



## Lean Manufacturing System at Rainbow Enterprise

**Norhayati Mohd Alwi\***

*Department of Accounting, International Islamic University Malaysia, Jalan Gombak, 53100  
Kuala Lumpur*

*Email: mhayati@iium.edu.my*

\* Corresponding author

**Nor Hafizah Zainal Abidin**

*Department of Accounting, International Islamic University Malaysia, Jalan Gombak, 53100  
Kuala Lumpur*

*Email: nhafizah@iium.edu.my*

**Norsyahida Mokhtar**

*Department of Accounting, International Islamic University Malaysia, Jalan Gombak, 53100  
Kuala Lumpur*

*Email: syahida\_m@iium.edu.my*

### Abstract

Mr. Johan was wondering how long his business could sustain. His company, Rainbow Enterprise was suffering from some internal problems. Being an owner-manager, Mr. Johan had to shoulder the challenges alone. Fortunately, in November 2017, he was introduced to Mr. Syakir, a consultant funded by Malaysian Productivity Centre. Between February and October 2018, the consultant provided some coaching and training to Rainbow Enterprise. In just a few months, the lean manufacturing system was introduced. Rainbow Enterprise invested some capital on changing the factory layout, improving the inventory management system and introducing proper planning and control system. Despite the changes, there were still issues that worth to be highlighted. Firstly, the company had production workers who were reluctant to change their attitude towards the new system. Secondly, due to the capacity issue on the management side, the 5S system was temporarily put on hold. Thirdly, it was still too soon to translate the results of the changes into monetary terms. By the end of 2018, Mr. Johan was still in doubt of the actual improvements that the consultant and the lean manufacturing system had offered him. How could Mr. Johan sustain his business? How could he progress further? Why were production workers reluctant to change? Were there hopes for future growth?

---

### INTRODUCTION

Rainbow Enterprise was a 100% *Bumiputera* manufacturing company, managed and run by Mr. Johan. It was initially based in Kajang but later moved to Petaling Jaya due to expansion. Since its inception in 2010, the company had always targeted for the production of best quality apparel. Thus, they focused on using high-quality raw materials, practised fine quality of sewing and printing processes. They also worked hard for cost minimisation while preserving the quality.

Rainbow Enterprise manufactured corporate shirts, school uniforms, t-shirts, skirts, *jubah*, blouse, muffler, and tote bags. Two important product segments were customised apparel and own brand t-shirt. The custom-made product was categorised as 3B business while the standardised product was categorised as Deluxe product line.

### TEXTILES AND APPAREL INDUSTRY ANALYSIS

In 2016, the textile and apparel industry was the tenth largest export earner with RM13.9 billion contributing to approximately 1.8 per cent to Malaysia's total exports of manufactured goods. The exports were targeted to grow at 5.8 per cent from RM13.4 billion in 2010 to RM 24 billion in 2020, which mainly contributed by textiles sub-sector like yarns and woven fabrics (IMP3 2006).

The textile and apparel industry in Malaysia was highly diverse and heterogeneous comprised of four sub-sectors namely;

- a. Primary textiles (polymerisation, spinning, weaving, knitting, and wet processing),
- b. Made-up textiles,
- c. Made-up garments, and
- d. Textile and clothing accessories (labels, buttons, zippers and packaging).

In a broader sense, it spans into upstream and downstream activities. The upstream sector covers production fibre, woven and knitted fabric while the downstream sector consists of made-up garments (such as shirts, pants and skirts) and home textiles. Malaysia's apparel manufacturers continue to maintain an excellent reputation for quality to meet high standards set by the international brand owners such as Nike, Adidas, DKNY, Tommy Hilfiger, etc. (MATRADE 2012).

The number of textiles and apparel companies has increased by 33.7 per cent from 445 in 1996 to 595 in 2005. Out of the total, 253 were textiles companies and 342 were apparel companies, as shown in Table 1.

Table 1. Textiles and Apparel Companies

	Number of companies	Suggestion performance	Weighted score
	1996	2005	1996-2005
Textiles	164	253	54.3
Apparel	281	342	21.7
Total	445	595	33.7

Source: Industrial Master Plan 2 (IMP2)

In 2006, the total export of textile and apparel amounted to RM10.6 billion mainly to the United States, European Union, Turkey and Canada, while the import of textiles and apparels was primarily from China, Taiwan and Japan amounted to RM5.4 billion in 2006. The main factor for import of raw materials, mostly textiles, yarns, woven and knitted fabrics, was due to the shortage of local supplies, both in quantity and quality.

The textiles industry will continue to be relevant in future years as more emphasis is now given to serve the needs of a niche market and upstream activities. To accelerate the shift of manufacturing and service sectors, from labour intensive into high value-added, and knowledge-intensive and innovation-based industries, the Government has introduced a new tax incentive namely Automation Capital Allowance (ACA) under the Malaysian 2015 Budget. Several investment policies were also introduced to attract investments in the industry, particularly in the synthetic-based textile sub-sector. The government had also provided further measures like skills enhancement in designing, production and marketing, facilitation of domestic capabilities and institutional support. Furthermore, the Ministry of International Trade and Industry has developed six strategic thrusts (MITI 2007). The thrusts include:

- Intensifying the promotion of investment in higher value-added textiles and apparels, including key support services,
- Sustaining the market share in textiles and apparels and promoting exports of the targeted growth areas,
- Intensifying regional integration of the industry,
- Enhancing domestic capabilities and facilitating the utilisation of ICT and new technologies,
- Enhancing the skills of the workforce in designing production and marketing,
- Strengthening the institutional support for further development of the industry.

Generally, the future of the Malaysian textile and apparel industry is dependent upon consolidation of upgrading of existing facilities, reducing costs and improving efficiency to remain competitive. Twenty-first-century manufacturing is characterised by customised products, which led to more complex production planning and control systems in mass production. Thus, many organisations struggled in the current global competitive markets. To become relevant, they were required to adopt the latest technology in production activities.

Therefore, Mr. Johan, the CEO believed that to accelerate the shift of the manufacturing process, from labour-intensive to knowledge-intensive and innovative based industry, change must happen in the company. At the initial stage, he adopted lean manufacturing system which focused on the irregularities in the production process. He believed that the quality control and quality improvement which were inclusive of systematic and proactive pursuits of improvement opportunities in production processes were crucial to increase the level of quality. Furthermore, in addition to detecting and reducing defective products, lean manufacturing also enables the company to streamline the flow of production processes, reduce operational costs and thus increase revenue. Ultimately, he believed in the long run; the lean manufacturing system could eliminate waste and non-value-added activities, which in turn could improve the lead time to the customer and company performance.

## **BACKGROUND OF RAINBOW ENTERPRISE**

### **Management and Organisational Chart**

There were four departments in Rainbow Enterprise that were set up to reflect its function. As illustrated in Figure 1, the departments were: production and planning,

human resource, administrative and finance, design, and sales and marketing. Being a manufacturing company, production and planning department had the highest number of employees (i.e. nine workers).

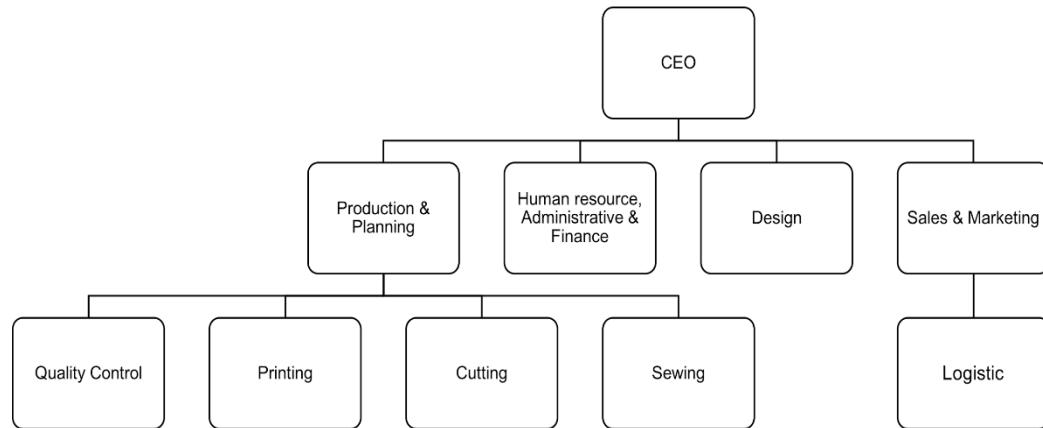


Figure 1 Organisational Chart

**Products – 3B and Deluxe**

Customers of Rainbow Enterprise included universities, schools, non-governmental organisations, and others. 3B, the standard product accounted for more than 50 per cent of the total sales. On average, total annual sales of the company was around RM1 million. Table 2 shows a summary of the performance of Deluxe and 3B products.

Table 2. Performance of Deluxe and 3B products

	<b>Deluxe</b>	<b>3B</b>
<b>Type of product</b>	Customised	Standard
<b>Pricing</b>	Depends on the design and materials	RM25, RM35, RM55 depending on the quality
<b>Average mark up</b>	30 per cent	45 per cent
<b>Average monthly production</b>	3,000 - 4,000 pieces	1,500 pieces
<b>Targeted monthly production</b>	7,000 pieces	3,000 pieces

**Competitor’s Analysis**

For 3B business, Rainbow Enterprise seemed more appealing to its target market as it offered more variety of products at reasonable price range compared to its rivals. It could also be regarded as a one-stop centre for the production of goods related to fabrics which enlarged its customer base. In terms of competitive advantage, Rainbow Enterprise in the future can champion the pricing and quality criteria as the company

manufactures the products on its own. Table 3 provides the competitor's analysis for 3B.

Table 3. Competitor's Analysis for 3B

Com pany	Social Media	Product	Price Range	Marketing Strategy	Competitive Advantage
<b>3B</b>	Facebook (5,678 likes), Instagram (383 followers)	Customised t-shirt, printing, sublimation, heat press, embroidery	RM12 and above	Website, social media, networking, event	Manufacturer
<b>A</b>	Facebook (33,420 likes), Instagram (1,084 followers)	T-Shirt, corporate, jacket, vest, sweatshirt, silkscreen print	RM9.90 and above	Website, social media, promotion, banner	Catchy website
<b>B</b>	Facebook (45,510 likes), Instagram (663 followers)	T-shirt, bib, bag, jacket	RM14 and above	Website, social media, blog	Free postage

On the other hand, the Deluxe products offered were cheaper compared to its rival. Interestingly, Rainbow sold their products at three different quality and pricing standards, which include cheap, reasonable and premium to capture different market segments with different purchasing power. On top of that, Deluxe business' strength lies on hundreds of agents distributed in various states across Malaysia, which entail bigger customer outreach and effective promotion. Table 4 provides the competitor's analysis for Deluxe.

Table 4. Competitor’s Analysis for Deluxe

Com pany	Social Media	Product	Price Range	Marketing Strategy	Competitive Advantage
<b>DEL UXE</b>	Facebook (43,291 likes) Instagram (238 followers)	Muslimah t- shirt, male pre- order t-shirt	RM25 - RM55	Website, social media, networking, event, agent	Agent
<b>A</b>	Facebook (115,388 likes) Instagram (17, 200followers)	Islamic couple t-shirt	RM79 - RM 147	Blog, social media, online shop (Carousell)	Couple Muslimah T-shirt
<b>B</b>	Facebook (96,249 likes) Instagram (14,300 followers)	<i>Muslimah</i> blouse, t-shirt, <i>jubah</i>	RM 55 - RM180	Website, social media, Tumblr	Very active on social media

**PRODUCTION PROCESS AT RAINBOW ENTERPRISE**

**Production flow**

There were four stages of the company’s production process namely cutting, sewing, printing, and quality control and packaging. The processes for each stages were illustrated in Table 5.

Table 5. Production Process

Stage	Process/Detail	Number of employees
Cutting	Fabrics were measured and cut according to sizes and patterns requested by customers.	2
Sewing	Sometimes, when demands exceeded capacity, the company outsourced the sewing part to strategic partners. The production workers were paid based on the number of outputs produced.	4
Printing	Due to only one production worker worked in the printing department, part-time workers were often hired to accelerate the printing process. The company had no sublimation machine but accepted orders for sublimed t-shirts. The sublimation process was normally outsourced to a sublimation printing company.	1
Quality control and packaging	Defects were inspected and defective products would be sent for rework. Apparels were packed according to orders and sizes.	2

## **Outsourcing to Strategic Partners**

### ***Sewing strategic partners***

At times of surge in demand, Rainbow Enterprise would outsource the sewing part of certain projects to other sewing factories. One of the company's merit was that it maintained good networking strategies with its outsourcing partners. The latter played a significant role in assisting Rainbow Enterprise enlarging capacities and meeting more demands from customers. The sewing outsourced partners were based in Sungai Buloh and Gombak area.

### ***Sublimation strategic partners***

Initially, Rainbow Enterprise offered silkscreen and press mode of printing. In tandem with high customers' preference for sublimation t-shirt, the company collaborated with a sublimation factory in Kepong. Since the company did not have a sublimation machine due to its high cost, the strategic sublimation partner had helped Rainbow tremendously in providing more quality products in line with customers' taste. The sublimation process was also quicker and easier, which allowed full coloured images printed digitally on the t-shirts.

## **CURRENT ISSUES AND CHALLENGES AT RAINBOW ENTERPRISE**

### **Waste Problems**

#### ***Unsystematic inventory arrangement and waste***

Unsystematic arrangement of finished goods and raw materials inventory in the company contributed largely to its waste problem. In this case, different types of fabrics were segregated in a proper manner. Every time the company received the delivered raw materials by the suppliers, the workers simply placed them randomly on the racks. As a result, the workers tended to overlook and leave the unused raw materials over a certain period of time. This practice had caused high inventory values in their Statement of Financial Position. Moreover, as the materials had their own estimated lifespan, Rainbow Enterprise had to quickly use the materials in order to avoid obsolescence and inventory costs.

#### ***Raw materials inventory and new order management***

Due to poor inventory management, raw materials inventory was not properly monitored. More specifically, the listing of inventory that was supposed to be in place for tracking the inventory movement was not available. Therefore, the company did not realise the availability of old inventories on the racks and simply ordered new inventories whenever needed. The excess materials had caused the company to incur higher costs of production as certain raw materials could not be utilised for other projects and might lead to obsolescence. This unnecessary inventory holding costs were caused by the disorderly inventory arrangement which in turn resulted in reduction of profit.

It was also a common practice of the production supervisor to wait for information from the tailors on the availability of certain raw materials such as collars, ribs, and accessories for dress. Occasionally, the latter placed an ad hoc order when they discovered insufficient raw materials during the production process. Sometimes, the raw

materials had to be delivered from the Johor supplier since the materials matched with the fabric colour from that particular supplier. Hence, the company had to face the aftermath of bad reputation and distrust from their customers. In worst case scenario, the existing customers as well as the prospective customers might switch to another company that could promise a better lead time.

### ***Returned finished goods inventory and waste management***

The company was also facing issues regarding sales returns. The store manager did not communicate the information to the management properly as there was no proper record management that could enable them to track the conditions and quantities of products returned by the customers. Hence, the returned finished goods inventory was left idle and over time, the goods' existence became unknown. As a consequence, the company faced additional waste problems as to absorb added losses from obsolete finished goods.

### **Production Capacity Issue**

For its standardised product namely Deluxe, the company was capable to produce up to 3,000 pieces per month. However, due to the absence of systematic production timetable and regular monitoring, more often than not, during the peak demand phase (i.e. the month of "Independence Day" or National Sports Day celebration), the company had to turn down a number of orders for 3B businesses due to perceived lack of capacity.

The company outsourced some parts of the production process of Deluxe products to its strategic partners, for instance, sewing, to cater the lack of capacity issue. Although this practice managed to facilitate the company to fulfil the very high number of orders, but it also led to other worrying issues. For example, the issue of quality due to the failure in executing consistent monitoring in the strategic partner's production process. This will be further elaborated in the following sub-section. Another factor that led to the prevailing low productivity level is the lack of motivation among the production workers.

### ***Issue of Production Workers***

The production workers' prime issues are centred around labour supply and work attitude. Foreign workers whom mostly made up the production workforce of Rainbow Enterprise relied on the work permit regulation. Strict regulation by the government on foreign workers has reduced the labour supply and caused disturbance to the production process of the company as well as its strategic partners. Pertaining to the work attitude issue, the workers were more likely to come late or be reluctant to do overtime in the events of excessive demands.

### **Issues on Packaging and Product Quality**

#### ***Piece based remuneration scheme and product quality***

The product quality issues at Rainbow Enterprise were contributed by both in-house and outsourced production process. In the case of the former, the attitude of the tailors that at times prioritised their high pay rather than quality led to below par product quality. As the tailors were paid on the basis of piece rate, during peak demand, they were pushed as well as inclined to sew faster. A higher number of completed materials means a higher pay. As a result, the company had to spend more time on repair or rework.



Under certain circumstances, they did not even have time to repair as the customers opted to have their apparel ready in time for their event.

#### ***Lenient quality control practices***

Rainbow Enterprise conducted a quality control inspection during the packing process, that is, after the completion of production. Prior to that process, there was no proper quality monitoring although at times, the supervisor might inspect some materials during the production process. The common quality problems at the company included incorrect colour printed, puckering and measurement issues. Due to these issues, the company incurred huge costs of reworking and repairing the rejected products.

#### ***Packaging issues***

In times of surge in demand, the company had to hire part-time workers to help in the packaging process. However, due to the lack of experience of part-time workers and time constraint, the company faced the problem of wrong or insufficient order quantity delivered to the customers. It was discovered that the part-time workers wrongly folded and packed the long sleeve t-shirts as short sleeve. In fact, there was a specific way to fold the long sleeve and short sleeve t-shirts for easy identification. Since the company had already sent the orders to the customers, it then required additional postage costs for re-delivery, and indirectly, gave a bad reputation to Rainbow Enterprise.

#### ***Incorrect Cutting Practices***

Due to wrong arrangement of pattern employed by the cutters, the raw material or fabric in a single lay was not optimally utilised, which would lead to waste. This was discovered during the process audit. Apart from that, the cutters had no proper cutting plan as they always cut materials for each project separately although some of the projects entailed the same type of fabrics. Due to this issue, the company incurred more overtime and utility expenses.

#### **Outsourcing Issues**

##### ***Insufficient apparels returned from outsourced sewing partner***

The common issue faced by the company with outsourcing is insufficient finished goods quantity returned. This issue emerged as the outsourced partners did not receive enough quantity of cut pieces such as sleeves or collars, which was the mistake of the company itself. This then resulted in production delays. The tailors would have to sew the insufficient quantity in house and were forced to halt their current production works. This in turn caused dissatisfaction among the tailors and demotivated them to work productively.

##### ***Insufficient sublimed apparels from outsourced sublimation partner***

Likewise, the sublimation partner also frequently complained of insufficient quantity of cut pieces sent by the company. In this case, the runner had to deliver the remaining quantity to the sublimation partner, as Rainbow Enterprise did not own a sublimation machine. This led to additional cost to be incurred and affected the relationship between Rainbow Enterprise and the outsourced partner.

### Factory Layout Problem

Both cutting and sewing areas were located in the same room. The current layout was not “production-friendly” as having two production processes in one area caused the room to be crowded and uncomfortable to work in. The workers also threw and lumped all the waste materials under the cutting table and sometimes the unused materials were hidden in the waste piles, causing the company to incur more production costs.

### IMPLEMENTING LEAN MANUFACTURING SYSTEM

In order to brief the usefulness of lean manufacturing system, several discussions between the consultant and Mr. Johan were conducted earlier. Mr. Johan finally agreed to introduce the lean manufacturing system to Rainbow Enterprise in early March 2018. The system aimed to provide benefits such as waste minimisation, and quality and productivity improvement. Rainbow Enterprise also decided to implement several types of lean manufacturing tools: *Heijunka* (Production levelling); *Kaizen* (Continuous improvement); the 5S system (*Seiri, Seiton, Seiso, Seiketsu, Shitsuke*); and visual planning (*Kanban*).

In order to facilitate the change process, Mr. Johan and his employees underwent training and coaching sessions with the consultant for six months. Training classes and guided coaching were conducted with the staff as to familiarise themselves with the lean manufacturing system.

### CHANGES IN RAINBOW

#### Factory/Workstation Layout

New physical equipment arrangement was implemented in Rainbow Enterprise. The new arrangements were aimed to solve several issues. First, a proper storage location made it easy to access available materials and to monitor the inventory balance. Therefore, the issue of inventory built-up was solved. Besides, Rainbow Enterprise managed to minimise production delays and improve material movements. Hence, the overall improvement made the workflow more systematic among workers and increased efficiency. The factory layout changes are illustrated in Figure 2 and 3.

Figure 2 Factory layout before the change

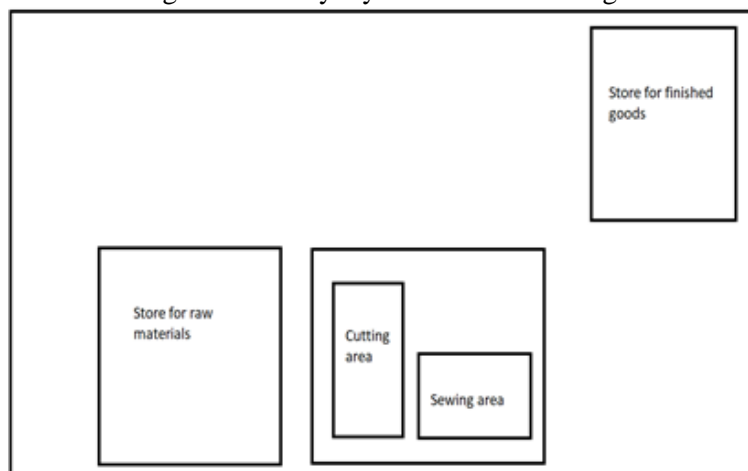
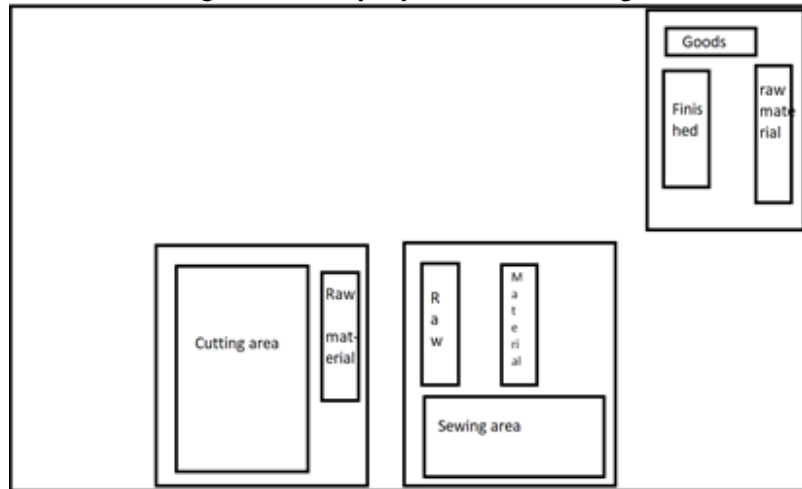


Figure 3 Factory layout after the change



### **Enhancement of Inventory Management System**

#### ***Labelling and segregating the fabrics (raw materials)***

In line with introduction of lean manufacturing system, the fabric racks were organised properly and were labelled based on fabric types. Monitoring of fabric movement was further enhanced through the introduction of fabric control listings. The listings should monitor the details of fabric colours and weight. Preceding control procedures such as the use of label and fabric segregation helped Rainbow Enterprise to retain low level of raw material inventory.

#### ***Change in cutting process***

A 'best practice' was introduced to the cutters. Instead of cutting a pattern independently by order, the cutters had to identify patterns from multiple orders that used similar materials and cut all those patterns simultaneously. This new practice helped the company to reduce waste and increase capacity for additional orders. High efficiency also led to overtime cost reduction which in turn reduced operation costs significantly.

#### ***Stringent quality control of work in progress***

Goods returned by the strategic partners for outsourcing activities (i.e. sewing or sublimation) often had quality and quantity issue. It is because the company failed to prepare control checklist prior sending the goods to the strategic partners. Therefore, one staff was assigned to monitor and count ready-cut materials and work in progress inventories prior sending them out to strategic partners. In short, this corrective measure further reduced operational costs **through reduction in rework** activities, overtime and transportation costs, as well as replacement costs of additional sublimation process.

#### ***Barcode system for finished goods***

A barcode system was already in place in order to facilitate the postage process. Recently, the system was extended to Deluxe t-shirts as each t-shirt was assigned with a unique barcode generated based on the customer order. Packaging of an order

would be packed together based on the respective barcode. As such, it was easily to identify any insufficient or excess quantity of certain type of products, for instance, sometimes short sleeve or long sleeve t-shirts that might be folded incorrectly.

### ***Basket Initiative***

A basket system was introduced to offer temporary storage for semi-completed goods. This system aimed to reduce mess and space usage after a work was done at each station. However, the system could not be implemented further. This was mainly due to limited number of workers in handling the process especially when there was a large quantity of orders received during festive seasons.

### ***The 5S system***

Rainbow had attempted to implement the 5S system but only managed to implement a few stages of it. The significant change brought by the system was apparent in the store section. The employees worked together to sort (*Seiri*) the store by clearing all unnecessary or obsolete raw materials and finished goods. Fabrics were set in order (*Seiton*) for easy retrieval via the rack system. Each level of the rack was assigned with label of specific types of fabrics. Then, the storage area was cleaned (*Seiso*) to offer neat, clean and healthy environment for workers to work.

In short, although they were only able to execute the 5S system partly, Rainbow Enterprise benefited significantly as purchasing costs were successfully reduced and material wastage was significantly minimised. Consistent with Randhawa and Ahuja (2017), despite the short period of engagement with consultant, the company managed to reduce delays (lead time), improved motivational level of workers, reduced the number of dissatisfied customers and improved profits.

### **Lean Planning and Control System**

Lean Production Planning and Control (PPC) tools which was introduced by the consultant brought significant positive impacts to the company. The company introduced takt time, cyclic planning and visual planning to the production department.

### ***Takt time***

Takt time was introduced to establish an average production time for each unit. It was supposed to synchronise with the delivery lead time to meet the customer demand. It allowed the company to fully utilise the capacity of the business which entailed higher productivity and reduce idle time.

### ***Cyclic planning***

This is “a repeated methodology of planning that aims to mitigate the volume variation in demand with optimised sequences of production runs” (Clotet 2015). The planning tool enabled Rainbow Enterprise to plan its production schedule on daily, weekly and bi-weekly basis which was also adjustable. As a result, Rainbow had opened up opportunities to become more flexible in meeting more customer demands and, hence reaping more profits.

### ***Visual planning***

The visual planning board helped the company to improve communication on the production plan and its progress in an efficient manner. The visual planning schedule for daily and weekly were circulated on cloud (i.e. mobile apps) that could be accessed by Mr. Johan and his employees. Not only that, it was also displayed on the whiteboards. As a result, the company was able to prioritise important tasks and improve on the need for levelling workloads. In addition, this acted as a positive pressure that provided a signal for team members to meet the deadlines.

### ***Automated monitoring system***

The usage of three monitoring whiteboards, used to monitor sales and production activities, was found to be complicated as frequent updates were required to be done consistently. Therefore, in line with the IR 4.0, the company had initiated, in its trial stage, an application system. This was to automate the monitoring process of the production activities. This automation enabled supervisors to monitor activities in production process, time tracking on job completion and job assignment. The idea was initiated by the owner himself due to his own educational background in engineering.

## **RAINBOW ENTERPRISE AND THE CHALLENGES AHEAD**

In October 2018, Mr. Johan started to smile. In just a few months, under the guidance of a consultant, Rainbow Enterprise was able to implement the lean manufacturing system. The company had invested on changing the factory layout, improving the inventory management system and introducing a suitable planning and control system. Generally, Mr. Johan had seen some improvements in his company. The factory layout was improved to mitigate the inventory management problem. The lean planning and control system was introduced to address the issue of production capacity. An improved flow of production process helped solving the packaging and quality issues. Nonetheless, the issue of outsourcing and foreign workers were yet to be settled.

Despite some costs that Rainbow Enterprise incurred on the changes, there were still issues worth to be highlighted. Firstly, Rainbow Enterprise had production workers that were reluctant to change their attitude towards the new system. Secondly, due to the demand and production capacity issue and the resistance by production workers, the 5S system was temporarily put on hold. Thirdly, it was still too soon to translate the results of the changes into monetary terms.

By the end of 2018, Mr. Johan was still in doubt of the actual improvements that the consultant and the lean manufacturing system had offered to him. How could he sustain the business? How could Mr. Johan progress further? What were Rainbow Enterprises' strengths and weaknesses? Why were the production workers reluctant to change? What are the roles that the consultant could play to address the issue of outsourcing and the resistance of production workers towards the 5S system? Were there hopes for future growth?

## DISCUSSION QUESTIONS

1. Identify the problems or challenges currently been faced by Rainbow.
2. Perform value chain analysis on Rainbow.
3. Analyze the factors that can be considered as strengths and weaknesses of Rainbow for financial sustainability and future growth.
4. How does Lean Manufacturing System (Kaizen, 5S, Heijunka-production levelling, Kanban-visual planning) support the production improvement initiative in Rainbow?
5. Identify the potential changes to performance management system due to the introduction of Lean Manufacturing System
6. How organisational culture (work values) and leadership style might influence organizational change (MCS)?
7. How the consultants play their role in bringing change to Rainbow?
8. How would you apply the Lewin's Change Model to Rainbow? Are there better ways to bring changes to Rainbow?

## References

- Clotet, J.F. (2015). *Lean Production Planning and Control in Semi-Process Industry*, MA thesis, Department of Production and Quality Engineering, Norwegian University of Science and Technology.
- MATRADE. (2012). *Furniture-Industry Profile*. Malaysia External Trade Development Corporation, Kuala Lumpur, Malaysia.
- Ministry of International Trade and industry (MITI). (1997). *The Second Industrial Master Plan (IMP2)*.
- Ministry of International Trade and industry (MITI). (2006). *The Third Industrial Master Plan (IMP3)*
- Ministry of International Trade and industry (MITI) (2007). *Ministry of International Trade and Industry Report 2006*.
- Randhawa, J.S., & Ahuja, I.S. (2017). Evaluating impact of 5S implementation on business performance. *International Journal of Productivity and Performance Management*, 66(7), 948-978.