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EXPLORING E-KANBAN APPLICATION IN THE INVENTORY MANAGEMENT PROCESS

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Abstract
This research is conducted to investigate the potential implementation of the e-kanban methodology in the inventory management process at Honda Autoparts Manufacturing (M) Sdn Bhd At Pasir Gudang, Johor Bahru. With a growing interest in Industrial 4.0, many business practices have moved from manual processes to automation which heavily relies on the usage of electronics platforms. The transformations of the manual process to the electronics platform is covering a wide range of operation that includes the implementation of Kanban in inventory management. Kanban, which is a manual method adopted from the Japanese company practices is also subjected to changes. Hence, this study is to investigate the potential adoption of electronic Kanban (E-Kanban) at Honda Autopart Manufacturing that currently implemented the manual Kanban for their logistics department. This study adopted a qualitative method using a focus group interview to collect the data for analysis. The finding revealed that lack of knowledge and cost are the main themes unveil for the Honda to adopt the changes from manual to the electronic platform for Kanban. The findings from the study contribute to the preliminary information for future study.

Index Terms-- Supply Chain Management, Logistic Management, Inventory Management, E-Kanban.

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INTRODUCTION

The implementation of inventory management is always overwhelming with the tool application of the Kanban process. Kanban is the most adopted methodology to improve operational efficiency through the application of manual card to monitor the stock level of the inventory used in the production process. This method used widely in Japan, in particular in the managing of the inventory. In line with the development of technology, many organizations have converted the current Kanban methodology to the electronic platform known as E-kanban. Despite many advantages of E-Kanban over the manual practice, there are mixed results on the implementation that require for the investigation in the context implementation in Malaysia.

INVENTORY MANAGEMENT SYSTEM

Inventory management has many systems and methods that can be used to manage the inventory process in the company, either a manual or a software system such as ERP. Among the long-establish and well-known methodology is a Kanban method that well adopted among Japanese companies. Like other manual methods, Kanban methodology also exposed to transition in line with the business modernization that moves towards digitalization and automation. Therefore, Kanban is now available either in a manual or in the E-platform.

EVOLUTION OF KANBAN

Over the previous three decades, the Kanban process has exceptionally effective in developing the highest quality manufacturing environment for global competitiveness. Kanban, which translates as ''signboard'' (Muris et al, 2010) is synonymous with the early days of the Toyota manufacturing system. In the late 1940s and early 1950s, Taiichi Ohno developed Kanbans to control manufacturing between tactics and to enforce 'Just In Time' (JIT) at Toyota manufacturing in Japan. These ideas did not obtain global acceptance until the world recession in the 1970s. By using Kanban, he minimized the work in the manner (or WIP) between strategies and reduced the price associated with retaining inventory.

In the early years of established Toyota company, they used Kanban to utilize the machine and scale back prices. However, nowadays Toyota continues to use the system not solely to manage price and flow and also use for continuous improvement by conjointly to spot impediments to flow and opportunities.

ISSUES OF KANBAN METHODOLOGY IN THE INVENTORY MANAGEMENT

The impact of Globalization has benefited many individual economies around the world by making the markets more efficient, increasing competition, and spreading wealth more equally. The impact also has put great pressure to the current business landscape and operating procedure leading to change in the product variety and physical distance among the suppliers in supply chains process that further amplify the complexity of Kanban applications that lead to mistakes, such as delays, lost cards, and incorrect deliveries.

The complexity in the current business practice has seen the Kanban manual cards are no longer moved at the real-time of product consumption, whereas the motion of Kanban conventional card continually has some irregularities (Drickhamer, 2005). Therefore, Kanban conventional cards are misplaced sometimes and inflicting immediate troubles in JIT production (Kumar, 2007). The difficulty to adopt the business change has made the conventional Kanban systems stayed difficult to adapt the adjustment in the mixed production process as the conventional cards have to be collected and replaced by new ones (Mertins, K. et al,1999).

Furthermore, traditional Kanban structures cannot track and reveal the location of physical cards. Physical card or Kanban card and its statistics are always challenging during a transmitting process to the computer data system. It requires an additional employee to key- in manually all the data that will increase the tendency of error during manual entry (Qing et al., 2011). These manual errors can be eliminated by using the integration network technology such as the application of an electronic Kanban system.

According to Suprasith, J. et al (2011), a Kanban system is no longer appropriate for companies that have combined and fluctuating demand, poor best production processes, or having an especially giant range of products. Sudden decreases or increases in the combine or demand of products can additionally cause trouble for a Kanban system. A bigger complexity of Kanban systems can be made as the manufacturing methods contain greater components or product mixes, which in flip can lead to a device breakdown. If a scenario does no longer performs as expected, the whole manufacturing system has to be shut down.

THE INTRODUCTION OF E-KANBAN

Electronic Kanban or referred to as E-Kanban is a signaling system that uses a combination of techniques to trigger the movement of materials used in internal manufacturing (Adam et al. ; 2012),. Electronic Kanban differs from the conventional Kanban in that it makes use of technical information such as barcodes and digital messages to replace the function of Kanban manual card. In E-Kanban design, the digital Kanban computing device will monitor the inventory movement that marked with barcodes that are scanned at several stages in the manufacturing process, of which this information will use to signaling the internal and external stakeholder to arrange a replenishment of products.

E-Kanban structure also can be integrated with Enterprise Resource Planning (ERP) systems to increase the visibility of the Inventory status. Data pulled out from this integration can be used to optimize the inventory degrees with the aid of better monitoring, provide a lead for real-time demand and signaling to extended visibility.

E-Kanban implementation will minimize material shortages, helps to reduce losing cards, helps to analyze provider efficiency and improves the furnish chain transparency Suprasith, J. et al (2011. However, the conventional Kanban card is still a favorite choice in the manufacturing process due to the capability to offer direct supply of products for manufacturing requirements despite the inflexibility process and low efficiency which all can be reduced by using e-Kanban (M. Raju Naik, 2013).

Another present learns about the benefit of E-Kanban can also help mainly in blended model manufacturing to visualize the statistics of process, production agenda and resource working hours on the laptop screen (Hai Yan Wang, 2012). Besides, it can make the interplay between supervisor and whole production method and information dynamically whilst monitoring and controlling the production.

Many studies have shown that E-Kanban is affordable (Haou& Hu, 2012), is invented to replace the manual Kanban which pursuits at being greater responsive to decrease inventory cost, and the most important can be reconfigured to feature the robotics function (Mohanty et al., 2003). As such, it may optimize manufacturing sequencing based on facts from downstream.

Moreover, the e-Kanbancan auto-update the Kanban statistics which can ease the workers' tasks and averted many troubles. (Hou& Hu et al., 2012) Furthermore, it helps to enhance the pull system process in phrases of production efficiency, limit the waste, and shorten the planning schedule (Shingo, 1998).

IMPLEMENT OF E-KANBAN

A. Process Implement

There are several principles (Graves et al., 2008) in the implementation of E-Kanban that are crucial as discusses in the following:

Firstly, the E-Kanban has to comply with the standard principle of the Kanban card system, which includes the smooth and leveled production, combined mannequin sequence, secured material flow, operations tight synchronization, and pull indicators generated from the stock system.

Secondly, the E-Kanban system should continue the improvement in reducing the level of inventory and the production batches until able to correct all the hidden troubles. This enhancement approach needs to be included in the E-Kanban features to obtain most of the benefits realized from the pull manufacturing system.

Thirdly, the computing device ought to be trouble-free and should be designed properly to be capable to be integrated with various techniques that will further enhance the effectiveness of E-Kanban.

Figure 1. A sample of E-Kanban sticker after printed (Source: S. Kotani 2007).

Fourthly, card problems can be resolved by using the machine and other technology such as barcoding (see figure1). The fundamental challenges for funding in the E-Kanban systems are mixed production, technique visibility, and device speed and multiplied reliability. These features should be taken into consideration during a planning stage and the selection of software.

Fifthly, to fill gaps in the manufacturing techniques such as satisfactory issues, laptop failures, or material go with the flow problems will contribute by E-Kanban.

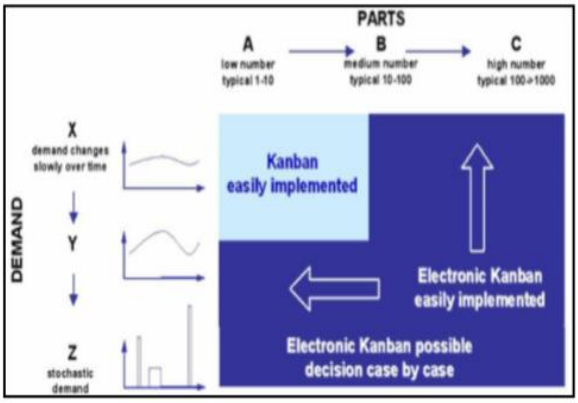

Figure 2. Areas of application of Kanban systems and E-Kanban

As shown in Figure 2 it is very difficult to use the conventional Kanban to manage a wide variety of materials circulating in the enterprise. This is because it is impossible to manage a massive range of Kanban cards that circulate in the system as compared to the E-Kanban system that has much higher applicability to the

speed of the changes. As such, the conventional Kanban card is not suitable to be applied in a mixed-mode variable where high fluctuate of demand makes the system becomes unstable.

Hence to be capable to extract the most benefit from every differentiation between the different Kanban structures, it is summarized in Table 1.

Table 1. Differentiation of card Kanban and E-Kanban

	Card Kanban	**E-Kanban**
Transparent Material flow	✓	✓
Control of ordered material level	✓	✓
Easier and faster ordering of material	✓	✓
Easier work for handlers with material	✓	✓
Regulation and optimization of stock	✓	✓
Simplification of production planning	✓	✓
Works with a high amount of materials		✓
Long distances between stations		✓
Quick and precise info		✓
Big financial investment		✓

Undoubtedly, E-Kanban has many benefits over the conventional Kanban system, which has been validated in much previous research (M.RajuNaik, 2013, Mariam, 2017, Ahmad et al. 2018). After the implementation of E-Kanban, many of the organization was able to eliminate the unnecessary steps of the conventional Kanban procedure and decrease the execution time, which has generated a huge saving.

1. The steps of the new e-Kanban manner include:
2. Collection and digitization of regular Kanban in the laptop system;
3. The transfer of information;
4. Transparency and improving the efficiency of the grant chain.

CHALLENGES IN E-KANBAN

According to Ahmad et al. (2018), constraints in e-Kanban are when the management is not ready for the new method. This is due to the fact they need to appoint experts in their company. The individual desires to own professional ability or expertise in a unique discipline Cristovao Silva et al, (2010).

Furthermore, the lack of assisting practices around the use of Kanban. Electronic kanban methodology is not a lot unique as the typical methodology. Therefore, supporting practices is necessary or essential for the use of a method, technique or procedure.

Next, is a lack of training. Many groups left out at this factor as this element required value to instruct the workers. According to Cristovao Silva et al, (2010), the procedure of learning the capabilities the worker needs to do a particular job or activity.

RESEARCH DESIGN

The researcher conducted a focus group interview with selected respondents decided by Honda management. Six (6) respondents were nominated by the company, however, only four (4) respondents made available during the discussion day. Despite a shortage of two (2) respondents, the moderator has proceeded the session by following e strictly on the focus group procedure of the interview discussion. List of the respondent is shown in the following table:

Table 2. List of respondents

Representatives	Faizul Bakri Bin Abdullah	Senior Manager
	Noor Afiqah Binti Roslan	Production Planner
	Lucy AnakKayah	Logistics Department
	Heryadi Bin Ishak	Production Department
Time	10.00 am - 12.30 noon	
Date	1st of October 2019	
Venue	Quest Room at Honda Autoparts Manufacturing (M) Sdn Bhd, Pasir Gudang, Johor Bahru.	

RESULTS OR FINDING

The purpose of this chapter is to discuss the findings obtained from the analysis in the qualitative study on the implementation of-Kanban system in Honda Autoparts Manufacturing (M) Sdn Bhd. The finding of the focus group interview is summarized in the following sub-heading:

A. The level of E-Kanban adoption among the current Kanban practitioner

In this study, there a lot of sharing between the moderator and the respondent towards the subject research of the understanding of the implementation of E-Kanban. At the early stage of the focus group discussion, the majority of the staff are quite uncertain to confirm the implementation of Kanban practice in their organization evident in the following statement:

''……., if we visit another factory in Japan for example, of course, they knew about Kanban system and so on…but in Malaysia, they (management) does not mention it directly…'' (En Faizul)

''.... we never know this system is Kanban system… or e-Kanban system and so on... but, practically what we practice was a Kanban system.''(En Faizul)

This argument is supported by the following statement that confirmed only a few people in the company, in particular, top management knew about the system that currently is used which based on the sharing session is similar to the Kanban system.

''I do not know about this kind of system but I have heard that word from the boss. All I know is all the process at my production. Maybe aaa…. what I do in my daily activities at production is relatable with this system. Perhaps.''(En Heryadi)

''Aaa.. yes. only upper management knew it.''(En Faizul)

From the sharing, it is found that the study organization has not communicated officially on the system used in the current process event to the senior position. The current practice (Kanban) has been set up during the early establishment of the company and been cascade down to the other staff through the established Standard Operating Procedure (SOP). implementing the Kanban process in the operation despite not formally informed their staff. All respondents learn the Kanban process through their job experience and self-awareness.

'' Aaa ... when I was started working here around in 1993. At that moment there was no direct system process. Never..then I was the one who studied all these processes schedule. I learned how this system works. I knew the amount inventory can hold, the quality control. Urmurhm. I can say for almost 26 years I've been studying this. '' (En Faizul)

''That one I did not learn very much. Haha. This is according to my experience working here. '' (En Faizul)

Due to a lack of transparency in information sharing, the majority of them are still lacking in E-Kanban knowledge evidence in the following statement:

'' I'm not sure if anyone else knows. But as I said before, I have heard of this e-Kanban but never learned about it. Urm. '' (PuanAfiqah)

''' Urmm yes for me. I heard of that but I never know about it. '' (Puan Lucy)

The respondent revealed that he has heard about the term E-Kanban from the other source of information such as reading and the internet.

'' If it was me I would have heard and read a little from the internet.'' (PuanAfiqah)

''' Urm I have heard, but not know very much about that…it is from internet'' (Puan Lucy)

Without being realized by the respondent, the E-Kanban platform has been fully implemented in the logistics process. While the rest of the process is remain using the old method; using a manual card.

'' Once we received the customer's demand, we can start shipping plan and send it to production. Then production will do the scanning. So, from the scanning, we will check and print a sticker and that will be included in our daily movement. After a month, we will see the balance of inventory stock. All that producing in production we will scan includes the export shipments.'' (Puan Lucy)

'' For now, we control using aaa... barcode system. So when the production is over, the production workers will scan the barcode to sent it to the logistics team. The logistics team will receive those to see how much output it takes to get to the finished goods area. Then at the finished goods area, they will scan the barcode one more time. From there, logistics already knows how many items are in stock at the back (production).'' (PuanAfiqah)

''I think ….at logistics department. Before the production process. '' (En Faizul and Puan Lucy)

''Yes, we got that. At the logistics department where Lucy's department.'' (PuanAfiqah)

B. Barrier and challenge in implementing of e-Kanban.

Costs are important to business innovation as it will impact the profitability of the company and require as part of the justification for the investment. In this study, the cost limitation is always the main concern for the management of the study organization. This is one of the reasons they are not fully converting the manual Kanban to the electronic platform.

"It is a plan to have full automation system …, but our main reason unable to implement is the cost itself….it is management decision''(En Faizul)

''Of course, the cost!''(Puan Afiqah)

It is a suggestion during the discussion to the production team to lead in the process of converting the current manual system to the electronic platform in the production area. However, the suggestion has triggered out a new barrier in the implementing of E-Kanban as the following statement:

'' aaa nope. …..what the assurance the system does not face breakdown for a day.''(En Heryadi)

''The weakness of e-Kanban is when we install it into a server, it has high possibility to breakdown…. as happened in the logistics '' (En Faizul).

'' Like at our production area,…. It is a pretty dangerous move as experience in Logistics. This is why we used a manual method like for example; we can make copy the data into a pen drive. And then we can log in to another computer. That is the Macola system that I talked about.''
(En Heryadi)

The study organization is currently using a Macola system, a software solution for small and medium-sized manufacturers and distributors. The reluctant of some of the respondent to convert to a full E-Kanban indicate a lack of knowledge and exposure to the integration process which is an effective solution in many business solutions.

During the discussion also, the majority of the respondents claim E-Kanban which is currently implemented at logistics might not suitable for their product. This is a new insight to be explored in a future study on the possibility of limitation of E-Kanban for a certain product.

''Aaa… Maybe other factories like electronics are capable of tracking them. We cannot because we producing huge products like bumpers and dashboards. There will be obstacles if we still wanted to use e-Kanban.'' (En Heryadi)

''Other company can control their system directly. Unlike us, we can only know our wrongs when the shipment arrived the customers"(En Faizul)

CONCLUSION

The majority of respondents in this study are still lacking in terms of knowledge in the E-Kanban implementation. It is evident during the interview, where all of them are unable to confirm the Kanban implementation at their organization, only after a few sharing, the respondent confirmed that the Kanban process is implemented in their organization. This is because there is no official confirmation from the top management on the system used in the operation that was inherited from the parent company in Japan. This finding supported Suprasith, J. et al (2009) that suggest the success of adoption new system are much depends on the organizational readiness and the awareness of the potential benefits from the implementation.

Throughout the study also, the researcher discovered out the management of the organization in this study is much less uncovered about machine integration which is a challenge in E-Kanban implementation when the administration is not equipped with sufficient knowledge (Ahmad et al., 2018).

The further investigation revealed that E-Kanban has been implemented at Logistics process without being realized by most the respondent. It uses a barcoding system to support the planning process and monitor the movement of material used for production. However, the system is not extended to other processes due to limitations in the integration process with the existing system. As suggested by Adam et al., (2012), Electronic Kanban (E-Kanban) is a signaling system that uses a mix of technology to trigger the movement of materials within a manufacturing or production facility, and by approaching technology manufacturing expertise consultant, this issue might be fixed.

The study organization also faces a limitation in the budget to convert another manual process into a full E-Kanban platform. This is supported Burton, E.et al, (2010) finding that management needs to consider take into the consideration the financial view – investment into the implementation of E-Kanban

which will involve costs of terminals and other expenses connected with development and IT implementation (Olga Maříková, 2008)

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