The company possesses some technical skills, but it is below what is required on the one hand, and is insufficient in responding to the work requirements on the other side, and often the work is done on the basis of groups or teams, and the company works according to a good technological sequence of the production process and that the stages meet its requirements. The defect lies in the implementation procedures, and this is consistent with the importance of documenting the stages and familiarizing workers with the requirements and procedures of each stage.

4. The three variables showed (having a good level of the production system (C12), commitment to improving the production system (C13), working to meet the planned needs with actual work requirements in each stage of production (C14), an explanation of the relationship with the main variable (production system efficiency) (C18) , As interpreted (96%) of the main variable, which means that the effectiveness of the production system is demonstrated by the company have a good level of the production system and its commitment to improving the production system and facing the planned needs with actual work requirements in each stage of production and thus raising the efficiency of the production system and get rid of all kinds of losses.

Analyze data using correlations:

The relationship between the variables of the questionnaire was analyzed to determine the nature of the relationship between the analysis of the production system and its improvement in the company under study, and the relationship between the main independent questionnaire variables was summarized (clarity and description of the stages of production processes (C15), documentation to describe the sequence of production processes (C16), availability Technical and technological skills (C17) and the adopted main variable (production system effectiveness (C18) in Table 2, as follows:

etween the dependent variable and the independent main variables

Availability of technical and technological skills (C17)	Documentation to describe the sequence of production processes)C16)	Clarity and description of the production processes stages (C15)	Main independent variable The adopted main variable
23534	23812	23692	Effectiveness of the production system)C18(
2325	2325	2325	morale level

The results of Table 2, which shows the relationship of production system analysis to improving and raising its level of effectiveness and impact on the performance of the company under study and improving its productivity, showed that the correlation of all independent main variables (C15, C16, C17) with the adopted main variable (C18) indicates that strength and clarity as it appears in the relationships between each of the independent main variables and the dependent main variable as follows:

1. The independent main variables (C16 and C15) showed the highest and strongest correlation relationships with the dependent main variable (C18), as the correlational relationships reached (0.810,0.692), respectively.
2. The independent main variable (C17) ranked second in the strength of its relationship with the dependent principal variable (C18), as it recorded the correlational relationship (0.534) with the dependent main variable.

It is concluded from the foregoing that all the correlational relationships between the main independent variables and the adopted main variable are of a moral nature, and this indicates the validity and acceptance of the research hypothesis (reviewing and analyzing the production system in Ibn Majid Company contributes to its improvement and re-design), which means that improving the production system depends on reviewing and analyzing the system. Production in the company is under study.

6. Conclusions

The previous analysis referred into two main results, such as:

First: The company's lack of a clear scheduling system that analyzes the customer's order, its production stages, needs and requirements for each stage, and according to this analysis, the need for materials and parts is determined in the required quantity and time.

Second: does not meet the planned needs with the requirements of actual work at every stage of production, in a way that ensures response to the need of the stage, and operating with the required efficiency that contributes to the disposal of wastes ofall kinds.

As per what have mentioned previously, the model is established that achieves improvement in the production system through the compatibility between the production scheduling system according to (MRP material needs planning), and the principles of (JIT system).

According to the following steps:

1. A clear description of the order confirmed by the customer (with the required type and quantity) specifies the type of unit to be produced and is it only one unit or a group of units.
2. Analyze the unit which required to be produced to components and parts, i.e. (parts and materials) required.
3. Draws a plan for the structure of the unit to be produced according to the levels, indicating the following information (the need of the part and the material, the processing time, the waiting time, and the time of launching the order for manufacture or purchase).
4. Determining the needs and requirements of the last stage, which is precedes the delivery of the finished product to the customer or to the stores, and the needs of the other stages are determined successively, i.e. the last stage, after which the previous stage, and so on down to the first stage.
5. Reviews the needs and requirements of the stages to ensure that they are completed and that they fulfill all requirements and conditions and approve them, before starting the actual work.
6. Review the scheduling specified in the first three paragraphs, to verify that it fulfills the conditions and requirements, and approve them.

7. G
iving permission to purchase or manufacture orders for parts to be ready at the times specified for them.

8. Giving permission to start operations, so that the requirements of each process are ready and upon completion of the previous process the subsequent process is fully prepared to receive the flow process (materials or parts).
Thus, the production process is organized and the various cases of loss are disposed of as much as possible.
The following figure shows that:

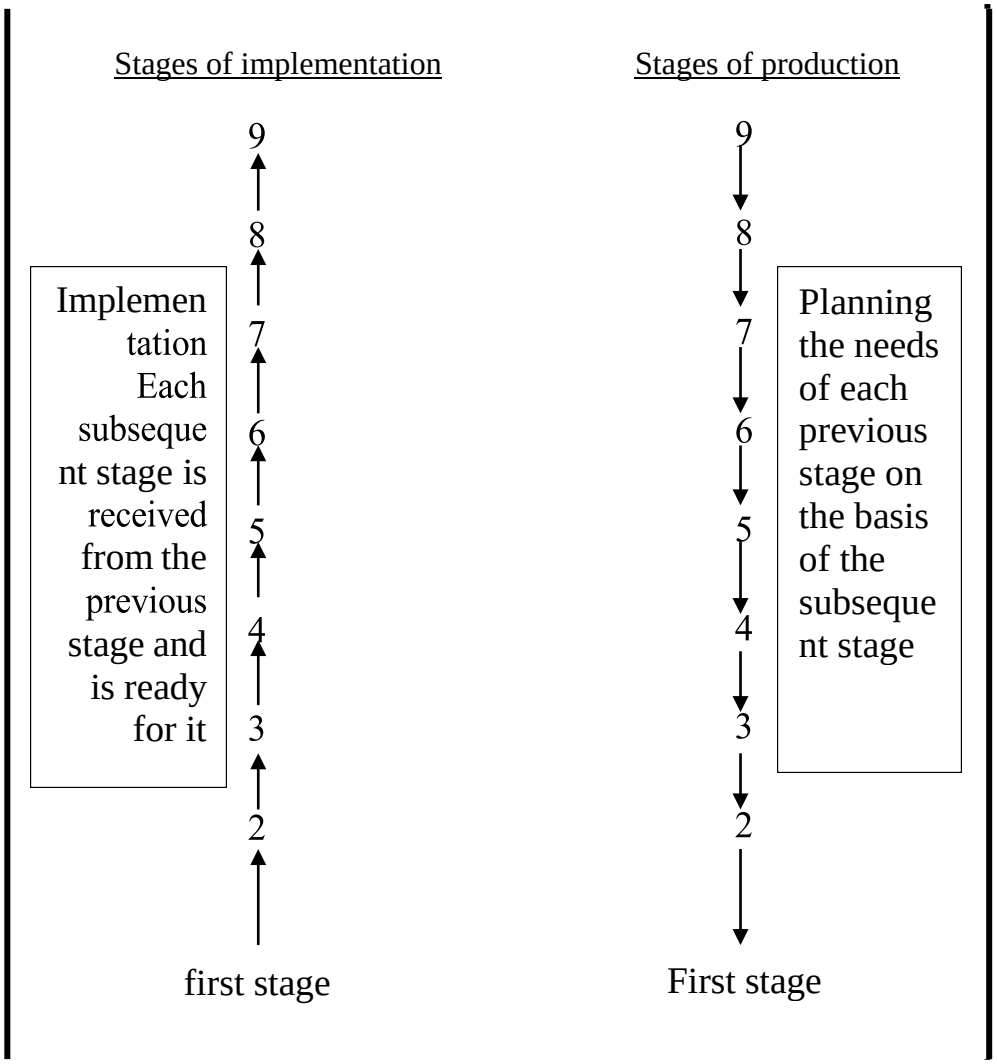

Figure 4: The production according to proposed system

References:

1-P.K.Shulka, (2000),"*Production and Operations* Management", Duskin/McGrow-Hill.

2- Les Galloway et al, *(*2000),*"Operations Management in context",* Butterworth Heinemann, Oxford.

3- Aquilano . Nigholas J. & Jacobs Robert F . ,Chase . Richarch B.,(2003)," Operations Management for Cometive Advantage : 4th ed : McGraw Hill Co.

4- Daft ، Richard L. ,(2003)," *Organization Theory and Design* ", 9th ed. , U.S.A , Western College.

5- William.J.Stevenson,(2002)," *Production and Operations* Management", McGraw-Hill\

Irwi

n, Boston .

6- Vikas Kumar, 2010, "*JIT Based Quality Management: Concepts and Implications in Indian Context*" ,International Journal of Engineering Science and Technology Vol.2 (1).

7- Roger.G.Schonberger,(2007),"*Operations Managemen*t", McGraw-Hill\ Irwin, Boston. 8-R.B.Chase and D.M. Stewart,(2000)," *Production and Operations* Management", McGraw-Hill,

.

9- Akbar Javadian Kootanaee, . K. Nagendra Balm, Haniidreza Fooladi Talari,(2013)," *Just- in- Time Manufacturing System: From Introduction to Implement*", International Journal of Economics, Business and Finance, Vol. 1, No. 2 ,ISSN: 2327-8188 (Online)

.

10- Michael K. Adeyeri, Kehinde Adeleke,(2019*)," Development of SMEs Coping Model for Operations Advancement in Manufacturing Technology*",Advanced Applications in Manufacturing Enginering

11- Michel Robert and Bernard Racine,"*E-Strategy pure and sample*s", McGraw-Hill, 2001

12- Johnny C. Ho,(2001), "*An integrated MRP and JIT framework*"**,** Computers & Industrial Engineering 41 (2).

13- Yogesh Hole et al 2019 J. Phys.: Conf. Ser. 1362 012121