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An Account for Implementing Just-in-time: A Case Study of the Automotive Industry in China

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Abstract

Just-in-time (JIT) has been a popular operation strategy partly because of its success in the japanese automobile industry. Various benefits such as inventory reduction, improved operations efficiency, and faster response, have been studied widely in previous studies. Therefore, successful implementation of JIT is vital to many companies. This research makes use of a case study to explore five key research themes, which are information system, production planning, inventory management, quality management, and suppliers management, and the success factors surrounding implementation of JIT for an automotive company. This case study also provides evidences for supporting the benefits of employing JIT. Semi-structured interviews were conducted to collect relevant data. The research finding indicates that JIT system is crucial for the success of automobile companies, and operates JIT system can lead to many advantages to the case company. The major contribution of this paper lies in the discussions of the successful factors as a practical guide to implement JIT systems.

Keywords: Just-in-time, operations strategy, automotive, implementation, case study

1. Introduction

Just-in-time (JIT) theory has been operated widely in the japanese automobile industry and the electronics industry, although more and more applications can be found in other industries over the world [1]. The ideology of JIT is 'producing the necessary item in the necessary quantity at the necessary time is an eternal diver of production and operations management' [2]. The ultimate objective of JIT is to enhance flexibility of the whole system, which is one of the competitive factors in future manufacturing and services systems [3-4]. In addition, there are many production plannings and control methods, such as Kanban systems [3], being developed in order to achieve the objectives of JIT.

The main objective of this research is to study issues surrounding the implementation of a JIT system for an international automotive company. The factory concerned is located in China, one of the many branches of the aforementioned company. This study will reveal the current status and issues surrounding the JIT implementation in the case company, and examine how these issues can be tackled and improve the company's competitive strength. More specifically, five key research themes, which are information system, production planning, inventory management, quality management, and suppliers management, have been identified and success factors surrounding these five themes are explored. Semi-structured interviews with senior managers of the case company were organised in order to collect relevant data. The rest of this paper is organised as follows: Section 2 presents a review on relevant literature. Some key factors regarding JIT implementation are identified. Section 3

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summarises the background of the case company and the research method. Section 4 reveals key research findings, followed by the conclusion in Section 5.

2. Literature Review

Over the past few decades, JIT has drawn increasing attention from both practitioners and academics. According to Bozarth and Handfield [6], JIT is a management philosophy based on elimination of all kinds of waste and continuous improvement of productivity. In a broader sense, this applies to all forms of manufacturing and also many service industries as well. JIT requires elimination of waste which means that JIT systems could lead to delivery of 'perfect' products or services at the 'exact' time they are required [7]. In this connection, the main purpose of JIT systems is to identify and to eliminate as many kinds of wastes as possible through improving production activities within a company, and probably extend to external supply chain activities. A JIT system could be an 'effective tool' for assisting a company to reduce costs and then to obtain higher profits [2]. The Toyota Production System (TPS) is one of the most successful examples of JIT system [8-10]. It is proven that JIT system is also applicable in small companies in addition to the success in large companies [11-12].

JIT is also known as lean manufacturing, which is defined by Bozarth and Handfield [6] as a production philosophy that puts emphasis on the minimisation of the amount of all the resources (including time) being consumed in various activities of the enterprise. The aim of lean operation is to achieve a stable flow of products and services that could be delivered to customers at the quality level and time they want in order to satisfy customers' needs. In general, JIT can achieve wider benefit than the definition listed above, as companies that have implemented JIT can monitor their performance better and hence produce consistent performance accordingly [13-14]. Apart from manufacturing operations, JIT can also be applied to service operations such as healthcare systems [15].

JIT can be considered as one of the variants of production planning and control systems, which are pivotal management tools for satisfying increasingly high customer expectations in the competitive business environment [16]. Traditional production planning and control systems are 'push' in nature, which means planning department decides the production schedule and transmits to all production processes according to forecast of the demand of market. In contrast, JIT promotes "pull" control, which encourage the downstream processes pull items through the system rather than have them pushed by the upstream processes. Among many methods regarding JIT, Kanban, which was a card-based production system in its original setting in TPS, is a typical production planning and control system that aims to reduce inventory and lead times by 'pulling' production based only on the demand from the subsequent stages of production [16-17]. Using Kanban system could guarantee the required quantity of each item in each workstation or stage of production [18]. The cards carry (or translate) important production information along the production line which is essentially an information system, though it is not computer-based. Rhodes [7] advocates that a proper information system can facilitate JIT system by communicating quicker among departments. Recently, electronic Kanban has become a trend in modern JIT system [19] and this study will also reveal how such a computer-based kanban system, and also information technology in general, can facilitate implementation of JIT. JIT can also be applied to warehouse management such as cross-docking scheduling [20].

Obviously, the 'pull' nature of JIT helps companies to reduce safety or idle inventory because of the triggering of production process is based on more accurate demand information. In other words, companies do not need to keep excessive inventory. McLachlin [21] reported a list of advantages and benefits claimed for industries implementing JIT system. These include reduced lot sizes, lower inventory, improved quality, reduced waste and rework, improved motivation, greater process yield, increased productivity, increased flexibility, reduced space requirement, lower overhead, reduced manufacturing cost, reduced lead-time, elimination of certain tradeoffs such as cost and quality, and improved problem solving capabilities. However, steady demand and production planning is almost a pre-requisite for any JIT systems. Thus, the practicability of stable production planning could affect the JIT performance.

Another important element in JIT systems is quality management [22]. Obviously, normal production schedule will be affected if there are many defective products produced. This will definitely affect the requirement on steady production schedule as mentioned above. Therefore, it is important to understand how JIT can be implemented together with a good quality management system. This is somehow related to the cooperation between the company and the suppliers since the quality of the final products may be affected by the sources of the components [21]. In addition, capability of the suppliers can also affect availability of the components. Thus, how to maintain a good supplier relationship is another area that will be investigated in this study, which is the final research objective of this study.

Despite the benefits of JIT as summarised above, successful implementation of JIT is not always easy. Claycomb et al. [23] realised that the basic aim of JIT is easy to understand and formulate, but achieving this objective is more difficult and complicated. For instance, in order to deliver a particular product at the exact quantity needed, the transportation network has to be dependable and communication between internal and external of the industry has to be considered and could allow delivery of products or parts within a narrow window with minimisation of materials handing [23]. A holistic or integrated supply chain is required. In this connection, this study aims at investigating the issues mentioned above surrounding a real-life implementation of JIT system. The JIT system of an international automotive company with a factory located in China, Company BH, is analysed. The objectives of this study include identifying the profile of the JIT system in Company BH, examining their pre-implementation and implementation experiences, assessing the reasons for and the potential advantages associated with its adoption of JIT and highlighting the JIT practices targeted for future implementation.

3. Background of the Case Company and Research Method

With reference to the growth of Chinese manufacturing industry in the last two decades, it is not surprising that Chinese manufacturers have realised the need to build advance production systems such as JIT in order to maintain, and possibly upgrade, their operations effectiveness. Company BH is a typical example. It is a joint venture company with an overseas partner. They sold over 50,000 cars one year after the company's establishment in 2002, and ranked top ten motor companies in terms of its sales in China. The company had extended the production capacity to 150,000 cars in 2004, and to 300,000 in 2006, which means the company has become one of the top five motor companies in the Chinese automotive industry. Despite the growth, the company is keen on maintaining the market position or even moving ahead by introducing JIT system. This is also the reason why the company is selected for this study, which aims to provide managerial insights regarding successful implementation of JIT.

Robson [24] defined case study as 'a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence'. Saunders et al. [25] also summarised that the method of case study could answer the exploratory and descriptive or analytic research question- 'why' and 'how'. In addressing the research objectives as mentioned in previous section, case study is thus employed for data collection so that interrelated elements as identified in Section 2 will be examined, as well as their influence on the performance of the JIT system of Company BH.

More specifically, although a single case is explored in this study, Company BH is a good representative of a critical case that wants to improve its competitive strength through JIT system [25]. In order to collect data, semi-structured interviews were organised, which is a common method in the operations and supply chain management domain [26]. The purpose of interview is 'to understand the experience of other people and the meaning they make of that experience' [27]. The use of interview could help researchers gather valid and reliable data form interviewees that relate to research questions and objectives [25]. In addition, the interviews will be conducted as one-on-one form which is the most appropriate method and is relatively easy to arrange [28]. There are five interviewees chosen from the case company who have professional experiences in managing or implementing JIT system of the company. Their background is summarised in Table 1.

Table 1 Background of interviewees

Interviewees	Department and Position
Mr. A	Components Development Department, Director of Development
Miss B	Components Development Department, Director of Development
Miss C	Quality Control Department, Warehousing Components Quality Director
Mr. D	Production Management Department, Director of Material
Mr. E	Production Management Department, KD Support Chief

Through reviewing and analysing the context of interviews, the author made some notes and recorded the range of reactions to questions explained, which can be categorised under the five themes as identified in Section 2 and are reproduced in Table 2. Findings under these themes are explained in detail in Section 4.

Table 2 Five key research themes

	Key Themes
Theme I	Information system
Theme II	Production planning
Theme III	Inventory management
Theme IV	Quality management
Theme V	Suppliers management

4. Research Findings and Discussions

4.1. Theme I: Information System (and Information Technology)

Most interviewees support that proper design of information systems could assist JIT systems. They pointed out that information system is a technological foundation and its application to JIT is an elevated method for implementing JIT production system. The case company established a close dynamic corporation alliance via the Internet from upstream to downstream of the whole supply chain in order to realise the interaction among the company, suppliers and customers. In addition, information technology could assist the case company for building seamless connection between order information of upstream and resource information of downstream in order to reduce inventory by sharing information between both sides. Thus, the case company could enhance quicker response of the supply chain to ensure that materials could be supplied smoothly. More specially, the company employs electronic Kanban system to facilitate the flow of information, which will be explained further in Section 4.6.

4.2. Theme II: Production Planning

Themes II relates to the question on how JIT system can affect production planning in the case company. According to the interviews, Kanban is a primary management method in the case company's JIT model. Therefore, information can be conveyed throughout the production process and hence is more visible to the whole production process. Thus, daily schedule could be carried out and the production plan is operated from JIT perspective. As a consequence, excessive or insufficient production capacity could be avoided and also the waste of production resources or lose of orders could be eliminated. This supports the three production philosophies, namely, synchronisation of production, balanced production and rationalisation of resources distribution. Particularly, Miss C believed that:

"Balanced production is the premise condition for achieving the JIT production"

4.3. Theme III: Inventory Management

This section explains how the case company can (or cannot) achieve 'zero inventory' through implementing JIT system (and hence some barriers of achieving 'zero inventory'). The interviewees pointed out that the production process for JIT as mentioned in previous section has been implemented quite successfully. This means that production planning and materials preparation are stable with respect to the end consumption. In other words, inventory can be maintained at a reasonably low

level. Most interviewees; however, believed that 'zero inventory' is just a kind of ideal condition subject to the existing logistics and supply chain paradigm. Although inventory level for most of the components or parts is minimised by the implementation of JIT, and some parts could achieve zero stock in the case company, this is not applicable to all components, parts, or finished products. In the meantime, some safety inventory cannot be eliminated completely from the system.

4.4. Theme IV: Quality Management

The interviewees considered that quality is a very important factor to assure successful JIT implementation. The concept of quality management is extended to all workers. In addition, to ensure the JIT systems can be implemented effectively, supplier quality management is of vital importance. Performance indicators have been employed to examine the achievement of suppliers in quality, on-time delivery, and so on, in order to encourage suppliers to participate in the JIT program. More about suppliers management is discussed in Section 4.5.

4.5. Theme V: Suppliers Management

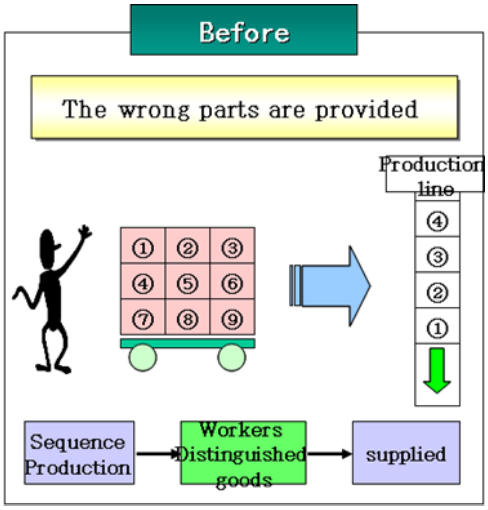
This section discusses the relationship between the case company and its suppliers and how the case company manages its suppliers. Some interviewees explained that in the case company, choosing and evaluating suppliers objectively in JIT production system is crucial for the development. There are about 100 major suppliers in the case company and most of them (40 suppliers) have built their production facilities near the case company. Thus, suppliers can reduce the time spent in distribution and can coordinate with the company tightly so that accurate information can be passed on to the company quickly. In other words, integrated JIT system could be achieved by the case company and its suppliers. However, there are some barriers regarding choosing and evaluating suppliers. For instance, some interviewees pointed out that some selection criteria cannot be enforced because of subjective judgement of the top management, who gave preferences to the suppliers from their own country.

4.6. Discussions

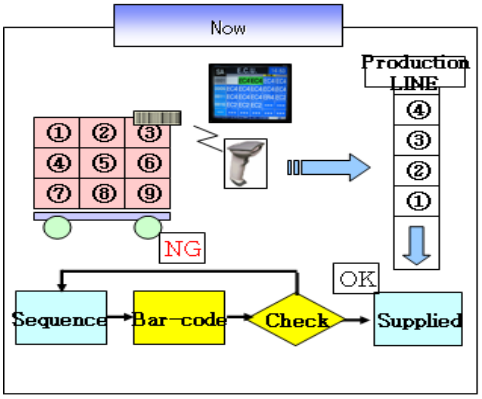
4.6.1. Role of information technology in JIT system

Fig. 1(a) shows the old system of the case company, which did not make use of a proper information system so that suppliers cannot report the delivery situation to Company BH quickly and timely. Therefore, the company had to employ many workers to check when and how many goods were provided. The disadvantage could lead to excess inventory in the factory. In addition, this made the company very difficult to control the production process and hence production efficiency was also low. The main problem of the old system is that wrong parts or components could be provided to the production line, which has a great influence on the whole production line. Implication of manual inspection is low efficiency. Fig. 1(b) depicts the new JIT information system, utilising bar-code system to monitor the flow of parts. The system could prevent wrong pats being used in the production line and could guarantee that the production line is uninterrupted. This system could also improve the production efficiency and reduce the labour cost by updating production information instantly. Through the use of electronic data interchange technique to link Company BH and its suppliers, Company BH could get the information from the suppliers through a monitoring system. The new JIT information system could achieve quick response in production line and build a close relationship between Company BH and its suppliers.

One drawback of developing such inter-organisational information system is of course high capital investment. In addition, the development cycle of the system is quite long. In view of the benefits the new system can introduce; however, it is worth investing for the new information system in order to ensure smooth and steady production.



(a) Old information technology



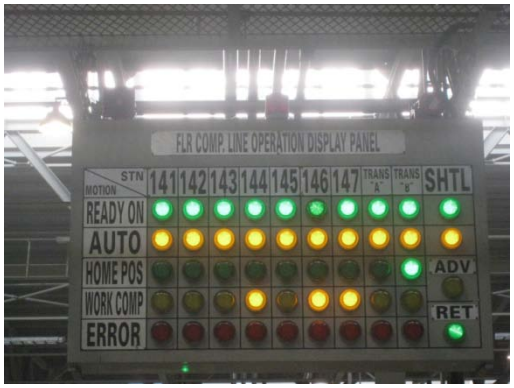
(b) New information system

Fig. 1 Information systems of Company BH

4.6.2. The effect of information system on JIT production

In Company BH, the major barrier of implementing JIT production planning and control is the uncertain factors of production planning and control, especially when the plan has to be adjusted so that its suppliers may not be able to make quick response due to such unexpected events. As a result, some parts could not be supplied at the right time. Since the whole supply chain of Company BH includes various suppliers and process stages, the situation is even severe. In the case company, Kanban has been using in the production line to ensure synchronisation of production. More specifically, Company BH employs electronic signal Kanban system to resolve the problem. Fig. 2(a) illustrates a 3-lamp signalling system that has been built in each workshop. One signal lamp means that parts are being produced and the other one means that this production process has been completed and the parts are going to be delivered to the next workstation. The last one means that there is an error in producing the parts or this workshop was stopped by the unexpected events or problems. According to the electronic Kanban signal, the subsequent workstations could understand the production situation from the former process visually in advance. If errors have occurred at the former process, the subsequent workstations could use the safety inventory for production. This can maintain a smooth production process. In addition, an operation display panel as depicted in Fig. 2(b) has been built in every sub-production process. The operation display panel shows the production process of every workstation in the production line. Managers could make production planning and control decisions based on the information displayed on this panel in order to ensure JIT production.

(a) 3-lamp signaling system



(b) Display panel

Fig. 2 Electronic Kanban System in Company BH

4.6.3. The impact of JIT system on inventory cost

Company BH believes that they cannot reduce the inventory cost by themselves. However, they could build a closer relationship with its suppliers to reduce the inventory cost together. In the past, the suppliers had to decide when and how many materials to be delivered on their own based on incomplete information sent from Company BH. This delivery method led to high level of inventory in Company BH's warehouse. Because of such high level of excessive inventory, Company BH had to employ many workers to manage and prepare materials for its production line. In addition, the case company wanted to improve its logistics network in order to reduce the inventory cost and enhance productivity of its production system. Company BH had found some problems of its logistics network as illustrated in Fig. 3.

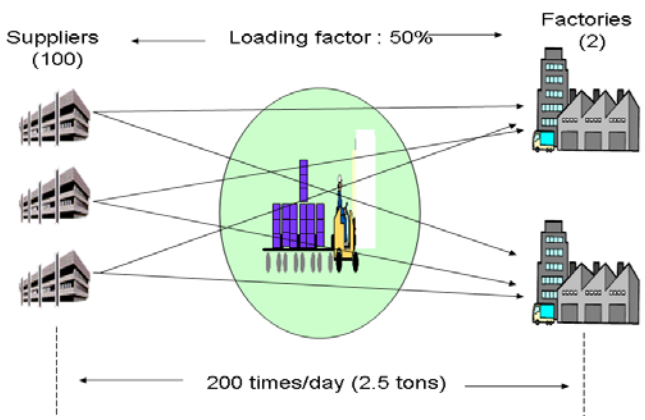


Fig. 3 Electronic Kanban System in Company BH

There are about one hundred suppliers of Company BH in China. They used to supply components and materials to the manufacturer directly. The total number of trucks used was two hundred times per day. As a consequence, Company BH could not control and forecast the number of materials supplied effectively so that suppliers had to transport components on their own. On the suppliers' side, the loading factor could be low (50%) which, in consequence, leads to a higher transportation fee. Company BH has improved its inventory system to reduce inventory cost by introducing the new inventory system as shown in Fig. 4. Under the new system, suppliers only deliver the right quantity of parts based on Company BH's production order. Goods are delivered more frequently (once or twice a day, for example) but in a smaller batch size. In addition, components and materials are supplied to the distribution centre instead of to the warehouse of Company BH directly. The distribution centre is to store and to pre-process parts. When production order is sent out, the distribution centre will deliver the right quantity of goods to the right production line at the right time.

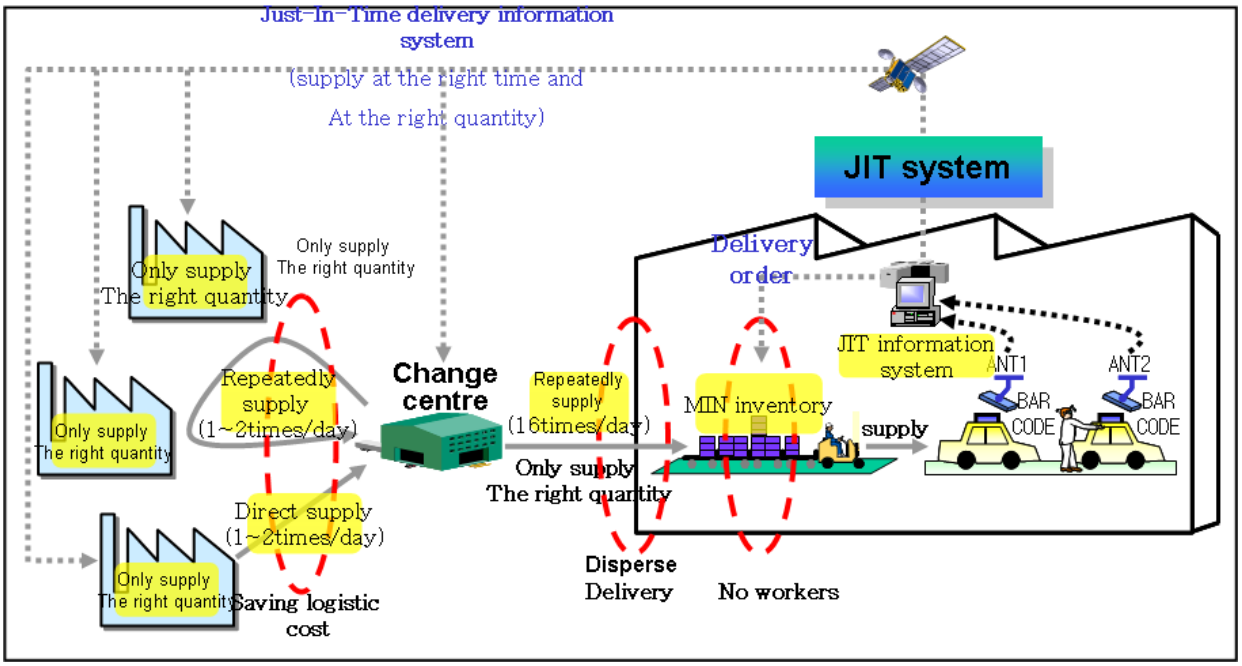


Fig. 4 The new JIT delivery system of Company BH

The distribution centre supplies goods to the production lines more frequently, which could be up to sixteen times each day. This delivery method could improve the trucks' loading and unloading efficiency. Furthermore, this could reduce the safety inventory. Consequently, inventory level can be reduced and hence direct labour cost in relation to inventory management can be decreased. From suppliers' perspective, the logistics related cost is also reduced as discussed below. The case company also improved the efficiency of its logistics system, which is depicted in Fig. 5.

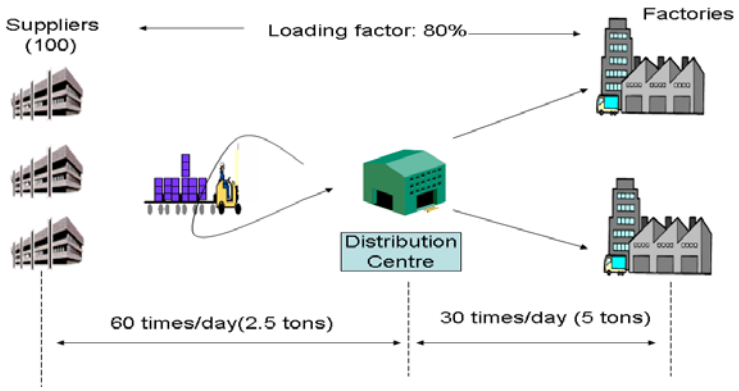


Fig. 5 The new logistics method of Company BH

After improving the logistics system, a distribution centre has been built near the factories. Suppliers could transport their materials to the distribution centre. The distribution centre then supplies the parts to the production line according to the production plan and inventory requirement. Moreover, suppliers could reduce the delivering frequency to sixty times per day and the loading factor could increase to 80%. As the result, the transporting cost from suppliers could be reduced. This can be illustrated by the following numerical example.

In the past, one of the Company BH's suppliers used to spend 120 RMB to deliver its components to the company each time. It needed to transport materials three times per day. Considering the loading factor of 50%, the total delivering fee of this supplier per day can be calculated as follows:

120 (RMB / per times) × 3 times / Loading factor (50%) = 720 (RMB per day) (1)

Since Company BH has built the distribution centre, the loading factor has increased to 80% and this supplier can use small trucks to transport goods multiple times a day instead of using large trucks. The delivering fee has reduced to 80 RMB each time and that supplier need transport goods five times per day. In this connection, the total delivering fee of this supplier per day can be calculated as follows:

80 (RMB / per times) × 5 times / Loading factor (80%) = 500 (RMB per day) (2)

Thus, suppliers could save 220 RMB delivering fee each day, which represent a reduction of over 30%, and also the case company could control the inventory easier. Through improving the case company's inventory management, it can be observed that the amounts of actual inventory level are lower than the anticipated ones. Table 3 summaries the inventory level in the first half of the year after implementation of JIT.

Table 3 Inventory level for six months

	Jan	Feb	March	April	May	June
Projected	98,135	96,766	100,458	104,193	103,425	103,016
Actual	63,181	62,787	55,629	63,232	60,431	55,145
Saving	34,954	33,979	44,829	40,961	42,994	47,871

4.6.4. Question mark of 'Zero inventory'

According to the interviews, there is a concern about safety inventory in Company BH. Most interviewees pointed out that only a few spare parts could achieve 'zero inventory' after the implementation of JIT. That means most interviewees do not believe that 'zero inventory' can be achieved realistically in the case company. For example, Mr. D commented that: "Zero stock is just a kind of ideal condition … It is nearly impossible to reach zero stock"

However, the interviewees believe that inventories could be reduced to a minimal level through implementing JIT and the associated logistics system. In the case company, there are several reasons to keep safety inventory. First, some interviewees pointed out that there are some factors which cannot be controlled by implementing JIT such as parts that cannot be supplied in time due to traffic congestion and emergencies. Second, safety inventory is stored near the production line to ensure production can be operated steadily. Third, Company BH has found that if 'zero inventory' has to be achieved, its suppliers will be under a lot of pressure. They have to deliver products to the production line extremely frequently. That will harm the relationship between the company and its suppliers. Mr. E commented that: "We will lose our core suppliers at cost of forcing to achieve 'zero inventories'"

This opinion is in contrast to the basic theory of JIT. However, Company BH believes that safety inventory is not only important for making production planning and control stable, but also critical for managing supplier relationship. This is further explained in the section below.

4.6.5. Supplier relationship and JIT

As mentioned before, there are about 100 core suppliers working closely with the case company. About 40 suppliers have built their factories near Company BH in order to achieve quicker response when they receive the production orders from Company BH. They could supply small amount of materials to Company BH frequently in order to avoid excess stocks in warehouse. In addition, the transportation cost could be reduced because the travelling distance is shorter. Suppliers are eligible to participate in the product design and development process. Representatives from the suppliers are delegated to Company BH's production line not only to resolve production problems, but also to help Company BH's product and process development. In addition, they are responsible to report the inventory situation everyday so that the suppliers bear more responsibility for inventory management.

Having said that a problem has been put forward by the interviewees regarding supplier selection process. Since Company BH is an international joint-venture company, some conflicts have occurred during the supplier selection process. For example, Mr. A commented that: "We are too subjective in choosing suppliers … So it is crucial to establish a complete supplier evaluation system to choose the potential suppliers"

Some interviewees pointed out that some preferences have to be given to those suppliers which come from the same country of the parent company of Company BH. However, the local suppliers have cost and location advantage that those suppliers could not achieve. Therefore, most interviewees supported to use local suppliers. Nevertheless, it is crucial to set up a proper supplier selection system to support JIT implementation.

4.6.7. Quality management and JIT

Reid [29] pointed out that excessive inventory could hide the defects of inventory management such as supply and quality problems. As a result of the JIT implementation in Company BH, inventory level had been reduced as showed in Table 3 and hence the problems and weaknesses of their system could be exposed so that they can be resolved accordingly. More specifically, Company BH's quality management includes a quality assurance system. Company BH requires its suppliers to report the situation of delivery and quality of materials every day. Moreover, Company BH evaluates and grades the suppliers regularly, with reference to on-time delivery of materials, the quantities of defective products, the attitude of working and attendance, and so on.

5. Conclusions

JIT is famous in reducing inventory level, and eliminating various kinds of wastes. Nevertheless, implementing a successful JIT system is never an easy task. It is a misunderstanding that reducing inventory is equivalent to implementing JIT. Merely reducing inventory level, however, will not achieve the benefits of JIT philosophy, but the original performance of the legacy system would become worse. "Zero inventory" is just a target and reduce inventory level is the outcome, but not the only action of implementing JIT. This is simply because the whole production activities, and the extended supply chain activities, are not synchronised in such a case. The extended supply chain activities also include suppliers management and the associated quality issues. Due to advance in information technology, employing information system may help. However, choosing the right information system is of vital importance. Otherwise, the whole production activities will be automated at a wrong pace. This research helps address above issues and can give insights to practitioners regarding the implementation of JIT systems.

More specifically, the research reveals some key findings in implementing JIT systems under five themes, which are information system, production planning, inventory management, quality management, and suppliers management. They are further explained based on the case study. The case also demonstrates how various issues surrounding these themes are integrated in the case company. A holistic system has been built in company BH to cope with the five themes in an integrated manner. In particular, the whole logistics system and the relationship with suppliers are of vital importance. In addition, this research also supports the benefits of applying JIT systems as advocate in many studies. As a matter of fact, all of the above requires top management support and a good strategic plan, although this part is not mentioned in this paper. This is a possible future research direction to explore how such factors contribute to the five themes.

Although case study is a widely accepted research method, the limitation of this study lies with the single case study. This inevitably undermines the contributions of this work due to a lack of generalisability. In the future, multiple cases could be conducted to generalise the key issues identified in this study by collecting more data from more companies, and preferably in different sectors for comparison purpose. Alternatively, a confirmatory factor analysis via a questionnaire survey which involves more companies will equally serve the purpose.

References

[1] H. K. Chan, S. Yin, and F. T. S. Chan, "Implementing just-in-time philosophy to reverse logistics systems: a review," International Journal of Production Research, vol. 48, pp. 6293-631, 2010.
[2] Y. Monden, Toyota Production System: An Integrated Approach to Just-In-Time, 3rd ed. Japan: Engineering & Management Press, 1998.
[3] R. Diaz, and A. Ardalan, "An analysis of dual-kanban just-in-time systems in a non-repetitive environment," Production and Operations Management, vol. 19, pp. 233-245, 2010.
[4] J. A. Buzacott, and M. Mandelbaum, "Flexibility in manufacturing and services: achievements, insights and challenges," Flexible Services and Manufacturing Journal, vol. 20, pp. 13-58, 2008.
[5] H. El Haouzi, J. F. Pétin, and A. Thomas, "Design and validation of a product-driven control system based on a six sigma methodology and discrete event simulation," Production Planning and Control, vol. 20, pp. 510-524, 2009.
[6] C. Bozarth, and R. Handfiled, Introduction to Operations and Supply Chain Management, 2nd ed. USA: Pearson Education, Inc., 2008.
[7] E. Rhodes, J. P. Warren, and R. Carter, Supply Chains and Total Product Systems: A Reader, UK: The Open University and Blackwell Publishing, 2006.
[8] C. Kumar, and R. Panneerselvam, "Literature review of JIT-KANBAN system," International Journal of Advanced Manufacturing Technology, vol. 32, pp. 393-408, 2007.
[9] J. Jayaram, A. Das, and M. Nicolae, "Looking beyond the obvious: Unraveling the Toyota production system," International Journal of Production Economics, vol. 128, pp. 280-291, 2010.
[10] S. M. Aghazadech, "JIT inventory and competition in the global environment: a comparative study of American and Japanese values in auto industry," Cross Cultural Management, vol. 10, pp. 29-42, 2003.
[11] S. -H. Hum, and Y. -T. Ng, "A study on just-in-time practices in Singapore," International Journal of Operation & Production Management, vol. 15, pp. 5-24, 2003.
[12] S. Dowlatshahi, and F. Taham, "The development of a conceptual framework for Just-In-Time implementation in SMEs," Production Planning and Control, vol. 20, pp. 611-621, 2009.
[13] M. Z. Meybodi, "Benchmarking performance measures in traditional and just-in-time companies," Benchmarking: An International Journal, vol. 16, no. 1, pp. 88-102, 2009.
[14] A. Furlan, G. Dal Pont, and A. Vinelli, "On the complementarity between internal and external just-in-time bundles to build and sustain high performance manufacturing," International Journal of Production Economics, vol. 133, pp. 489-495, 2011.
[15] F. Rahimnia, and M. Moghadasian, "Supply chain leagility in professional services: how to apply decoupling point concept in healthcare delivery system," Supply Chain Management: An International Journal, vol.15, pp. 80-91, 2010.
[16] M. Stevenson, L. C. Hendry, and B. G. Kingsman, "A review of production planning and control: the applicability of Key concepts to the make-to-order industry," International Journal of Production Research, vol. 43, pp. 869-898, 2005.
[17] M. J. Junior, and M. G. Filho, "Variation of the kanban system: literature review and classification," International Journal of Production Economics, vol. 125, pp. 13-21, 2010.
[18] K. Takahashi, N. Nakamura, and M. Izumi, "Concurrent ordering in JIT production system," International Journal of Operation & Production Management, vol. 17, pp. 267-290, 1997.
[19] G. Q. Huang, Y. F. Zhang, and P. Y. Jiang, "RFID-based wireless manufacturing for real-time management of job shop WIP inventories," The International Journal of Advanced Manufacturing Technology, vol. 36, pp. 752-764, 2008.
[20] G. A. Álvarez-Pérez, J. L. González-Velarde, and J. W. Fowler, "Crossdocking— Just in Time scheduling: an alternative solution approach," Journal of the Operational Research Society, vol. 60, pp. 554-564, 2009.
[21] R. McLachlin, "Management initiatives and just-in-time manufacturing," Journal of Operation Management, vol. 15, pp. 271-292, 1997.
[22] Z. Chen, and M. Zhou, "Supplier relationship management JIT production orientated in automobile manufacturing industry," Group Technology & Production Modernization, vol. 24, pp. 1-5, 2007.
[23] C. Claycomb, R. Germain, and C. Droge, "Total system JIT outcomes: inventory, organization and financial effects," International Journal of Physical Distribution & Logistics Management, vol. 29, pp. 612-630, 1999.
[24] C. Robson, Real World Research, 2nd ed. Oxford: Balckwell, 2002.
[25] M. Saunders, P. Lewis, and A. Thornhill, Research methods for business students, New York: Prentice Hall, 2007.
[26] H. K. Chan, W. Y. C. Wang, L. H. S. Luong, and F. T. S. Chan, "Flexibility and adaptability in supply chains: a lesson learnt from a practitioner," Supply Chain Management: an International Journal, vol. 14, pp. 407-410, 2009.

[27] I. Seidman, Interviewing as qualitative research: a guide for researchers in education and the social sciences, London: Teachers College Press, 1998.
[28] H. Maylor, and K. Blackmon, Researching Business and Management, New York: Palgrave Macmillian, 2005.
[29] N. Reid, "Just-in-Time Inventory Control and the Economic Integration of Japanese-owned Manufacturing Plants with the County," State and National Economies of the United States, Regional Studies, vol. 29, pp. 345-355, 1995.