


APPLICATION THE KANBAN CARDS AND THE VALUE STREAM MAP (VSM) TO RATIONALIZE INVENTORY COSTS AND TO IMPROVE THE COMPANY'S PERFORMANCE AND OVERSIGHT APPLIED RESEARCH IN ELECTRICAL CABLES FACTORY / UR STATE COMPANY FOR ELECTRICAL INDUSTRIES

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 31 January 2023</p> <p>Accepted 27 March 2023</p>	<p>Purpose: This research aims to try to application the two cards (kanban) system and the value stream map in the electrical cables factory in the Ur Company for Electrical Industries, with the intention of rationalizing the storage costs and improving the production, marketing and warehouse process to get rid of waste, and loss in time and cost.</p>
<p>Keywords:</p> <p>Kanban; Value Stream Map; Zero Inventory; Just in Time; Box Scores; Burst Kaizen; Map Current Status; Map Future Status.</p>	<p>Theoretical framework: This research problem emerged due to the lack of The factory application of these systems that work to solve the problem of storage accumulation as well as improving the progress of the production process, and the research hypothesis has proven that it is possible to apply the Kanban system and the value stream map in the plant under discussion.</p> <p>Design/methodology/approach: The research showed the most important conclusions, including stock accumulation of various types, reduction of inventory, improvement of work flow, improvement in response to changes in customer requests, reduction of risk of obsolescence of inventory, reduction of the percentage of spoilage from (3%) to (2%), and rationalization of total production inventory from 858 tons [26 tons × 31 days] to 806 tons [26 tons x 33 days].</p>
	<p>Findings: application the two cards (kanban) system and the value stream map in the electrical cables factory in the Ur Company for Electrical Industries The improvement in the current status of the Value Stream map, to the future status was carried out according to the Kaizen Burst (continuous improvements). As for the most important recommendations,</p> <p>Research, Practical & Social implications: The improvement in the current status of the Value Stream map, to the future status was carried out according to the Kaizen Burst (continuous improvements).</p> <p>Originality/value: This study is one of the very few studies that focus on the concept of cards (kanban) system and the value stream map it was necessary to implement the Kanban and value map system in the Cables electric plant, activating the state of transparency in the production and marketing work and facilitating the work The administrator and the need to open communication channels between the administration and workers to take advantage of the proposed views, reconsider the incentive system and link it to performance and to encourage workers to excel and drive innovation and creativity.</p> <p>Doi: https://doi.org/10.26668/businessreview/2023.v8i4.1371</p>

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APLICAR OS CARTÕES KANBAN E O MAPA DO FLUXO DE VALOR (VSM) PARA RACIONALIZAR OS CUSTOS DE INVENTÁRIO E MELHORAR O DESEMPENHO DA EMPRESA E A SUPERVISÃO DA PESQUISA APLICADA EM FÁBRICA DE CABOS ELÉTRICOS / EMPRESA ESTADUAL PARA INDÚSTRIAS ELÉTRICAS

RESUMO

Objetivo: Esta pesquisa visa tentar aplicar o sistema de dois cartões (kanban) e o mapa do fluxo de valor na fábrica de cabos elétricos da Ur Company for Electrical Industries, com a intenção de racionalizar os custos de armazenamento e melhorar o processo de produção, comercialização e armazenamento para se livrar do desperdício e da perda em tempo e custo.

Estrutura teórica: Este problema de pesquisa surgiu devido à falta da aplicação na fábrica destes sistemas que funcionam para resolver o problema do acúmulo de armazenamento, bem como para melhorar o progresso do processo de produção, e a hipótese de pesquisa provou que é possível aplicar o sistema Kanban e o mapa do fluxo de valor na fábrica em discussão.

Projeto/método/abordagem: A pesquisa mostrou as conclusões mais importantes, incluindo acúmulo de estoque de vários tipos, redução de estoque, melhoria do fluxo de trabalho, melhoria em resposta a mudanças nas solicitações dos clientes, redução do risco de obsolescência do estoque, redução do percentual de deterioração de (3%) para (2%), e racionalização do estoque total de produção de 858 toneladas[26 toneladas × 31 dias] para 806 toneladas [26 toneladas x 33 dias].

Constatações: aplicação do sistema de dois cartões (kanban) e do mapa do fluxo de valor na fábrica de cabos elétricos da Ur Company for Electrical Industries A melhoria no status atual do mapa do fluxo de valor, para o status futuro, foi realizada de acordo com o Kaizen Burst (melhorias contínuas). Quanto às recomendações mais importantes,

Pesquisa, implicações práticas e sociais: A melhoria no status atual do mapa do fluxo de valor, para o status futuro, foi realizada de acordo com o Kaizen Burst (melhorias contínuas).

Originalidade/valor: Este estudo é um dos poucos estudos que se concentram no conceito de sistema de cartões (kanban) e no mapa do fluxo de valor que foi necessário implementar o sistema Kanban e mapa de valor na usina elétrica Cables, ativando o estado de transparência no trabalho de produção e marketing e facilitando o trabalho O administrador e a necessidade de abrir canais de comunicação entre a administração e os trabalhadores para aproveitar as visões propostas, reconsiderar o sistema de incentivos e vinculá-lo ao desempenho e incentivar os trabalhadores a se sobressaírem e impulsionarem a inovação e criatividade.

Palavras-chave: Kanban, Mapa do Fluxo de Valor, Inventário Zero, Pontuação Just in Time, Pontuação de Caixa, Burst Kaizen, Mapa Status Atual, Mapa Status Futuro.

APLICACIÓN DE LAS TARJETAS KANBAN Y EL MAPA DE FLUJO DE VALOR (VSM) PARA RACIONALIZAR LOS COSTES DE INVENTARIO Y MEJORAR EL RENDIMIENTO Y LA SUPERVISIÓN DE LA EMPRESA INVESTIGACIÓN APLICADA EN LA FÁBRICA DE CABLES ELÉCTRICOS / UR STATE COMPANY FOR ELECTRICAL INDUSTRIES

RESUMEN

Propósito: Esta investigación tiene como objetivo tratar de aplicar el sistema de dos tarjetas (kanban) y el mapa de flujo de valor en la fábrica de cables eléctricos en la Compañía Ur para las Industrias Eléctricas, con la intención de racionalizar los costes de almacenamiento y mejorar el proceso de producción, comercialización y almacén para deshacerse de los residuos, y la pérdida en tiempo y coste.

Marco teórico: Este problema de investigación surgió debido a la falta de La aplicación en fábrica de estos sistemas que funcionan para resolver el problema de acumulación de almacenamiento, así como mejorar el progreso del proceso de producción, y la hipótesis de investigación ha demostrado que es posible aplicar el sistema Kanban y el mapa de flujo de valor en la planta en discusión.

Diseño/metodología/enfoque: La investigación mostró las conclusiones más importantes, incluyendo la acumulación de existencias de diversos tipos, la reducción del inventario, la mejora del flujo de trabajo, la mejora en la respuesta a los cambios en las peticiones de los clientes, la reducción del riesgo de obsolescencia del inventario, la reducción del porcentaje de deterioro del (3%) al (2%), y la racionalización del inventario total de producción de 858 toneladas[26 toneladas × 31 días] a 806 toneladas [26 toneladas x 33 días].

Conclusiones: aplicación del sistema de dos tarjetas (kanban) y del mapa de flujo de valor en la fábrica de cables eléctricos de la Empresa Ur de Industrias Eléctricas La mejora del estado actual del mapa de flujo de valor, al estado futuro se llevó a cabo de acuerdo con el Kaizen Burst (mejoras continuas). En cuanto a las recomendaciones más importantes,

Investigación, implicaciones prácticas y sociales: La mejora en el estado actual del mapa del Flujo de Valor, al estado futuro se llevó a cabo de acuerdo al Kaizen Burst (mejoras continuas).

Originalidad/valor: Este estudio es uno de los muy pocos estudios que se centran en el concepto de sistema de tarjetas (kanban) y el mapa de flujo de valor era necesario implementar el sistema Kanban y mapa de valor en la planta eléctrica Cables, activando el estado de transparencia en el trabajo de producción y comercialización y facilitar el trabajo El administrador y la necesidad de abrir canales de comunicación entre la administración y los trabajadores para aprovechar los puntos de vista propuestos, reconsiderar el sistema de incentivos y vincularlo al rendimiento y para alentar a los trabajadores a sobresalir e impulsar la innovación y la creatividad.

Keywords: Kanban, Value Stream Map, Zero Inventory, Just in Time, Box Scores, Burst Kaizen, Map Current Status, Map Future Status.

INTRODUCTION

In a world of development in all its technological, information, and behavioral aspects, changing customer demands and keeping pace with the era of modernity in all its administrative, production, marketing and warehouse systems, the Kanban system appeared as a technique for work and rationalization of inventory systems; and this system is a key element at the appropriate time in accordance with the philosophy of agile manufacturing and systems JIT (Just in Time) flexible systems, material modeling; and simulation software, mapping; techniques based on Toyota's flawless production system (Abdulmalek & Rajgopal, 2007) and value mapping defined by a (Value Stream; Mapping) (VSM) (by Rother; & Shook, 1999) as an efficient tool that demonstrates the clarity of the production process.

The Kanban system was originally developed in Toyota or the Toyota Production System in the 1950s; (1950s) as a means of managing the flow of materials on the production; line. Over the past periods Kanban worked efficiently and effectively in (Lau & Mak production systems, 2004), and it has evolved into optimal manufacturing systems for an environment conducive to globalization in competitiveness. Kanban symbolizes the Kan-Ban card as the core of Kanban's concept is that the supplier, warehouse, and manufacturer should deliver; components only when they are needed only In that system, there are work centers located; along Production lines only Production / rendering required; components when they receive an empty card and container, indicating that more parts are needed in production. In the event that the line is interrupted each work center will produce only enough; components to fill the container and then stop. In addition, there are limits Kanban is the amount of inventory in the process by acting as permission to produce more storage, Kanban is a chain process; in which orders; (cards and containers) flow from one business unit to the last production or delivery process at which all components are drawn from production lines down to warehouses (Braglia, 2006); this system worked as a continuous workshop Its end is in the warehouses, then there will be no materials or production under manufacture within the production line without there

being a demand for it from the next stage, the system aims to zero storage, in addition to that any stage in which you cannot pass production in which a part of defects, malfunctions or defects It aims to have zero defects output. In order for the; Kanban system; to be an efficient and efficient system, there must be a technique that works together for the organization to achieve success in all internal aspects as an institution that operates according to modern advanced systems that exclude waste, waste and disposal of losses in costs, and external as an institution aspiring to achieve competitive advantages, then it became necessary to Use the value stream map (Hines & Rich, 1999).

- 1. Objective Of The Work Or Research Problem:-** Through field visits, the researcher noted that the electrical cables factory suffers from high levels of inventory at its various levels (raw materials, half of the factory and full production), due to poor coordination and linkage between all departments in the company, whether they are productive, marketing and administrative, which led to the accumulation of inventory costs The end of the period at its various levels, which requires the application of the Kanban system and the value path map to get rid of excess storage costs, in addition to that all industrial establishments lack the presence of the Value Stream Map (VSM) within their production systems, which reflects positively on the performance of the calf systems And administrative.
- 2. The Research Objective:-** Apply both the Kanban system and the value stream map to control inventory costs, given the existence of a relationship between them and the progress of the production process and rationalization of storage costs. The ability of the value path map to improve the flow of productive work, remove obstacles and work problems, as well as remove lags and holidays, and show a clear picture of the factory's current and future state through a continuous improvement process.
- 3. The Importance Of Research:-** It emerges through the importance of applying both the Kanban system and the value stream; map, which is one of the strategic cost management tools, and the extent of their integration to work together to reach the optimum and continuous improvement of the production, marketing and planning process and trying to provide a practical application that solves the problems of Accumulating inventory costs.
- 4. Research Hypothesis:-** The research is; based on the hypothesis that "the application of both the Kanban system and the value stream map works to draw a clear picture of the product's path inside the factory through visual management in a way that

removes the excesses and obstacles and achieves fluidity within the factory and guides inventory costs.

LITERATURE REVIEW

Conceptual Framework: The Kanban system is; an essential part of the on-time production system (JIT); or the agile production system; It originated in Japanese; manufacturing as; a simple solution that the administration set out to manufacture a small, repetitive batch. The most popular and common; Kanban system is one of the leading Toyota; systems in the 1950s s1950. (Ohno. 1988), (Shingo S. 1982) , In the; 1970s , it became clear to a few select groups that; the Japanese, most notably; Toyota, had found; a better way to make cars, causing a number; of very interesting; things to happen.. First and foremost, the majority went towards the world of industrialization in a huge; case, which is disbelief, namely, "Adopting this sector of the industry brings a lot of risks", after hearing a lot about the so-called "will to work in Japan" "as a small series of efforts came to try to capture Parts of the Toyota system; that served Toyota well; The part that seemed most; attractive was the JIT concept. It spread quickly like stock rationalization, which is a small part of what actually came after the manufacturing process. JIT practitioners came up with many ideas And systems, including the application of the Kanban system, which is reducing storage to limit m Because of the high cost of inventory production and management, some companies have started using the “zero inventory.” Many early; efforts in imitating agile production; focused on just in time; production, as a Concept for reducing; inventory. (Harrison & Storey, 1996).

1- Historical overview:- The beginning of Kanban from; the beginning of the Toyota; production system and agile; manufacturing processes, as it depends on the performance of the process used; in industrial institutions to increase the competitive; advantage. These basics for agile manufacturing; are a continuous recruitment of; improvement processes that focus on getting rid of losses and waste or activities; that do not; add value to the activities; within the institution. As agile manufacturing is a common term; used by well-known authors; (Womack, Jones & Roos); to describe the production method; on the basis of the Toyota Production System; (TPS) within the boundaries of the institution; thanks to the development of this system is due to the four prominent figures in this field and they are ... Sakechi Sakichi Toyoda; who founded the Toyoda Group; in 1902, and Kiichiro Toyoda; son of Sakichi Toyoda, who headed the; carmaker

between; 1936 and 1950; Eiji Toyoda & Taiichi Ohno, founders; of the system. Kanban. (Shingo S, 1982).

2-Visual Control: Also called Visual Management; or Visual Control. The visual location is the workplace in which everything related to operation operations can occur. (Abd, 2019) Once there is a place of work and our use of visual perception, we find in this site what explains the progress of the production process such as measures. Quality, percentage of achievement of goals, names of machines and equipment, signs indicating the place of safe walking within the workplace, tables showing required work and boards that clarify the tasks of working individuals, work instructions, standard work specifications and other aspects related to production processes; knowledge of all the information pertaining to the production process, each business required results and details are clear in front of him The information is not the preserve of the manager nor the supervisor, but is available for both has to do with work and quality. (Badurdeen,, 2005).

There are two known types of visual control: Andon lights and Kanban cards, which are described as follows:-

A-Andon System:

B- The Kanban Carts System cards. The Kanban system in question will be explained in detail.

A-Andon system: In the system (Andon), it is referred to as a warning (lights - signs - bells ... etc.), created before exacerbation and at the beginning of defects, and it is also as physical signs in the production system. (Andon) is a Japanese word meaning lamp and in English it refers to the meaning of (Lantern Any lantern or lamp. It can be in the form of lights, lamps, panels, texts, graphics, coding, audible alarm bells, various warnings, or recording verbal messages.

3- The Kanban Carts System Cards: The system has been developed at Toyota Motors factories in Japan as; a program to streamline the flow; of products throughout; the production process. It aims to; improve the productivity; system and to ensure the participation of the operator and his contribution to achieving high productivity; by creating a clear vision (Highly Visible); which means observing the flow of; products through Production system; and build a reasonable level of inventory levels; within the system. After that, it developed more to mean the production; activity control to accomplish the goals of; (JIT) and the operational management of (production on time;),

as well as the Kanban system as an information system; to monitor and; assist the control of production; quantities at each manufacturing and assembly stage of operations. (Dennis, 2015).

4- Kanban is a Japanese term meaning a card, Kanban is usually in the form of rectangular; paper cards; placed in transparent sheets, there are; two main types of card used are: - (Chase, et al, 2006).

First - Withdrawal Kanban

Quantum debit cards are defined as the subsequent process that requires withdrawal to the previous duty station. Each card is designed between two duty stations only - a business center used for the part requested, and a business center used for the part it produces. (Ikonen, 2011).

Second - Production Kanban

Production cards define the quantity of the specified part that is produced at the workstation and which must be manufactured in order to replace the part that was drawn by the Kanban drawing card : - (Schroeder & Goldstein, 2018)

In order to use and operate Kanban cards efficiently, this requires a very strict commitment and discipline. This commitment is related to the use of Kanban cards. These requirements for commitment are many to clarify the need well and document the manufacturing procedures and a group of well trained workers to understand the work procedures and generate confidence and experience to do good practice . (Ikonen, 2011).

There are five guidelines for using Kanban cards, as this helps to complete production on time:-

The job center finds withdrawn only the required items from the previous work center and according to the required quantities alike and we take the importance of the specified time. There; are a set of operating; principles that support this are;

Do not move or transport permitted materials without the availability of the drawing kanban card, and the availability of an empty container.

No more parts of the cursor are allowed on the drawing Kanban card.

The work center or process. These items should only be produced as the items are withdrawn to the following work center or process. Edited Production Kanban Cards workstation scheduling.

1-The work center does not allow the production of larger quantities of conditional quantities on the Kanban card of production and the chain of operations at the work center or the process that must be followed in sequence. The Kanban card of production has been provided. The production begins by scheduling the final assembly section, which is the primary source. Scheduling is passed backwards through the production system that issues the Kanban production cards. Strict adherence to the guidelines results in efficiency for this transmission line (but it is not visible).

The defects or substandard items should never pass to the next duty station; this indicates strict quality control; for each work station, or a step in the production; process. Allowing the defective; parts to remain within; the production; system will maximize obstruction to; the flow of parts to the stage the following is when the; faulty part is discovered. (Dennis, 2015).

The level of stores in the production; system is protected by; the number of Kanban cards, as each card represents; standard contents for containers, the number of cards must be less than possible by reducing the number of cards and the size; of each container; then the level; of inventory gradually decreases.

2-Kanban cards are used to determine the amount of stock specified in the business to make progress on the factory floor. When the containers are emptied, visual signals can be returned to fill those containers. In the absence of a card (Kanban) he is asked to return the full box, in the absence of a card (Kanban) and when the visible signs do not stop then there is overproduction (Liker, 2004).

3-Kanban cards are one of nine core elements of the JIT system:

Standardized work., Production planning., Takt time, Level Scheduling (Heijunka).

The production of One Piece flow., Cellular Layout. , Kanban cards;.

Single Minute; Exchange of minutes (SMED)., The supply chain.

4--Kanban is referred to as an effective system in the agile enterprise, it is a basic technique that determines the state of production quantities, and therefore facilitates the system of on-time production (JIT) and the order system, where Kanban cards are a key component of production at the appointed time.

5-Kanban operates according to the Pull system; of the production system. The word is derived from two Japanese words, which is the word; (Kan); meaning visual; and; the word; Ban, meaning card; billboard, or billboard. Hence, it means a sign board, cards,

electrical signals, a visible plate, a visual record, the standard production quantity, Volume of content or abstract contact.

These cards do not constitute the Kanban system, as they are used in the payment system to transfer orders and control. It is used as a signal card when more parts are required to be delivered and the card is identical or similar to the signals used when producing more parts (Schroeder, 2007).

6-Kanban cards are used as an information system when ordering materials. The card includes; (the name; of the material, part number, quantity, source, destination, etc.), but the point box, light signals, colored boxes drawn on the factory floor can be used to indicate stores and spaces Or passages, but wrongly referred to as Kanban.

7-Kanban means a signal of a stream and stream of a workstation or (upstream) to the stream and stream of another workstation (estuary - below the flow stream / Downstream Flow) until the next workstation prepares to produce a meal from the other parts.

8-The Kanban system is a visual signal system. When a traffic light occurs, production must start and stop. There are several benefits to be gained when adopting the Kanban system:

Reducing inventory.

Improving workflow.

Cancel Over Production.

Improving responsiveness when request changes.

No inventory obsolescence risk.

The worker has a role in making process improvements. (Imai, 2012)

9-Kanban updates the update. If it is necessary to update the design of a specific product, then that update can be achieved in the final product as soon as there is no neglected products.

Reduces loss, waste, waste; and scrap, as products; and parts are manufactured only when required. The materials are delivered only when needed, which reduces loss and waste and reduces storage costs;. Reducing total costs by preventing excess production, developing a flexible workstation, reducing waste, waste and scrap costs, reducing logistics costs, reducing indirect costs, reducing inventory costs which reduces direct wages costs as a result of reducing the number of workers. (106-Dennis, 2015).

Third: The equations for the implementation of the Kanban system:-

a-Determine the number of kanban containers:

$$K = \frac{D(\underline{W} + \underline{P})(1 + a)}{C} \dots \dots \dots \text{Equation No. 1}$$

b- Calculating the number of standard containers filled with the finished product and withdrawn daily from the ending storage point to the shipping point (Marketing): - (Krieg, 2005: 30-44).

$$PK = \frac{D}{c} \dots \dots \dots \text{Equation No. 2}$$

c- Calculating the operating time needed to complete one container using the formula:

$$\underline{P} = (\sum P + \underline{M}n + \underline{Q} n) \times C \dots \dots \dots \text{Equation No. 3}$$

d- Calculating the movement or withdrawal time for one container back and forth through the formula:

$$\underline{W} = \underline{M}p \rightarrow w + \underline{M} w \rightarrow p \dots \dots \dots \text{Equation No. 4} \dots \dots \dots (\text{Krieg,2005})$$

10-The Kanban method in its various forms is the backbone of the graceful dragging system. If Kanban deviates, the drawing system within the value stream fails and the production cycle, the production rates decrease, and the operations become unstable, it is necessary to maintain the drawing system effectively.

11-Value Stream Map (VSM):- The value stream can be defined as the process of planning the graceful steps in collecting and analyzing data in a systematic manner, which helps management, engineers, technicians, and suppliers, and customers in identifying waste and wasting and explaining its causes.

The purpose of the value stream is to identify and eliminate waste or loss in the production process. The value stream map includes five steps:- (Womack & Jones, 2003).

1-Defining the value of the customer: The value is determined precisely from the viewpoint of the final customer and then identifying the problems that affect customers

to solve these problems, as this is through what is the required product, the work requirements that must be met, and commitment with the customer to deliver on time and at the right price (ITC, 2004) The first step in agile thinking is to understand what value and what activities and resources are really necessary to create value (Poppendieck, 2002).

2-Composing a map (the current status):- The most important elements of achieving productivity agility are the value stream map, which is intended for all economic activities required to achieve the production process, starting with the product design, customer demand, production, and product delivery to the customer, since the value is diagnosed by the customer and is represented by a set of characteristics that the customer is willing to pay for, it represents the difference Between perception and sacrifice, (Kadhim, 2020)the sacrifice represents what the customer provides in exchange for obtaining the advantages and characteristics of the commodity and perception of what the customer gets from the actual use of the product, and the value stream map indicates a map of the flow of information and materials throughout the supply chain which is considered one of They are the tools used in the planning Volant as it facilitates the task of the exercise of the productive system lean (Dennis, 2015).

3- Analyze the map to identify opportunities for improvement. Determine activities that do not add value and losses. Do brainstorming to eliminate the loss and identify activities that add Value .

4-Configure (the future status) of the map in a visible and desirable position. Both (Rother) and (Shook) have adopted the standard method for Toyota to visualize the flow of materials and information on the value stream map. This map can be drawn in any sector from the simple administrative process within the office to the global industrial processes, where the value stream expands in succession from the raw materials in the factory floor to the final consumer. (Dennis, 2015). Its purpose is the process of writing, and installing all steps in the process as a current operating process to identify what we can describe according to the current state. Every step that managers urge is simple questions put around it; does creating this step be valuable to the customer? Is this step capable of it? Can the product prepare the produced goods all the time? Is it available? Can the product meet the customer's desires in terms of quality and all the time? Is it flexible? Can the product change quickly from one product to another? Does it produce

Small Lots and is the energy sufficient? and so on from questions. (Rother & shook, 1998).

1. Steps that do not create value should (and of course) be removed, and steps that are incapable or incapable, unavailable, inflexible, insufficient, less or more than what is required must be perfect and complete. But step-by-step analysis provides only a portion of the picture because the relationship between the steps is of equal importance. (Rother & shook, 1998).

2. The following map shows the flow of information from the customer to the various points in the production process, moving from right to left in the upper half of the map. The orders go from the customer to the computer (material needs planning - MRP), where the stock is waiting to be managed per week in the system according to the scheduled share of production until the next week, as the large amount of information accelerates the occurrence in the offices of managers to cover the shortage or cover customer demand and rapid sudden changes.

3. The researchers believe that the value stream map is a tool that is used as a visual map of the production flow that shows the state of current operations, and the future state after developing improvements to it. Providing a clear and visible way for workers.

4. The map also shows the flow of products from raw materials to products reaching customers, as it moves from left to right in the bottom half of the map. The map is a summary of the performance of the five necessary steps (value, value stream, flow, withdrawal, perfection), showing the amount of current and accumulated stock between stages and showing a comparison of the value creation time (which is very small) with the total output time (which is very large) The map helps managers to visualize Flow Kaizen, which needs to considerably tighten production time, to eliminate lost steps, correct quality, flexibility, availability, and adequacy of problems.

5. In this case, the specific steps required are to improve the susceptibility, ability (quality at the first time), deliverability (Uptime) and flexibility (changeover time) by managing the four steps in the industrial cell (we note that the lowest operator / Factor requiring results) as well as the setting and installation times of any department is greatly reduced by allowing the production of smaller meals, and more stock reduction.

6. The final step is the splitting of the needs planning system from the previous material, giving it to the production orders at every step in the operations, simply the withdrawal system is to place Kanban signs in the place and in the Kanban cards card

drawing (according to the specified demand level) where the Kanban cards work as the place of the pacemaker (Pacemaker Process) for operations in the value stream (Womack & Jones, 2003).

MATERIAL AND METHODOLOGY

Company Profile and Factory: Ur Public Company was established after the merging of:

The General Establishment for Cable and Wire Industry was established in 1974. The General Establishment for Aluminum Profiles Manufacturing was established in 1975. It was merged with one facility, which is (Ur Public Company) according to Decree Revolution Command Council No. 222 on 6/3/1988 and according to Law No. (22) for the year 1997 it was transferred to Ur State Company for Engineering Industries, and the name of the company was changed to Ur Public Company Electrical Industries located in the province of Dhi Qar / Nasiriyah city, and was registered with the Registrar of Companies, and governed by the Law of Public Companies.

The Application of the Kanban system (the two cards system):

Kanban is a production method that allows materials to move in a time-limited system (JIT). Kanban points out, as we indicated, in the theoretical side (card, signal, board or any other device) used for monitoring to follow up jobs through sequential operations.

Permission for production must stop at a certain time, as the work centers that supply the materials will also stop soon, and Kanban cards will not send more materials to the department or the subsequent work center.

The Kanban Cards System is a physical control system that contains cards and containers.

Here we show how to apply Kanban cards in the Cable Factory (pneumatic wires), which contains three work centers: clouds (machine / M85), then controversy (machine / M54), packaging and assembly (wooden rollers), as follows:

Pilot application of the two cards system (withdrawal and production): -

Figure (1) shows the work centers and the locations of the storage points between those centers; the direction of the flow of materials and information upon which it depends in the experimental operation of the Kanban system, as shown in the following steps:

1. The hanging wire production line in Cable Factory, as the production line in the factory has been adapted according to the direction of information flow, and the

characteristics and requirements of working the JIT system as a pull system, as it represents the filling stage (Work Center 3) below Downstream because it meets the quantities of wires required in the hanging pneumatic wire production line required by the company's marketing department. Accordingly, it is this stage that controls the determination of production activity and levels of inventory within all storage points in the production line, as this stage (packaging) withdraws all its needs from the previous stage it has controversy (Work Center 2), which in turn withdraws all its needs from the withdrawal phase (Work Center 1). Thus, the stage of withdrawal represents the highest value stream (Upstream) of the stage that feeds the stage of controversy, and among the three duty stations, storage points have been created.

2. Each storage point between workstations consists of two halves, denoted by a half (W) representing the inward storage point that contains containers filled with halves bearing drawing cards (Withdrawal), and half (P) represents the storage point outside, as it contains containers filled with equity Production cards are bearing (Production), knowing that the storage point (3) consists of only one half is half (P) (storage point outside).

3. Control of the flow of materials between each duty station and storage point is carried out through movement cards (pull), while control over the flow of materials and parts inside the work center is done by production cards.

4. Each inside storage point (W) contains a box for collecting movement cards (withdrawal), while outward storage points (P) contain a box for collecting production cards.

The proposed working mechanism:

First: The company's marketing department sends two empty containers, each with a movement / withdrawal card attached to the storage point (3), half (P).

Second: In the storage area (P), withdrawal cards are removed from the two empty containers, and placed on two containers filled with the two production cards on which they are located, then the two filled containers with withdrawal cards are returned to the final product marketing area (air wires) to meet the customer's request.

Third: The production cards are placed in the production card box in half (P) - the storage point (3).

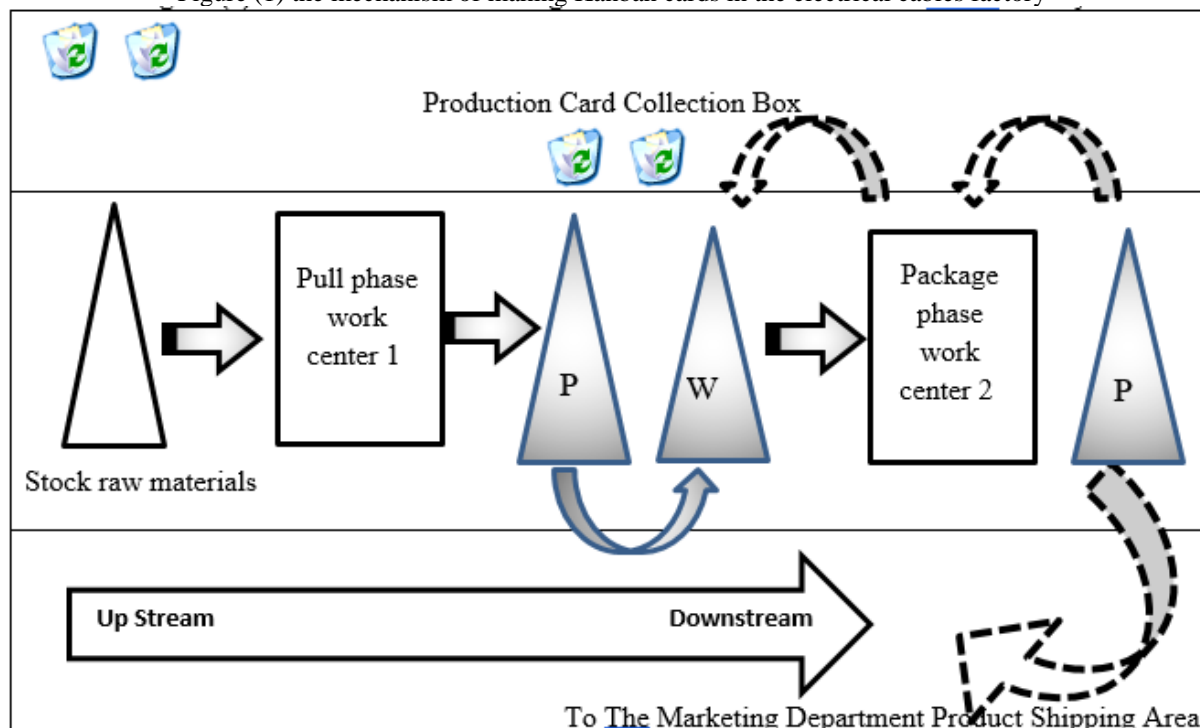
The presence of two production cards in this box with two empty containers represents the signal to start the production process at the work center (3) (packaging) for filling these two empty containers, and this also gives operators at the work center (3) the authority to open two containers filled with raw materials and parts available in an area Storage inside (storage point (2) - half (W).

Fourth: The presence of the two traffic cards in the traffic card collection box in half (W) - the storage point (2), two empty containers after the two traffic cards in them are moved towards the storage area outside (P) - the storage point (2) to require them to compensate the amount withdrawn by the center Work (3) from the storage point (2) to the inside - half (W) for use in the production process.

Fifth: The same steps are repeated in second and fourth; but between the two work centers (1,2) instead of the two work centers (2,3) and the two storage points (1,2) instead of the two storage points (2,3).

Sixth: Repeat steps first to fifth in each drawing process that takes place from the final product's shipping area to meet the customers 'scheduled marketing request. As in Figure 9, the mechanism of making Kanban cards in the electrical cables factory.

Figure (1) the mechanism of making Kanban cards in the electrical cables factory



Source: By researchers.

C = the quantity in the standard container of a specific part (container energy).

a = The management policy variable that reflects the efficiency of the work stages produced and used for the part. (Toyota usually uses a value that does not exceed 10%.)

$$K = \frac{24(0.25 + 0.75)(1 + a)}{1.2 \text{ Ton}} = 22 \text{ Contain}$$

(Average number of drawing and production cards) = 22 containers

D= 24 ton

16 H=0.75÷_P=12H

16H=0.2÷_W= 4H

C =1.2 ton

Calculating the number of containers: The number of standard containers that should be available at each point of storage within the production line is electable. The number of containers drawn from the final product from the storage point (3) (the optimum condition for the operation of the mechanism) should be equivalent to the agreed processing times and the points are indicated. The following are calculations for the number of containers at the specified storage points within the production line:-

- a)** Calculating the number of standard containers filled with the finished product and withdrawn daily from the storage point (3) to the shipping / marketing point and according to equation (2):

$$PK = D/C \dots \dots \dots \text{Equation No.2}$$

As:

PK = The number of containers drawn from the storage point (3) of the finished product.

D = average daily demand determined on the basis of the daily production capacity of (24) tons.

C = The capacity of one container (iron roll) is estimated at (1.2) tons (5% of the average daily demand D).

Thus, the number of containers (PK) = (24) tons ÷ (1.2) tons = (20) containers, which is the ideal number when the system is operating (in case of balanced operating times between work stages).

- b)** Calculating the number of containers filled with the product under manufacture that should be available within each storage point between the stages, according to equation (1) and according to the following:

First: - Calculate the operating time needed to complete one container using the following equation (3):

$$\underline{P} = (\sum P + \underline{M}_n + \underline{Q}_n) \times C \dots \dots \dots \text{Equation No.3}$$

As:

\underline{P} = average operating time to complete one container (and includes waiting time, movement in front, and between operations within the business phase) calculated as part of the day.

$\sum P$ = the sum of processing times needed to produce one ton.

\underline{M}_n = average time of movement between operations within the business phase.

\underline{Q}_n = average waiting time for operations in the business phase.

C = one container capacity.

Second:- Calculate the movement or withdrawal time for one W container back and forth through the following equation (4):

$$\underline{W} = \underline{M}_{p \rightarrow w} + \underline{M}_{w \rightarrow p} \dots \dots \dots \text{Equation No. 4}$$

As:

\underline{W} = the average movement time required to withdraw one empty container back to the producing stage, the time to replace it with one full and the time to withdraw the filled container in its return to the requesting part of the parts, calculated as part of the day.

$\underline{M}_{p \rightarrow w}$ = time to withdraw the movement of a filled container from the storage point (P) to the storage point (W), including when to replace it with an empty container at the storage point (W).

$\underline{M}_{w \rightarrow p}$ = time to withdraw the empty container from the storage point (W) to the storage point (P).

Table (1) shows the results of using equations (1), (2), (3) and (4) in calculating the number of containers that should be available within each storage point, as a difference is observed in the number of containers inside the storage points due to the difference in operating times between stages of work.

Table (1) Number of containers in the Kanban system ..the two-card system and the operating and movement times.

Storage point	Daily demand ton	Operation time P ⁻				Motion time W ⁻				Number of containers
		P As part of the day	P minute	$\underline{Q}_n = \underline{M}_n$	$\sum P =$ minute	W ⁻ As part of the day	W ⁻ minute	$\underline{M}_{w \rightarrow p} =$ time	$\underline{M}_{p \rightarrow w} =$ time to	
3	24	0.96	922	118	652	0.25	240	40	160	27
2	24	0.90	864	58	662	0.125	120	40	80	23

1	24	0.85	816	55	625	0.125	120	40	80	21
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Source: By researchers.

1-Equation (1) to calculate the number of containers: - $[K=D(\underline{W}+\underline{P})(1+a)\backslash C=]$

$$\text{containers } K3 = 24 (0.250 + 0.97) (1 + 0.10) / 1.2 = \mathbf{27}$$

$$\text{containers } K2 = 24 (0.125 + 0.90) (1 + 0.10) / 1.2 = \mathbf{23}$$

$$\text{containers } K1 = 24 (0.125 + 0.85) (1 + 0.10) / 1.2 = \mathbf{21}$$

2. Uptime by stages as a percentage extracted from the current value stream map in

Figure 11:-

- ✓ Withdrawal stage = 85%
- ✓ The stage of controversy = 90%
- ✓ Collection and shipping stage = 96%

Here, the researchers point out the benefits of the Kanban system:

- 1) The bottleneck becomes clear and visible all the time, this situation leads the two workers to cooperate to reach the ideal situation for each value chain instead of a part of it.
- 2) Useful for operational operations cases and team support when there are high rates of uncertainty and change.
- 3) It is characterized by its rapid spread throughout the company in all departments, including individuals and sales, and thus leads to increased visibility of everything that can be reached in the company.

4-Reducing inventory:-

The Kanban system is expected to reduce inventory by a rate of (75%) to (25%). This situation provides the factory with a large amount of inventory costs from security guard fees, electricity and extinctions, in addition to being affected for the better in the quality of the product due to the lack of long-term survival.

The areas that Kanban system provides when implemented can be used in the future for expansions or new investment opportunities.

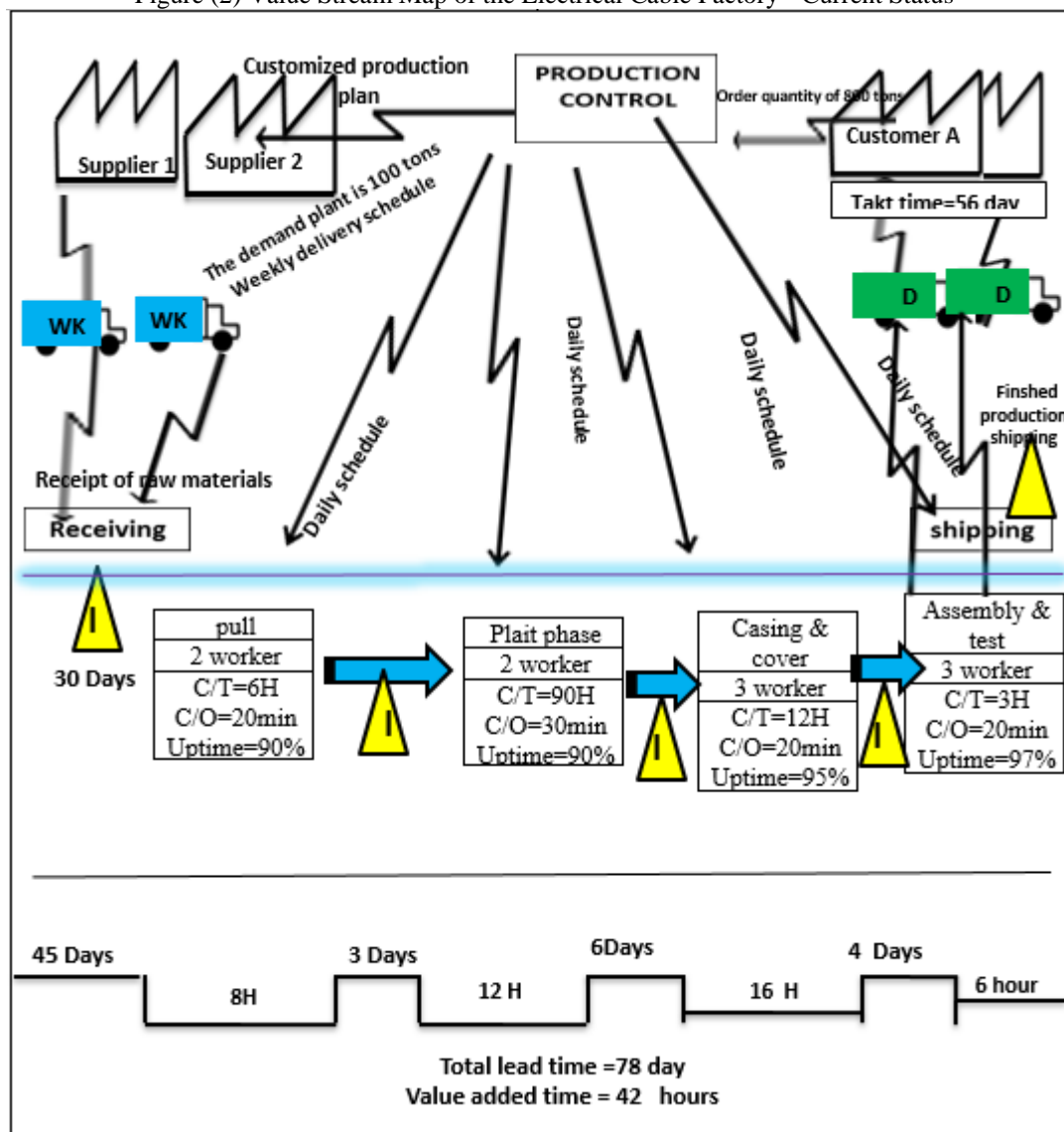
5-Improving work flow:-

- Visual organization in the work environment ensures that all parts are easily found.

Significantly, the movement speed from one state to another condition This movement reduces the handling time for the materials and the product is in operation and has a clear view of the flow methods.

Apply the Value Stream Map to the factory: Figure (2) shows the value stream map of the current state of the electric cable factory to be on the map determining and understanding the value flow in the production process that helps to understand how the product flows (the electric cable) from the time of customer requests until the product is sent to it also helps to determine the steps that add value For the customer and those that do not add value .. Figure 2 shows a map of the value stream of the electrical cable product as follows:

Figure (2) Value Stream Map of the Electrical Cable Factory - Current Status



Source: By researchers.

It is evident from the aforementioned figure that it is a visual lean technique that helps in the formation of the change process in the company, as it discloses all the flows of important materials and information that the product needs, in addition to that it shows a way to improve the future showing the formation of a better view towards the value expected and demanded and needed by the current customer and customers Expected.

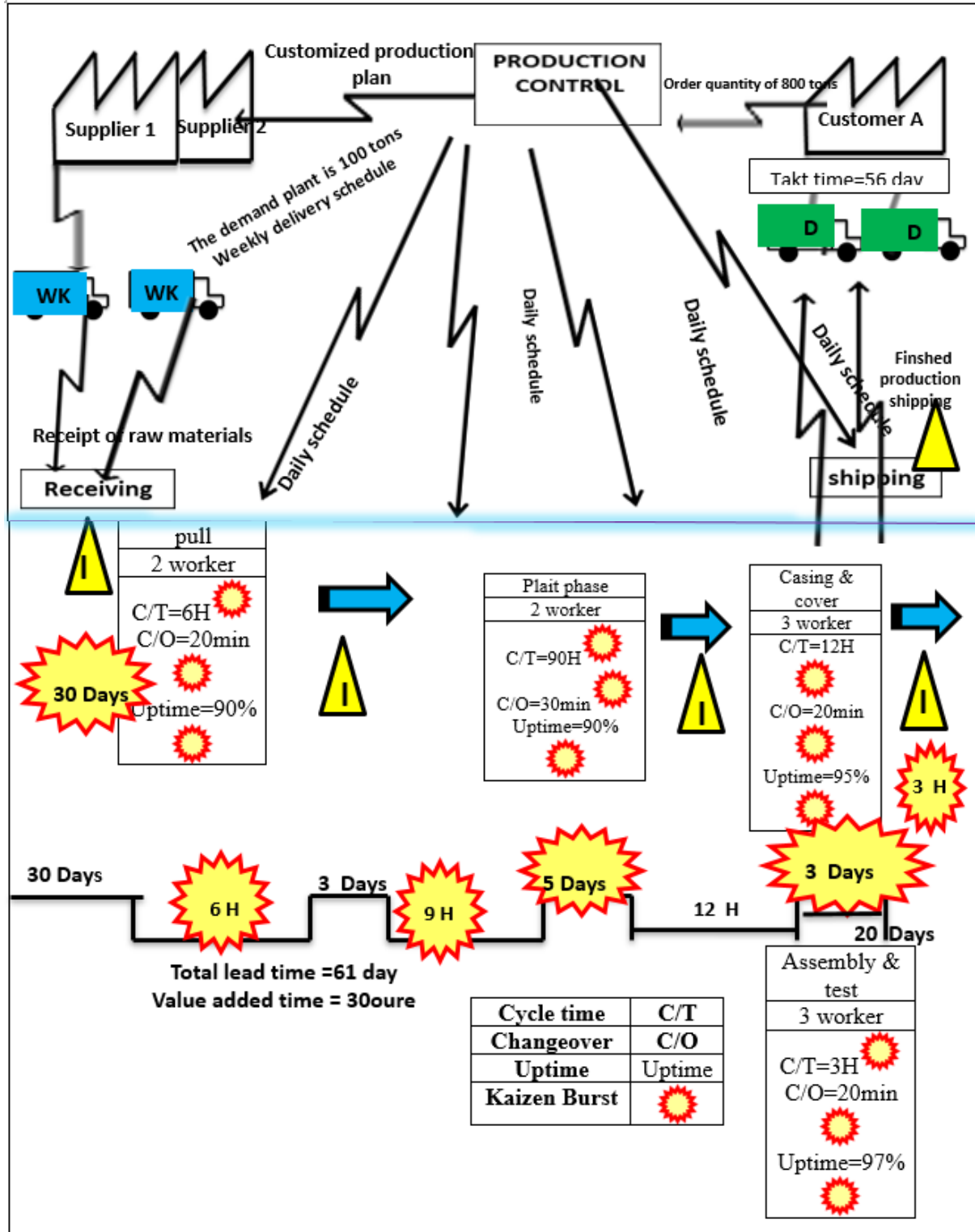
Figure (3) shows a map of the future status after making improvements in light of the variables, whether it is product variables or customer changes, as it shows the of (Burst) improvement and elimination of loss and waste and the removal of activities that do not add value and work budget and also the time is calculated (Takt Time).

The Box Score shown in Table (2) shows the difference between the current Status and the future Status after the creation or Burst Kaizen over the future Status as a result of continuous improvements, namely:-

- 1-**Updating the production plan in line with the evolution of the customer's need and according to a modern system called the(PLC system) This gives an increase in production and less time spent on production.
- 2-** Evolving the efficiency of the worker in line with the efficiency of the machine, by:
 - 13 working stages, start-up by the worker.
 - 13 working stages by control panel and by one button input data feed.
- 3-**The possibility of the worker with regard to the old lines requires a high effort and time, either in the case of using the system it requires no effort and time but rather requires entering the correct information of the product in terms of measurement, type, color ... etc.
- 4-** The old lines need eight hours of wiring, while the new lines need less than this time, sometimes up to one hour.
- 5-**Speed is a key factor in the efficiency and development of the machine by loading the machine with a reel of two instead of one.
- 6-** The lack of holidays in the new machine and the accuracy of the measurement and the product or the re-examination of the product in terms of length, weight, measurement and diameter via a screen controlled by the operator.

Later on, the future Status becomes the current Status, and so the improvements from one Status to another continue for the better.

Figure (3) value stream map - the future Status



Source: By researchers.

Table (2) Box Score for the current and future status / electric cable factory.

<u>The Description</u>	<u>Current Status</u>	<u>Future Status</u>
total lead time	78 day	61 day
time value creating	42 hour	30 hour
changeover time	30 min in the drawing phase. 35 min in the twisting phase. 30 min in casting & cover phase. 30 min in the assembly phase.	20 min in the drawing phase. 30 min in the twisting phase. 20 min in casting & cover phase. 20 min in the assembly phase.
spoilage & recast as aluminum scrap rework.	the percentage of spoilage %3 (technology spoilage ratio)	the percentage of spoilage %2 (2% actual spoilage achieved)
Finished goods inventory	858 ton $45\text{day to }78\text{day} \times (26 \text{ ton})=858 \text{ ton}$	806 ton $30\text{day to }61\text{day} \times (26 \text{ ton})=806 \text{ ton}$
Product making (ton) per time (week).	11 week	9 week

Source: By researchers.

Through the above table, we notice that the number of processing days for the order is reduced from [78 day] to [61 day], as well as the time that adds a value that has been reduced from (42 hours) [42 = 6 + 16 + 12 + 8] in the current status, to a shorter time To (30 hours)[3 + 12 + 9 + 6] = 30 hours]in the future status using Kaizen Burst, which reduced the costs of direct and indirect wages. As for the change time, the above schedule showed a case of low time in the drawing phase from 30 minutes to 20 minutes, as well as the stage of twisting from 35 minutes to 30 minutes. As for the casting and assembly phases, the time decreased from 30 minutes to each of them to 20 minutes. As we also notice a decrease in the percentage of technological spoilage from 3% to 2% after making the improvements that were made in the operational processes, which was reflected in reducing the percentage of spoilage and defective production which in turn guides the costs of the product, while the total production stock has been rationalizing the storage from 858 tons In the current status to 806 tons as a working meal for the future situation so that the total production stock does not accumulate in the factory warehouses in excess of the order and in this case the indirect industrial costs are rationalized as well as the costs of the accumulated storage that may be subject to spoilage and technical obsolescence, but for the time of the order the duration of the order has been reduced Her work from 11 weeks to For one meal or work order up to 9 weeks, achieving a faster response to the customer's request, on the one hand, on the other hand, a rationalization of the workers 'wages costs as a result of improving the performance of the process according to the Kanban card system and the value stream map.

CONCLUSIONS

Accumulation of inventory in its various classes (raw materials, work in production, and finished goods), and this case causes high storage costs that increase the costs of products or intermittent costs, as a result of not applying the Kanban system.

The bottleneck becomes clear and visible at all times, this situation leads the workers to cooperate to reach the ideal situation for each value chain instead of a part of it.

Useful for operational operations cases and team support when there are high rates of uncertainty and change.

It is characterized by its rapid spread throughout the company in all departments, including individuals and sales, and thus increases the visibility of everything that the company can reach in all its factories.

Reducing inventory:

The Kanban system is expected to reduce inventory at very high rates (75% -25%). This situation provides the factory with a large amount of inventory costs from security guard fees, electricity and depreciation , as well as being affected to the best in product quality due to the lack of long-term survival.

The areas that Kanban system provides when implemented can be used in the future for expansions or new investment opportunities.

Improving work flow:

Visual organization in the work environment ensures that all parts are easily found.

Significantly the movement speed from one state to another condition This movement reduces the handling time for the materials and the work in production and has a clear view of the flow methods.

The positive results shown by the Kanban card and the value stream map have highlighted the fact that this system and this map are an effective way to improve performance and raise the level of exploitation of productive, marketing and warehousing capacity, as their use has shown effective analytical results in improving, rationalizing costs, reducing costs and making decisions.

The Kanban system and the value stream map achieve a means to control production, marketing and warehouses, as well as positive advantages in the field of quality control, through achieving zero defect through the production process as it is not permitted to transfer manufactured materials or parts within the production line unless they are of high quality (100%) compared to the high rate of spoilage in actual conditions (3%).

Prevents excessive production, because the parts that produce and move are the parts that have a visible mark / card through two Kanban cards, then the inventory will decrease and will not reach the state of excess, resulting in very large savings in the acquisition costs of the inventory.

Improving the response to changes in customer demand In contrast to the production forecasting system, Kanban provided an immediate reaction to the environment by responding in terms of clarity and ease when reading Kanban cards in the case of the late time between the Purchase Order and the Production order, Which is most likely not found under Kanban.

Reducing the risk of inventory obsolescence, because the existing stock is the required inventory to meet the customer's need and demand.

The value stream map for the electrical cable factory was determined, and the map showed that activities that do not add value can be reduced through Kaizen burst events, and the processing time has been reduced from (78) days to (61) days, as well as the time that does not add value from (42) hours To (30) hours and the time of making the order was reduced from (11) weeks to (9) weeks.

Reducing the percentage of spoilage from (3%) to (2%), and rationalizing the total production inventory from 858 tons [26 tons x 31 days], to 806 tons[26 tons x 33 days].

The improvement in the current status of the value stream map to the future status was carried out according to the Kaizen burst (continuous improvements), as it brought about a positive change in the performance of the factory, which was reflected in reducing the time of changes, as these observations are observed in the phases of withdrawal and plait and the phase of plait and stock The Separation and packaging phase and the Assembly and inspection phase, up to the shopping phase, which are (6 hours, 9 hours, 5 days, 3 days, 3 hours, 20 days) respectively after the case of Kaizen burst.

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REFERENCES

Abdulmalek Fawaz A., Jayant Rajgopal, (2007) "Analyzing the benefits of lean manufacturing and value stream mapping via simulation: A process sector case study," *Int. J. Production Economics*, 107, 223-236.

Abd, W. H. (2019). Audit Program Proposal for Local Accounts Auditors: Applied Research on a Group of International Auditing Standards. *International Journal of Innovation, Creativity and Change*, pp. 201-221.

Ahnaf Ali Alsmady, (2022)," Accounting Information Quality, Tax Avoidance And Companies' Performance: The Moderate Role Of Political Connection" *international Journal of Professional Business Review International Journal of Professional Business Review (JBReview)*.

Agyapong-Kodua, J. O. Ajaefobi, R. H. Weston.(2009). Modelling dynamic value streams in support of process design and evaluation. *International Journal of Computer Integrated Manufacturing* 22, 411-427.

Apreutesei, M., Arvinte, I.R., Suciu, E.: (2010)"Procedure Used To Create a Lean Manufacturing Environment in a Company". In: *Metalurgia* 5, p. 34-41.

Badurdeen,Aza , 2005 , *Lean manufacturing Basics* , " www. Devisland. Net "

Bowes, P. (2010, September 24-25)."Lean Implementation for creating a differentiating edge workshop .Proceedings of 6th International Conference on Apparel & Home Textiles "Differentiating edge" (pp.46-48).New Delhi, India :Okhla Garment Textile Cluster.

Braglia, G. Carmignani, F. Zammori. 2006. A new value stream mapping approach for complex production systems. *International Journal of Production Research* 44, 3929-3952.

Bushra Hassan Mohamed El-Toby, Waad Hadi Abd, Akeel Dakheel Kareem, (2022),"Activating The Role Of Judicial Oversight In Iraq To Reduce The Phenomenon Of Tax Evasion": Field Research In The Federal Office Of Financial Supervision, Vol. 7 No. 5 (2022), *international Journal of Professional Business Review International Journal of Professional Business Review (JBReview)*.

Chase,R.B, Jacobs, F.R , Aquiland , Nicholas ,(2006). " *Operations Management for Competitive Advantage* " eleventh edition , McGraw-Hill.

Dennis, PASCAL, (2015)"Lean Production Simplified " *A P l a i n – Language Gaudi to the world M o s t P o w e r f u l P r o d u c t i o n S y s t e m* 3^{ed} .

Donald W., (2003). Inventory Control and Management, 2nd Edition, John Wiley & Sons Ltd.

Edwards & Skanby ,(2013). " A Lean Study to Improve the Efficiency and Flexibility of the Product Realization Process". Lund University

Gaither, N., & Frazier, G. (2004)."Operations Management(9th ed.) .New Delhi, India: Cengage Learning India .

Guan, L., Hanson, D. & Mohryn, M., (2009)."Cost Management ", 5th ed., SW1Y, South – Western India.

Harrison, A., Storey, J.: New Wave Manufacturing Strategies, Operational, Organizational and Human Dimensions. In: International Journal of Operations and Production Management 16 (1996), p. 63-76.

Heizer, Jay &Render, Barry,(2014). " Operations Management“, 10th ed., Prentice Hill, Inc., ,pp316-317.

Hines, P., Rich, N. and Esain, A., (1999), “Value Stream Mapping: A Distribution Industry Application”, An International, 6(1), 66-70.

Holmen, Danneskiold, (2002), study lean and increase velocity responsiveness "ALTA Als strategic white paper on automotive evolution", Copenhagen Denmark.

Ikonon .Marko ,(2011)." Lean Thinking in Software Development: Impacts of Kanban on Projects. University of Helsinki , Finland.

Imai, Masaaki, (2012). " Gemba Kaizen: A Commonsense Approach to A Continuous Improvement Strategy ", 2nd ed, MC-Graw Hill.

ITC .(2004) .Principles of Lean Thinking. [On-line] available www.itc.mb.ca.

Krieg, Georg N.,(2005)" Kanban-Controlled Manufacturing Systems"Library of Congress Control Number: 2004115950, ISSN 0075-8442, Printed in Germany.

Kovacheva, A.V. (2010)." Challenges in lean implementation: Successful transformation towards lean enterprise (Master’s Thesis, University of460Aarhus, Aarhus, Denmark). Retrieved from <http://pure.au.dk/portal-asbstudent/files>.

Krajewsky, J., Ritz, M., Larry, P., & Malhotra, K.,(2013) " Operations Management: Processes and Value Chains “, 9th ed., Person Prentice – hall, New Jersey.,pp121-133.

Kadhim, H. A. (2020). The impact of environmental auditing on the environmental dimension of sustainable development (Applied Research on" Environmental Governmental Institutions in Iraq). *Ilkogretim Online - Elementary Education Online*, pp. 2801-2812.

Kumar, V., (2010). JIT based quality management: concepts and implications in Indian context. *International Journal of Engineering Science and Technology*. Vol. 2, p. 40-50.

Lau .H, and K. Mak,"The design of flexible manufacturing using an extended unified framework" (2004). Journal of Manufacturing Technology Management. Vol. 15 (3), , pp. 222-238.

Liker, J.,(2004) ."the Toyota Way, McGraw – Hill.

-Manufactured housing research alliance New York , NY, (2005) , Getting Lean : assessing the benefits of lean production in factory built housing , " U.S. Department of housing and urban development affordable housing research and technology division ".

M. Braglia, G. Carmignani, and F. Zammori, (2006) "A new value stream mapping approach for complex production systems". International Journal for Production Research. Vol. 44 (18 – 19) , , pp. 3929 – 3952.

Mashell Brian H and Baggaley Bruce , (2004) , "Practical Lean Accounting : A Proven System For Measuring and Managing the Lean Enterprise" , figure 22.1 , New York , USA .

Mashell, Brian H.& Bruce l.Baggaley, (2006)," Lean Accounting what is it All About? " . p. 36 from Lean accounting summit in September.

Mohanad Kadhim Mejbel, Suzan Abbas Abdullah, (2023), "Evaluating The Performance of People in the Central Bank of Iraq (Cbi) According to the European Excellence Model", Vol. 8 No. 2 (2023), international Journal of Professional Business Review International Journal of Professional Business Review (JBReview).

Mohammed Sameer Deherieb Al Robaaiy, Abdulhadi Salman Salih Al-Husseini, Mohammed Hazim Alghazali "Appling the Lean Six Sigma Methodology in of the CostManagement & Continuous Improvement of Performance (Applied Research in the Blood Laboratory of the Hussein Teaching Hospital), Vol. 7 No. 4 (2022), international Journal of Professional Business Review International Journal of Professional Business Review (JBReview).

Poppendieck, Mary(2002) principles of lean thinking, "poppendieck . LLC,Mary @ poppendieck ". Review of General Management, VoL. 17, N. 1, p 164-171.

Nor Azian Abdul Rahmana, Sariwati Mohd Sharifb, Mashitah Mohamed Esac(2013)," Lean Manufacturing Case Study with Kanban System Implementation"Procedia Economics and Finance 7 pp 174 – 180.

Nayak, Bjjj, (2008), "Lean Manufacturing and Value Stream", Vice President San International, Master thesis A Case Study of Sony Ericsson – EFO705.

Ngoclan .Chi Pham ,(2015)." Apply Lean Thinking in Project Management". University of Applied Sciences. Helsinki.

Ohno T. (1988) The Toyota Production System, Productivity Press.

Ohno, Taiichi (2007), Workplace Management. Translated by Jon Miller, Gemba Press. McGraw-Hill.

Ohno, T. (2012)." Taiichi Ohno Workplace Management; Special 100th Birthday Edition. McGraw-Hill Professional.

Rother, Mike, and Shook, John (1998)." Learning to See Brookline MA: Lean Enterprise Institute .

Rother M., Shook J., (1999) "Learning to See: Value Stream Mapping to Add value and Eliminate Muda", Cambridge, Mass. The lean Enterprise Institute Inc.

Rother, Mike and Shook, Learning to See John, Lean Enterprise Institute.(2009), (Jared Lovelle , mapping the value stream) IIE solution 33 , no.2 , p.32.

Shingo S. (1982) Study of the Toyota Production System, Japan Management Association.

Shingo,Shigeo.(1989). " A Study of the Toyota Production System from an Industrial Engineering" View point. Portland, Oregon: Productivity Press.

Schroeder, Roger G. Susan Meyer, Goldstein,(2018)"OPERATIONS MANAGEMENT IN THE supply chain : DECISION AND CASES", 7^{ed}, Published by McGraw-Hill Education, 2 Penn Plaza, New York, NY 10121. Copyright © (2018) by McGraw-Hill.

Staats , Bradley R; upton , David M , (2009), " Lean principles , learning, and software production : Evidence from Indian software services, Harvard Business school, .

Womack, James P,and Daniel T. Jones ,(2005)." Lean Consumption " Harvard Business Review , Vol. 83, No. 3, March 2005 , PP. 58- 68 .

Womack, James P.,and Daniel T. Jones , (2003)."Lean Thinking :Banish Waste and Create Wealth in your Corporation , 2nd edition New York : Free Press , .

Y. Sugimori , K. Kusunoki , F. Cho & S. Uchikawa (2007). "Toyota production system and Kanban system Materialization of just-in-time and respect-for human System" homepage: International Journal of Production Research. <http://www.tandfonline.com/loi/tprs20> .