











significant role in planning and replenishment of inventories. A company may determine the technique depending on the nature of business or their organisational needed. Generally, it would be one or several of techniques which very useful in the sense of helps to track the inventory movement [22].

### 2.6.1 Economic Order Quantity (EOQ)

The traditional approach of Inventory Control by many organizations. This model used to figure out an optimal quantity that can be acquired or produced to diminish the cost of inventory, processes of material purchase orders, production set up where able to minimize the total cost of organizations in holding and ordering of the year. The general model of inventories offered for all, but the model quite restricts to suitable in manufacturing materials where the materials under consideration has no connection between other parts and demand which statically forecasted which may need to utilize productive capacity [13]. EOQ is a logical way of technique that every firms able to aware when to order and how much quantity to be ordered [34].

The EOQ model is underlying on certain assumptions that help the companies from any sectors to comprehend their weakness and shortcomings. Without this, EOQ model not able to work towards its optimal potential. Following are the assumptions of EOQ model.

- The cost of ordering is constant.
- Known the demand of the year, evenly spread and sustained throughout the year.
- No delay and instantaneous stock replenishment
- Purchase order price (per unit) of every item is constant without any discounts.
- No constraints on order lead time
- Backorder is not permitted.

### 2.6.2 Just in Time (JIT)

The JIT technique was pioneered by Japanese where the concept is very simple that organizations or manufacturing firms are obtaining the inventories only when needed. This system also known as a "Zero stock inventory". By approaching this JIT technique, the business able to enhance the investment while reducing of inventory holding cost. Furthermore, application of JIT brings an effective planning in production, tighten the inventory control system, increase quality of products and service, decreasing unwanted stocks, expenses and eliminating wastages [2]. Even though, JIT is a simple but [6] emphasised that high possibility to decimate the stockholding of organisation if it's not works successfully. The quality of materials and parts must be high and defective materials could halt the

manufacturing operations which may resulting to failure to meet customers required. Thus, reliable relationships are needed between suppliers for smooth operations. Ideally, it's encouraging to having suppliers nearby to the companies with trustworthy transportation services.

### 2.6.3 ABC analysis

The ABC (Always Better Control) is well known and utilized by most of firms to analyse their inventory. Under this technique, the inventory or materials are classifying into three categories such as A, B and C according to their respective inventory value and significance of cost. It is essential that ABC analysis method based on turnover. The exact percentages are adhered too but it's less important when comparing with turnover. In some cases, there have further classification "category D" where this group comprises with huge number of low turnover materials. The main purpose of this method is to ensure availability of stocks to fulfil the demand with lower amount of cost and effort [2].

### 2.6.4 Material Requirements Planning (MRP)

MRP is a system most broadly using by manufacturing firms to support in planning and control of inventory system, automate manufacturing activities, scheduling and calculating the materials or components that needed to produce a goods. MRP system begin with master schedule where the bill of materials for each product need to be accurate which is important to determine the production needed. Then, MRP converts the data to show timescale of required materials and it's helping to schedule the orders with suppliers and for further internal usages [6]. The common goal of MRP are to ensure the minimum level of inventory, to provide high service for customer needed and co-ordinate all the activities including purchasing, delivery schedules for both production and purchasing processes. The ability of MRP systems allow any types of business to re-planning and response rapidly to the changes of demand.

### 2.6.5 Determining inventory level

The basic technique of managing inventory by quantity is determining the stock level for each commodity which are recorded of every stock movement as a point or signal when the action needed by inventory management [35]. This is one of the crucial techniques where it allows the companies to maintain an optimum level of inventory. Besides that, it's also helps to retain the stocks for safety purpose if in case any unexpected fluctuating in demand.

Every company determines inventory level in following ways, but depended on their business [35]:

- a. Minimum level of inventory: It's represents that minimum quantity of inventory holding by companies before replenishment of new stocks.
- b. Re-Ordering level: It is the level of inventory that company should place with new order to get back the materials before falls to minimum level. The re-order level normally calculated depends on lead time of orders replenishment plus safety stocks.
- c. Maximum level of inventory: This means; the quantity of inventory should not exceed the limit. Those stocks over the limit consider overstocking.

### 3 Research Framework

The main aim of this research is to analyse the inventory management and the performance of AB Technologies Ltd through reviewed by techniques of inventory management. The broad objective of this study is to understand the overall inventory management on the organisational performance of AB Technologies Ltd. Following are the specific objectives of this study:

- To conduct literature review of inventory management.
- To investigate the techniques of inventory management used at AB Ltd.
- To produce an inventory management strategy for AB Ltd to improve efficiency in the future.

The following basic questions were formulated to guide the research:

- What are the inventory management techniques being practiced at AB Ltd?
- How do the inventory techniques affect their organizational performance?
- What is the relationship between organization performance and inventory management of AB Ltd?

The findings from this research will assist to impact on the society especially for those are relating in inventories, manufacturing process and supply chain field in the following ways. The study will show an overall of inventory management and its practices or techniques are used in AB Technologies Ltd. Thus, the findings of this study may be useful as a fundamental for further research and upcoming investigation in term of literature. The information from this research may beneficial for managers or staffs working in AB Technologies Ltd or different organisations especially encouraging them to gaining knowledge on how to do comparison between

inventory management and actual performance. It may also be an advantageous to future researchers to analyse further about the effect of inventory management practices on manufacturing performance or any other organisations. The research aims to undertake case study approach using mixed method combining with qualitative and quantitative methods.

**Research Question 1:** What are the inventory management techniques being practiced at AB Technologies Ltd?

No		5	4	3	2	1
		SA	A	U	SD	D
1	There are various techniques of Inventory Management used at AB Technologies Ltd.					
2	The responsible employees are clearly understood the term of Inventory Management at AB Technologies Ltd.					
3	AB Ltd adequately manages its inventory by keeping accurate and up-to date records.					
4	Raw materials and consumables are the most consuming inventories in AB Ltd.					
5	The materials are reviewed and acquired on Stock Review basic at AB Ltd.					
6	Bin Card used to record the physical movement of materials in AB Ltd.					
7	Monthly stock checks help to improve performance of inventory management at AB Ltd.					
8	Inventory Control System used in AB Ltd to manage the stock movement by systematically.					
9	Forecast is one of the essential techniques used at AB ltd to replenish the inventory levels.					

Table 1: Research Question 1 Data Questionnaire

The quantitative survey approach allows to quantify and illustrate the existing practices at the company AB Technologies Ltd. It also measures the impact of inventory management practices in actual on organizational performance of the company. Thus, the area of study was conducted on micro and small-scale manufacturing company which producing thermal protectors and temperature limiting switches. The research is intended to understand the common techniques of inventory management used at the company and its correlation between inventory management organisational performance. This research also considered the challenges faced in inventories by the chosen company.

**Research Question 2:** How do the inventory techniques affect their organisational performance?

No		5	4	3	2	1
		SA	A	U	SD	D
1	There is positive relationship between inventory management and organizational performance.					
2	Inventory management planning and scheduling the inventories according to their importance.					
3	Inventory Management helps in effective material management of AB Ltd.					
4	Customer service has been improved through inventory management practices.					
5	Inadequate inventory practices affect organization performance of AB Ltd.					
6	Process of purchasing/procurement are improved by practices of inventory management.					
7	Inventories held in AB Ltd Store are most for executing customer's orders rather than for storage or buffer.					
8	Inventory management effectively reduced the cost in AB Ltd.					

Table 2: Research Question 2 Data Questionnaire

### 4 Case Study Research: AB LTD

In 1992, AB Technologies Ltd, also known as AB Ltd was established in Malaysia by the parent company from Germany. AB Ltd commenced production with 180 of local employees and currently this number has been expanded to 720 of employees. In global market, AB Ltd is one of the universal leading manufacturing company which specialise in developing bimetal thermal protectors. The company major operations are producing thermal protectors and temperature limiting switches and their products mainly preventing of electrical windings and equipment from overheating. Figure 2 is showing internal supply chain of AB Ltd.

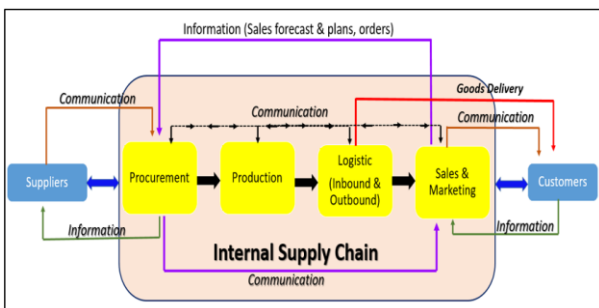


Figure 2: Internal Supply Chain of AB Technologies Ltd.

All the AB Ltd products are certified by international standards. Generally, their targeting market is an 'Electric motors' of business and mainly for AC

market (Alternative current) such as HVAC (Heating, ventilation, and air conditioning), transformers, ballast, heaters, machine parts and electronic components. Besides that, AB Ltd is the largest and most essential subsidiary company for the parent group which conducts sales and marketing in the Asia-Pacific region. AB Ltd products are producing with three main materials such as lead wires, switches, shrink caps and supporting with consumables items. The components to assemble switches and core material to produce shrink cap are acquiring from Germany and Romania. While, the lead wires are procuring from abroad as well such as Switzerland, USA, China, Hong Kong, and Sengapore.

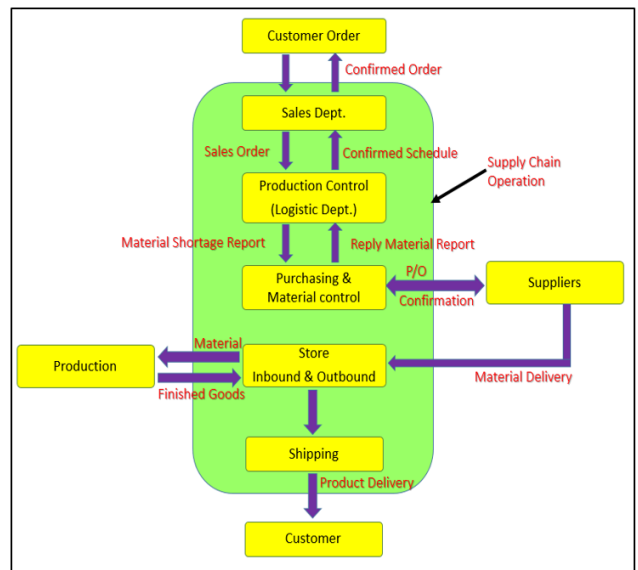


Figure 3: SC Process Flow of AB Technologies Ltd.

Figure 3 reflects the overall process flow of AB Ltd supply chain. AB Ltd supply chain is very simple and straightforward. Planning, sourcing materials efficiency in manufacturing process are the key features in their supply chain especially supplying the products to customers at the right time without failure. The consumables items are from domestic suppliers. According to [36], a supply chain activity involves with continual process and every organisation has its own set of market, unique operations and demands. A supply chain not only includes manufacturer and suppliers whereby its connecting with transporters, warehouses, retailers, and customers [37]. Similarly, AB Ltd products are unique set, reliable and innovation company for renowned brand manufacturers in global market. The company also developing solution of thermal protection and supplying and furnishing them directly to customers.



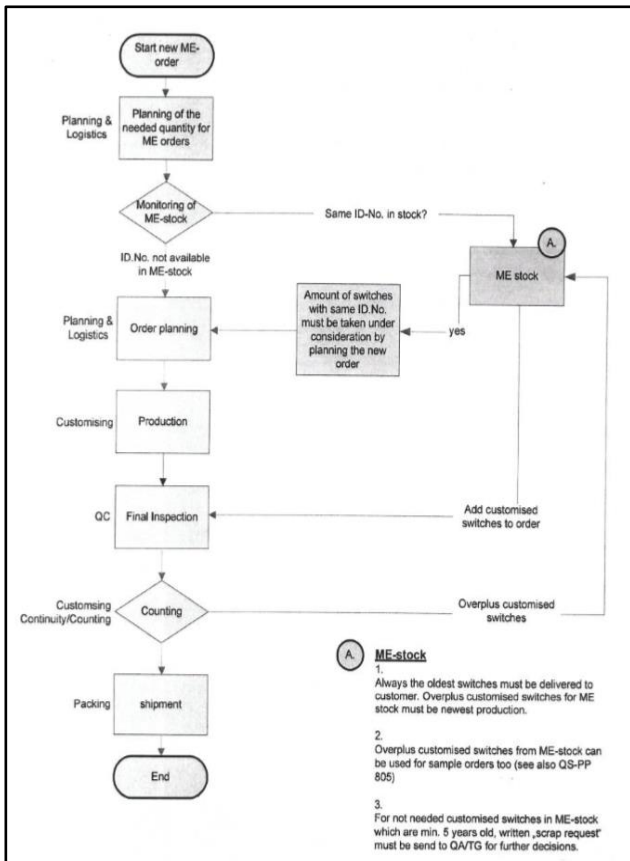


Figure 4: Overall Order Process Flow of AB Technologies (Source: Adopted from AB Ltd Work Instruction (WI))

### 5 Data Analysis and Findings

The analysis of data and interprets the findings of the study in line to reinforce the research objectives which included the study on inventory management techniques used by AB Ltd. Formula of Likert Scale and Weighted Mean Score has been used during quantitative data analysis. Weighted means scale is an average data where each data is multiplied by a predetermined before calculation in term of purpose to treat equally of data.

$$\bar{X} = \frac{\sum WF}{N}$$

W: Weighted Means Scale (WMS); F: Value of category; N: Total Population

The respondents given their responses by inform of Strongly Agree, Agree, Undecided, Strongly Disagree and Disagree, where:

- Strongly Agree = SA = 5
- Agree = A = 4
- Undecided = U = 3
- Strongly Disagree = SD = 2
- Disagree = D = 1

Total:  $15 \div 5 = 3$ , the Weighted Means Scale considered that 3 and above is positive and below 3 is negative. The findings are tabulated in below table 3 and table 4. According to above table 3, the questions were drafted to investigated into techniques of inventory management used in AB Ltd and to understand employee’s knowledge on processes of inventory management in line to attain first research objective. The main reason was to set up the strategies and to ensure proper organisational performance in AB Ltd.

No	Responses	Frequency	WMS%
1	There are various techniques of Inventory Management used at AB Ltd.	SA 46	4.38
		A 25	
		U 5	
		SD 2	
		D 2	
2	The responsible employees are clearly understood the term of Inventory Management at AB Ltd.	SA 32	4.21
		A 39	
		U 5	
		SD 2	
		D 2	
3	AB Ltd adequately manages its inventory by keeping accurate and up-to date records.	SA 50	4.52
		A 20	
		U 3	
		SD 1	
		D 1	
4	Raw materials and consumables are the most consuming inventories in AB Ltd.	SA 25	4.31
		A 45	
		U 5	
		SD 0	
		D 0	
5	The materials are reviewed and acquired on Stock Review basic at AB Ltd.	SA 15	3.62
		A 35	
		U 20	
		SD 5	
		D 5	
6	Bin Card used to record the physical movement of materials in AB Ltd.	SA 37	4.36
		A 40	
		U 0	
		SD 1	
		D 2	
7	Monthly stock checks help to improve performance of inventory management in AB Ltd.	SA 40	4.30
		A 28	
		U 9	
		SD 2	
		D 1	
8	Inventory Control System used in AB Ltd to manage the stock movement by systematically.	SA 0	1.56
		A 0	
		U 3	
		SD 39	
		D 0	
9	Demand forecasting is one of the essential techniques used at AB Ltd to replenish the inventory levels.	D 38	2.41
		SA 0	
		A 5	
		U 35	
		SD 28	

Table 3: Inventory Management Techniques at AB Ltd.

For a qualitative result, interviews were conducted to further confirmed that the techniques of inventory management used at AB Ltd. According to Head of Logistics, Stock Review, Bin Card System and Stock Count are the techniques approaching by the company. Respondents also strongly reported that the company doesn’t have proper inventory control system to manage and control the processes of inventory management by systematically. This is obviously can see in table 3 where the WMS value for question No.8 is negative, 1.56%. As discussed earlier, AB Ltd still depends on manual records while using Microsoft excel, manual stock cards and customer orders processing via email enquiries and shipping documents such as invoices, packing list and so on are prepared with using Excel sheets. The second problem was identified that no proper demand forecasting provided by Sales team where the questions No.9 in table 3 shown the WMS value

2.41%. Total 28 respondents strongly disagreed while 12 respondents were disagreed which the inventory planning not planning and scheduling according to forecast demand. During interviews, researcher also sought to understand that AB Ltd was acquiring materials based on customer requirements and the questionnaire survey revealed that 37 respondents strongly agreed for the statement that inventories held in AB Ltd Store are most for executing customer orders rather than buffer. In general, forecast is a prediction of future circumstances and it's a crucial requirement for all business especially for inventory planning. Earlier studies have identified that lower numbers of inventories are intolerable and undesirable that causes disruption for production strategies and order completions [38].

or negative which it relies on the method that applied by inventory management. Most interviewed participants explained that effective inventory management sustain quality of the company services included time management during the processes. Some still argued, with proper materials handling the company able to reduce labour costs which connected to enhanced performance of the company and its operations. Unrealistic inventory plan may cause to narrow down the business performance, lead to inventory shortage and bottleneck and delayed deliveries [39].

## 6 Conclusions and Future Research

Inventory is one of the significant assets in every organizations and effective inventory management is a vital key in the favorable of operations of organisations. Inventory management of AB Ltd. which co-ordinates the purchasing with suppliers, production process, and customer deliveries includes logistics planning to meet the markets demands and organizations performance to achieve company objectives and customer satisfaction. With respect to the findings of the research, Stock review, Bin Card System and Stock Count are the common techniques using by AB Ltd. An effective inventory management was associated with proper material handling which is one of the essential roles on the organisation performance. In addition, proper customer services, controls quality of company products, reduction of labour cost are helps organisations to reduced costs incurred in line to improved company performance. The findings of the study also noted that the monthly stock taking has affected positively the performance of inventory management where the stock variance was corrected by both physical and manual system. Finally, the study found that the company does not engaged with any inventory control system to maintain and supervise the processes by systematically.

Furthermore, there is no proper demand forecasting provided for effective inventory planning and scheduling. Strategic of inventory management makes every organisation to more efficient but it is quite challenge for most of organizations. As a result of this research, the following are the recommendations have been suggested for AB Ltd to improve its efficiency in inventory. In digitised and technological era, if still relying on manual inventory management system means it's inefficient and limited for business. Commonly, manual system is operating by humans which is high potential for errors even though sometimes most diligent employees also possible to get mistakes. The errors

No		Responses	Frequency	WMS%
1	There is positive relationship between inventory management and organisational performance.	SA	29	4.06
		A	38	
		U	5	
		SD	5	
		D	3	
2	Inventory management planning and scheduling the inventories according to their importance.	SA	43	4.40
		A	30	
		U	4	
		SD	2	
		D	1	
3	Inventory Management helps in effective material management of AB Ltd.	SA	29	4.14
		A	38	
		U	10	
		SD	1	
		D	2	
4	Customer service has been improved through inventory management practices.	SA	39	4.34
		A	33	
		U	5	
		SD	2	
		D	1	
5	Inadequate inventory practices affect organisation performance of AB Ltd.	SA	25	4.06
		A	38	
		U	15	
		SD	1	
		D	1	
6	Process of purchasing/procurement are improved by practices of inventory management.	SA	36	4.28
		A	32	
		U	10	
		SD	2	
		D	0	
7	Inventories held in AB Ltd Store are most for executing customer's orders rather than for storage or buffer.	SA	37	4.28
		A	34	
		U	5	
		SD	2	
		D	2	
8	Inventory management effectively reduced the cost in AB Ltd.	SA	30	4.19
		A	39	
		U	8	
		SD	2	
		D	1	

Table 4: Relationship of Inventory Management on Organisational Performance

Table 4 shows the responses to find out the significance relationship of inventory management on organisational performance of AB LTD. The reason was to explore whether employees were aware that inventory management and its practices contribute to organization performance. Based on the study, there is a positive effect and relation between inventory management and organization performance. The findings indicated positively 4.28% which the organization promptly react for productivity even though the materials purchasing upon customer requirements. Some qualitative results claimed that the relationship of inventory management and performance can be either positive

in inventory control management can leads the company to profitability lost which includes poor in customer services, time-consuming and frustrating for employees especially when stock out, stock discrepancy and so on. Thus, AB Ltd should automate their inventory management where the system much more easily to handle the arduous task in efficient way. The stock level of inventory can be tracked, up-to-dated, and providing real time of inventory level which able to act promptly to customer's queries.

An accurate forecast is most essential part in inventory management. AB Ltd. Sales team should update about the predictions of future customer orders. It is very helpful to inventory management especially during peak time, seasonal occasions, promotions and so on. An accurate forecast helps the business of AB Ltd. to know the best-selling materials, worst-selling materials and what is trends of market which is advantages for AB Ltd to satisfy the customers demand without disruptions. Furthermore, consistent demand forecasting allows the company to achieving a good turnover.

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