IMPROVEMENT OF IN-STORE DELIVERY BY APPLYING THE DMAIC MODEL

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ABSTRACT

This study aims to identify and correct problems in the in-store delivery process at the ABC Home and Construction Appliances Company in Thailand. Too much time was involved, from the customer placing a sales order at the warehouse to collecting goods at the pick-up point. These problems caused often considerable waits for those customers who had chosen to collect their goods themselves. The DMAIC model has been used to identify existing problems and improve the current process of the in-store delivery process. The methodology includes observation, interviews, and shared problem-solving. With an action plan, including KPIs, the picking process and waiting time are significantly reduced. Recommendations are made to ensure that the process remains in the improved state and is continually reviewed.

Keywords: In-store delivery, DMAIC, Customer Satisfaction

บทคัดย่อ

วัตถุประสงค์ของงานวิจัยนี้ คือการแก้ไขปัญหาของบริษัทที่ให้บริการด้านการส่งมอบสินค้าให้กับลูกค้าที่ต้องการรับสินค้าที่คลังสินค้าด้วยตัวเอง ซึ่งปัจจุบันบริษัทกำลังมีปัญหาเรื่องความล่าช้าของการส่งมอบสินค้าให้ลูกค้าที่มารอรับสินค้าที่คลังสินค้า ปัญหานี้มีสาเหตุมาจากการทำงานที่ขาดประสิทธิภาพ ดังนั้นความล้าช้าของการรอรับสินค้าที่คลังสินค้าของบริษัท จึงส่งผลต่อความพึงพอใจของลูกค้าที่ใช้บริการ

DMAIC เป็นเครื่องมือการปรับปรุงที่ช่วยให้ผู้ที่ต้องการแก้ไขปัญหาเข้าใจถึงสาเหตุของปัญหาที่แท้จริงและยังเป็นเครื่องมือที่ผู้วิจัยนำมาใช้ในการปรับปรุงกระบวนทำงานภายในคลังสินค้า ซึ่งระยะเวลาของการรอรับสินค้าจะมีผลต่อความพึงพอใจของลูกค้า ผู้วิจัยศึกษากระบวนการ DMAIC ภายใต้การกำหนดสาเหตุและเข้าใจปัญหา การวิเคราะห์สาเหตุของการส่งมอบล่าช้า นอกจากนี้ผู้วิจัยได้เสนอแนะแผนการปรับปรุงการทำงานที่มีประสิทธิภาพมากขึ้นเพื่อความพึงพอใจของลูกค้า

ผลของการปรับปรุงขั้นตอนของการทำงานในคลังสินค้าเพื่อลดความล่าช้าในการรอรับของลูกค้า โดยใช้กระบวนการ DMAIC บริษัทจะต้องดำเนินการปรับปรุงและพัฒนาขั้นตอนการทำงานอย่างต่อเนื่อง เพื่อที่จะสามารถปรับปรุงเปลี่ยนแปลงเพื่อการพัฒนาอย่างยั่งยืนสำหรับการดำเนินงานของบริษัทที่ดีขึ้นในอนาคต

*Ms. Kitiya's MSc Research Report has been revised specifically for the Journal of Supply Chain Management. Additional information and figures were inserted for clarification.

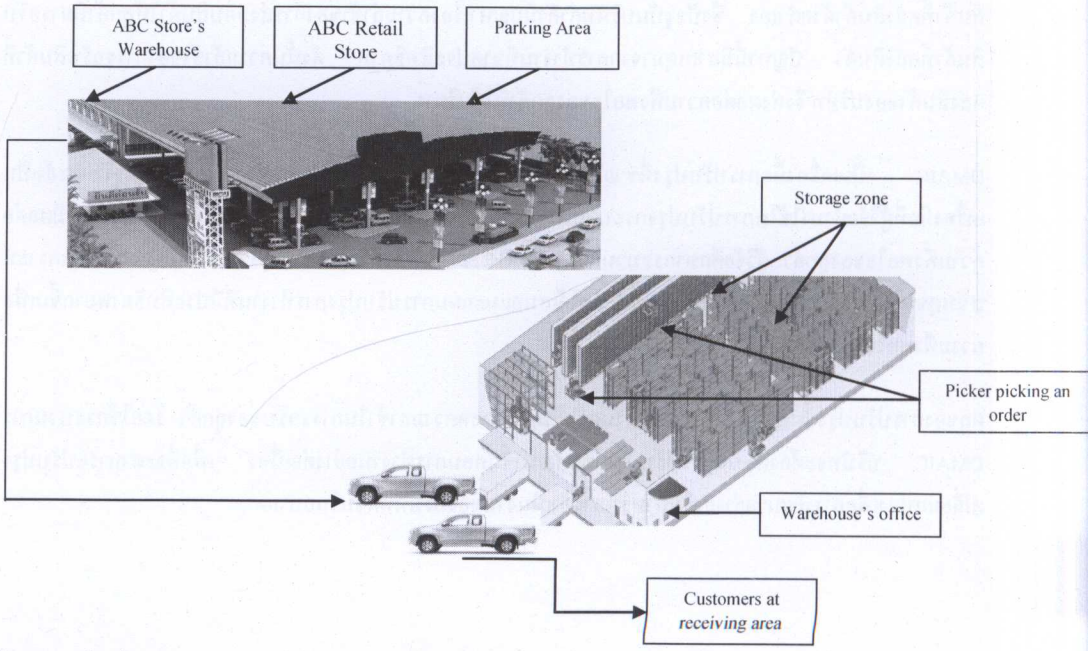
INTRODUCTION

The ABC Company (a pseudonym) Home and Construction Appliances Company was founded in 1983. The company is located in Pathum Thani province in Thailand. In the 1980s, ABC mainly supplied roofing materials, teak wood and other items used in construction. With low prices and high quality products, ABC grew rapidly. Within three years, the company was listed as "ABC Company Limited" because of increasing sales. The company has expanded its product line further and now carries a variety of construction tools, electrical equipments, paints, chemicals, and tiles.

The company is separated into two units: 1) a retail store selling household hardware construction materials, tools and accessories for home builders and 2) the store's warehouse where products are stored and customers come to pick-up their purchases. ABC is a one-stop shopping place for home and construction appliances. Customers can buy products at low cost: as the company's original slogan says: *"One-Stop, Low Price, and High Quality at ABC Company"*.

As part of its service, ABC Company provides a home delivery and in-store delivery service where customers can pick up their purchases at the store's warehouse collection area. When customers buy the products they are required to pay at the sales office. They can choose to receive their products at the ABC store's warehouse or request the home delivery service. For in-store delivery, the customer needs to pick up their products at the store's warehouse by using a drive-thru at the rear of the ABC Company building. An overview of the ABC store's warehouse and pick-up area can be seen in Figure 1.

Figure 1: Overview of the ABC In-Store's Warehouse
(Where the customers go to pick up their Product)



Source: Authors

Juran Institute (www.juran.com) stated that features of goods or services attract customers and promote customer satisfaction. ABC Company carries a large number of home and construction items, and offers home delivery and in-store delivery as part of the service. However, from several weekend observations during peak hours, it was found that customers who chose in-store delivery often have to wait to receive their products at the warehouse, for over an hour even sometime if it was just one item per order. Table 1 shows customer waiting time during weekend observation. Evidently the time required for in-store delivery service was excessively long and indeed required management attention for improvement if it was to achieve its business aims for customer retention as well as attracting new ones.

Table 1: Customer Waiting Time Observations during Weekends

Customer No.	Product Quantity	Waiting Time (minute)	Days/Time	Customer No.	Product Quantity	Waiting Time (minute)	Days/Time
1	7	120	Sat 11.00-16.30	21	5	45	Sat 11.00-16.30
2	3	60	Sat 11.00-16.30	22	4	90	Sat 11.00-16.30
3	4	90	Sat 11.00-16.30	23	1	50	Sun 11.00-16.30
4	6	120	Sat 11.00-16.30	24	7	60	Sun 11.00-16.30
5	6	90	Sat 11.00-16.30	25	10	120	Sun 11.00-16.30
6	2	50	Sun 11.00-16.30	26	3	30	Sun 11.00-16.30
7	3	60	Sun 11.00-16.30	27	6	120	Sun 11.00-16.30
8	5	120	Sun 11.00-16.30	28	5	50	Sun 11.00-16.30
9	5	60	Sun 11.00-16.30	29	2	30	Sun 11.00-16.30
10	4	90	Sun 11.00-16.30	30	5	60	Sun 11.00-16.30
11	2	30	Sat 11.00-16.30	31	1	40	Sat 11.00-16.30
12	4	50	Sat 11.00-16.30	32	1	30	Sat 11.00-16.30
13	3	45	Sun 11.00-16.30	33	5	30	Sun 11.00-16.30
14	4	60	Sun 11.00-16.30	34	2	50	Sun 11.00-16.30
15	3	35	Sun 11.00-16.30	35	4	45	Sun 11.00-16.30
16	3	40	Sun 11.00-16.30	36	9	90	Sun 11.00-16.30
17	2	30	Sun 11.00-16.30	37	4	60	Sun 11.00-16.30
18	5	120	Sun 11.00-16.30	38	4	40	Sun 11.00-16.30
19	6	50	Sun 11.00-16.30	39	1	45	Sun 11.00-16.30
20	7	60	Sun 11.00-16.30	40	7	50	Sun 11.00-16.30

Source: Authors

Ensuring customer satisfaction is one of the most important tasks facing a business today and it is at the heart of retaining loyalty. That is why customer satisfaction is the responsibility of every person who works at ABC. Achieving the highest levels of customer satisfaction should influence all business management actions (Smith, 1994). Therefore, this research seeks ways to improve in-store delivery process time in order to gain customer satisfaction. This is done by first identifying and analyzing the root cause of in-store delivery delays; and second, by proposing recommendations based upon the analysis of the in-store delivery process; third, by implementing the recommended changes; and fourth by setting up a procedure to ensure that the system remains in the improved state.

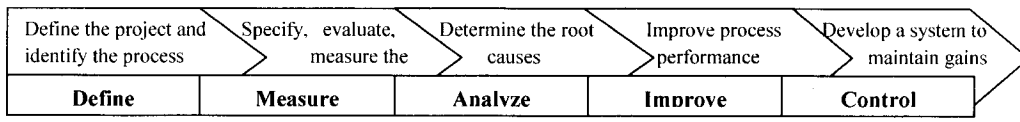
METHODOLOGY

This section outlines the variables, techniques and tools that are used to examine and analyze the in-store delivery process and identify the important factors that cause the long interval time between the purchasing point and receiving point.

One process improvement methodology that focuses on increasing customer satisfaction and reducing defects in any business is called DMAIC. It is a five-step systematic approach that allows companies to effectively manage process improvement. The acronym DMAIC stands for Define, Measure, Analyze, Improve, and Control. The DMAIC process for business improvement can be applied to improve the process involved in the in-store delivery and thereby improve customer satisfaction. A variety of tools had been employed primarily in the Define, Measure and Analyze steps of the DMAIC process to identify root causes and develop improvements for the process involved such as Observation, Interview, Process Flowchart, Cause-and-Effect Analysis, and Brainstorming.

The approach of DMAIC is to solve problems and improve results by using each step of a five step process. Each step must be completed before the next step is undertaken. Then that step is reviewed to find the alternative possibilities (Hambleton, 2007). The five steps of the DMAIC model in Figure 2 below, and the subsequent description, will help the reader to understand the model

Figure 2: Five Steps of DMAIC



Source: Snee and Hoerl (2002)

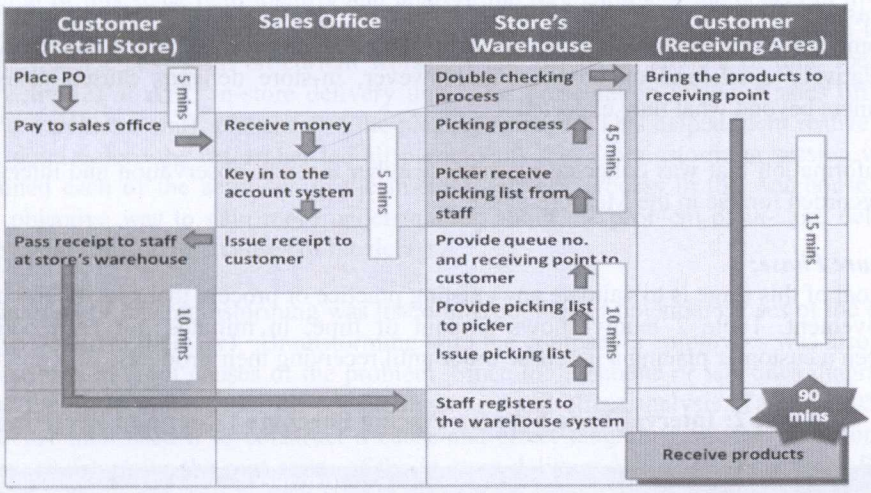
This following section explains in details how the research was done using DMAIC in conjunction with selected tools described earlier.

Define Phase:

The first phase of the DMAIC model is a Define phase. The goal of this stage is to define and clearly describe the problems of in-store delivery. The research methodology requires collecting two types of data. The first type was obtained by observation at the ABC in-

store warehouse where the researcher observed the working process in the warehouse and observed 60 customers in the customer receiving area. Those observations took place from 9th January 2015 to the 3rd May 2015. Data was only collected on Saturdays (11:00 am to 4:30 pm) and Sundays (11:00 am to 04:30 pm) because the customers are most likely to use the in-store delivery process during these hours and on the weekends, according to the store manager. Figure 3 shows the Process Flowchart of the in-store delivery that the researcher observed.

Figure 3: Process Flowchart of In-Store Delivery



Source: Authors

The process starts when a customer places a purchase order and pays money at the sale office (where receipt is issued to the customer). Then, the customer needs to go to the in-store's warehouse to give the receipt to warehouse staff. The picker receives the picking list from the staff at store's warehouse, and then goes around the warehouse storage areas to pick all the products required for that order. The picker needs to double check the products before taking them to the customer at the receiving area. The purpose of the research observation is to understand actual process practices and normal process routines of the in-store delivery, which will later help to identify the causes of problems.

Interviews were then conducted to further clarify what was seen during the observation process. Data was collected from interviews with the in-store's warehouse employees. The first interview was conducted with two available pickers who are responsible for picking and delivering the products to the receiving area. Another interview was conducted with the manager who has control over the picking process and checks the work flow of the in-store warehouse. Then interviews were conducted with 60 customers who had used the ABC in-store delivery service. Each of them provided details of the ABC in-store delivery service at the ABC store and warehouse located in PathumThani.

The subject of the interviews covered three main topics. First, how the in-store delivery processes flows when a picker receives the customer's order, until the customer receives their purchases, including how long each step in the process took. The second interview topic is how employees manage the process when a problem occurs. And the third interview topic is about asking customers why they use the in-store delivery and what problems they faced using this service.

Ideally, customers should be able to pick up their ordered items between 15-20 minutes, or no later than 35 minutes. Some home and construction appliances might be fragile or heavy and take longer to transport from the pickup point to the receiving area.

Figure 4 helps to illustrate the process flow of in-store delivery when a picker receives the customer's order until the customer receives their purchases. It shows that customers often have to wait 30 minutes at least and an hour utmost. There was a case during the observation in which the customer had to wait for 2 hours.

The in-store delivery often causes delays to customers, but the situation has never before been assessed by the company, hence they have no historical data of the process time. Customers used the in-store delivery because their expectation was that the process would be relatively quick and uncomplicated. However, in-store delivery caused delays to customers beyond what they expected.

All Information that was collected by the researcher through observation and interviews was recorded for use in the Measure phase.

Measure Phase:

The goal of this stage is to validate any existing practice or process that specifically needs improvement. Table 2 below shows amount of time, in minutes, for each activity, between a customer placing a purchase order until receiving their products.

Table 2: Interval Time between Placing Purchase Order and Receiving

	In charge	#	Activities	Minutes
1.	Customer	1.1	Place purchase order	
		1.2	Pay to sales office	5
		1.3	Receive receipt	
		1.4	Move to store's warehouse and pass receipt to staff at store's warehouse	
		1.5	Move to parking area designated by the queue number's receiving point	10
2.	Sales Office	2.1	Receive money	
		2.2	Key in to the account system	5
		2.3	Issue receipt to customer	
3.	Staff at Store's warehouse	3.1	Receive receipt from customer	
		3.2	Register to the warehouse system	
		3.3	Issue picking list	
		3.4	Provide picking list to picker	
		3.5	Provide queue number (queue and receiving point) to customer	10
4.	Picker	4.1	Receive picking list from staff at store's warehouse	
		4.2	Start picking process	
		4.3	Finish picking process	
		4.4	Double checking process	
		4.4.1	If correct proceed to 4.5	
		4.4.2	If incorrect proceed to 4.6	45
		4.5	Bring the products to receiving point	
		4.6	Bring the products to picking manager	
5.	Picking Manager	5.1	Recheck the picking list and do the process of 4.2, 4.3, 4.4	
		5.2	Bring the products to receiving point	15
6.	Customer	6.1	Total time of receive products	90

Source: Authors

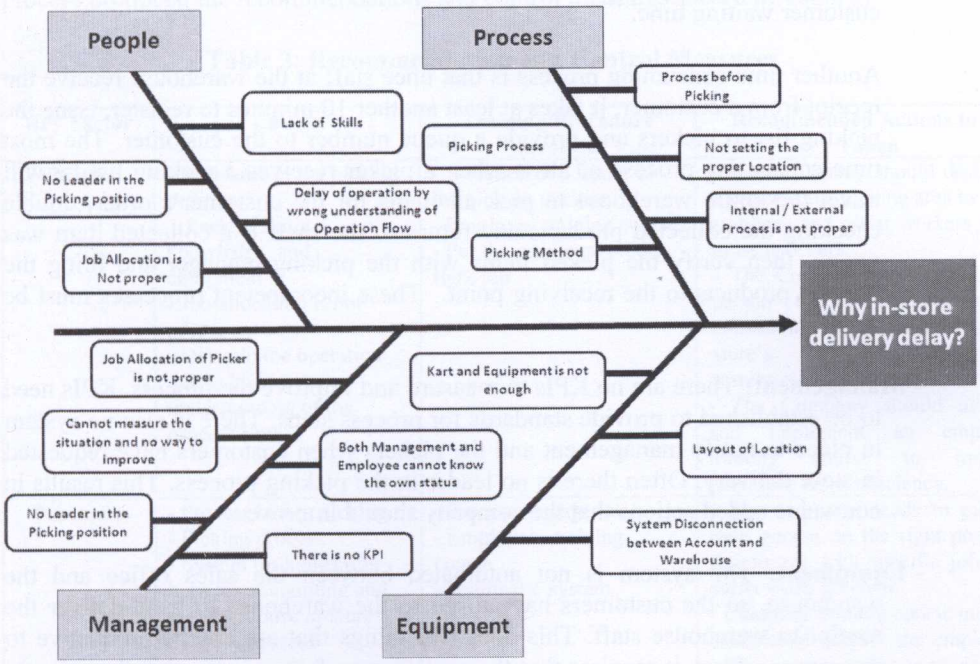
Table 2 shows amount of time spent on each activity from when customers place purchasing orders until they receive their products using the in-store delivery process. Note that the process takes 90 minutes. Note also that the part of the process taking place in the store's warehouse had a huge impact on the delay of in-store deliveries to their customers and therefore customer waiting time. This indicates that the process that takes place in the warehouse is the area that has substantial need for improvement. Therefore, the researcher used this data to analyze the problem in order to get the actual root cause.

Analyze Phase:

The goal of this stage is to identify and analyze the root causes of the delays in in-store delivery. During the analyze phase, the researcher had conducted a presentation to the current management team on current workflow and discussed amount of time spent on each activities at ABC in-store delivery unit. This presentation included sales officers, store's warehouse staff, pickers, and the picking manager. This helped them realize their weak point before the researcher led all participants into a brainstorming session which examined each of the activities in the in-store delivery process in the warehouse. The main objective was to gain more understanding about the problem of in-store delivery process and find the root causes of the delays.

The analysis of this brainstorming was listed in groupings of potential causes of the effect (delayed in-store delivery). Brainstorming with the company's employees was also used to determine the root causes of the problem. Since the Fishbone or Ishikawa diagram is one of the most popular tool for conducting cause-and-effect analysis (Tague, 2005) the researcher then used it to construct a cause-and-effect diagram from the brainstorming activity to determine the root cause of the in-store delivery, which can be seen in Figure 4.

Figure 4: Cause-and-Effect Analysis of the In-store Delivery



Source: Authors

The actual problem was focused on the desired effect which is reduced in-store delivery time, placed at the "fish's head". The interdependent resources are grouped into four categories: ***People, Processes, Management, and Equipment*** which are placed at the ends of each of the "fish's bones". Then, through brainstorming with the company's employees in the activity described above, potential causes of the effect will be determined for each of the grouping categories. Next, each group of causes identified during the brainstorming will be examined and analyzed to determine cause and effect relationships. This process will continue to drill down into the data looking for further reasons, and extend the branches till all root causes are identified.

The cause-and-effect analysis diagram above noticeably help ABC Company identify various separate problem causes. The researcher analyzed the data by different categories of the top four causes of in-store delivery delays.

The details of each cause can be categorized as follows:

- **People:** The pickers do not understand the operation flow well because they have not received proper training in picking procedure and technique in the warehouse. That lack of skills and knowledge causes unproductiveness especially when the pickers encounter obstacles and there is no picking leader or immediate supervisor to handle the problem. This is where much excess time in the process appears to be added due to non-value added activities.

- **Process:** The process before the picking is not well planned and automated. With the existing system customers must go to the warehouse office to give the receipt to the warehouse staff and wait until the information is registered into the warehouse system. Apparently, there is no internal link between the sale office and the warehouse, forcing customers to hand-deliver to the warehouse staff the receipt which contains the list of purchasing products. This is where time in the process should be eliminated through automation thereby reducing customer waiting time.

  Another time consuming process is that once staff at the warehouse receive the receipt from a customer, it takes at least another 10 minutes to register, issue the picking list to pickers and provide a queue number to the customer. The most time consuming process of all is when a picker receives a picking list he will travel the entire warehouse to pick all items for the customer's order, double checking the collected products and return to the shelf if a collected item was wrong, then verify the picked items with the picking manager and bring the ordered products to the receiving point. These incompetent processes must be ameliorated.

- **Management:** There are no KPIs to measure and improve the process. KPIs need to be established to provide standards for process steps. There is also no system in place to notify management and the pickers when customers have requested in-store delivery. Often there is no leader in the picking process. This results in non-value added actions that the company should improve.

- **Equipment:** The system is not automated between the sales office and the warehouse, so the customers have to go to the warehouse to hand-deliver the receipt to warehouse staff. This does two things that are counterproductive to the process. First, it requires that the customer performs a step that they should

not have to do. Second, the picking process could be started while the customer is making his way to the warehouse. Moreover, carts and other equipment required in the warehouse are not available because these items have to be shared in the picking process. This results in bottlenecks in the process and non-value-added time.

The researcher found that in-store delivery of ABC Company produced delays for their customers. The main cause of this problem is the in-store's warehouse process that takes too long. Thus, this actual problem was focused on the effect which is to remove delays from the process. Therefore, the root causes of this problem were displayed through a cause-and-effect analysis, which, together with a Process Flowchart, are used to find the improvement to prevent problem recurrence.

After analyzing the data and getting to the root causes of in-store delivery delays, the researcher worked with the store employees to generate an improvement plan to reduce delays, using the cause and effect relationships that were identified in the analysis phase. The proposed improvement plan is discussed in the next section.

Improvement Phase:

The main goal of this stage is to propose an improved process thereby solving the problems. The improvement phase developed the best methods and plans to improve, with corrective actions for use in removal or reduction of the root causes identified in the Analyze Phase.

In order to correct these root causes, the improvement action plan will involve four major factors and variables *(People, Process, Management, and Equipment)* which cause the in-store delivery delays. Development of the improvements required brainstorming with the picking manager and employees to get the best solutions to solve the problem. The results of the brainstorming with the key persons who are involved with the in-store delivery process produced the recommendations and control measures shown in Table 3.

Table 3: Recommendation and Control Measures

Key Factor	Causes	Training/Procedure involved	Recommended Actions to be Taken
People	- No leader in the picking position - Lack of skills, knowledge, and equipment - Job allocation is not proper - Delay in the operation due to incorrect understanding of the process flow	- Selection of a leader in the picking position - Employee training course - Put the right man on the right job	- ABC Company should designate a leader in the picking area to solve problems and assist workers when an issue occurs. - The Company has to appoint a person to be responsible for controlling and monitoring the store's process knowledge warehouse requirement. - The Company should develop and implement an employee training course to improve employee work efficiency.
Processes	- Process before picking - Picking process - System disconnection between accounting and the warehouse in-store delivery process	- Process management - Employees training course - Automatic system	- The company needs to put the right person on the right position. Employees with specific jobs can easily work efficient. - Company training course must be established to train the employees in the proper methods to develop improved work habits.

Table 3: Recommendation and Control Measures (Cont.)

			- ABC Company needs to develop a communications link between internal and external departments involved in the service of in-store delivery by automate the system that sends in-store delivery requests from the accounting office and the warehouse.
Management	- Lack of skills, knowledge, and equipment - Picker is not at the proper position - There are no KPIs -No measurement process has been developed to facilitate improvement - No leader over the picking function	- Employees training course - ABC Company's KPI	- ABC Company should have mandatory employee job training to manage the process to make it efficient and effective. - When not picking, the picker should always be positioned at the preparing area awaiting customer orders. - The Company needs to set and measure KPIs for the in-store delivery. - The picking manager needs to ensure that there is a monthly measurement of KPIs and use this information to track and improve performance.
Equipment	- Carts, forklift trucks, and pallet trucks are poorly scheduled -There is no systematic way of scheduling the use and return of the equipment -Information system disconnection between accounting and warehousing	-Provide enough carts, forklift trucks and pallet trucks - IT infrastructure - Intranet - Web-based technologies	- Company should provide enough carts and other picking equipments such as Forklift trucks and Pallet trucks to support the worker when needed. Also, the company needs to develop a process for workers to follow in checking out and returning equipment used in the picking process to a specified location. - In terms of IT, an implementation plan must include developing an IT infrastructure to provide link between sale office and the warehouse via intranet or other web-based technologies and application.

Source: Authors

The proposed recommendations in the action plan involve four key factors: *process, people, management, and equipment* that need to be improved to reduce the delays in the store's warehouse activity. However, several recommendations appear under multiple key factors in Table 3. Listed below are six actions recommended to improve the four key factors where the root causes for delays have been identified.

1. Putting someone in charge. The Company has to appoint a person to be responsible for controlling and monitoring the store's warehouse processes. ABC Company must designate a leader in the picking area to solve problems and assist workers when unexpected issues occur. A leader should check progress of the picking process continually. Where team member involved makes a mistake, the leader should take responsibility and provide guidance. If any process does not operate smoothly, the leader should identify the root cause of the problem and use his experience to help correct the problem.

2. Employee training. Employee training is essential for specific purposes related to the business. A company training course must be provided to train the employees in the proper methods to upgrade their skills. The training course should include Basic Skills: picking procedures, filling out paperwork, and knowing the layout of the warehouse. Training should also include Professional Skills: using the business systems, knowing and following procedure and scheduling. Technical Training should also be provided for using equipment and computers. Training can help to determine which methods to use and when to use them. Choosing several methods for each training session would be the most effective way to help employees learn, retain information, and perform their jobs better.

Warehouse staff as well as management need to be trained and to practice each step in the process to make sure that they clearly understand the entire process and all methods involved. Trained employees will be better able to handle customer inquiries, provide customer service, perform the picking process, use the equipment or make use of the computer systems. Therefore, the company should have a training course for employees and develop supporting activities within the department that follow up with employees after a learning activity. In the end, employees can become more motivated and excited about their work as they understand how and what they need to do to perform their jobs better.

3. Planning and correcting the pick. Company planning and organization makes the store's warehouse work efficient. Team members need to identify the scope and goals of the planning process related to each store's warehouse activity. The company needs to assign to each employee working in the process their role and specific responsibilities in order to divide the workload. They should focus on set procedures to use the time in the store's warehouse efficiently by establishing a timeline for completing the picking process and making sure that the process is completed in a timely manner. The picking leader should plan each pick so that time is not wasted and picks are performed efficiently and effectively with no errors.

The correction process in the store's warehouse includes a verification system and process before picking. The Manager will check and make a record in the paperwork to verify the items to be picked and their location. The pickers will verify what they have picked before providing their picked items to the customer's pick-up window. Good pick planning will make the process flow efficiently and accurately. However, should the company decide in the future to go for paperless picking and make an investment in Pick-to-Light technology, this will tremendously reduce the picking time and errors as staff can simply make their way to pick up the product following the lighted locations throughout the warehouse that link to the order management and inventory system.

4. Key Performance Indicators (KPIs). The company needs to identify KPIs for picking time for the in-store delivery process which best reflect achievable time reductions. The company should start tracking KPIs for each of the 5 steps in the picking process and for each picker (or person) in the store's warehouse. Customer waiting time at the sales office and receiving area should not be more than 10 minutes, and picking time at the warehouse should not be greater than 5 minutes per item. KPIs should be reviewed quarterly and times associated with each modified as a forcing function to ensure continuous improvement in time and accuracy of the process.

Using these KPIs, faster and more accurate pickers should be easily identified. The picking manager will work with these high performance employees to understand what they may be doing differently so that this information can be used to create training that

teaches the others how to pick quicker and with fewer errors. KPIs will also identify slow pickers and those with higher error rates. Once identified, these employees can be trained in the proper methods to improve their speed and prevent errors. In those cases where employees cannot meet KPI standards even after training, they will be re-allocated to other departments where their skills are more suitable for the work involved.

5. Equipment. The company needs to track the number of times that a picker has to wait for carts, forklift trucks, or pallet trucks, by the length of wait and by the type of equipment involved. Some types of equipment not available when needed in the peak period can cause serious delays. This tracking information can be used by the company to justify purchase of additional equipment such as pallet trucks or forklift trucks to support the worker when needed.

At the same time, the company needs to set up a system that ensures equipment used for lifting, moving and transporting products is returned to its proper location once staff finish using it. Reward can be provided to motivate staff to put back in place warehouse transport equipment, or technology such as a radio transmitter can be installed to signal to staff an abandoned cart or unused pallet truck.

6. Linking Sale Office with the Warehouse. The implementation plan will involve developing an IT infrastructure providing a link between sales office and store warehouse. The company needs to automate the system that sends in-store delivery requests from the accounting office to the warehouse. Instead of the customer bringing their receipt to the warehouse to initiate the picking process, this process should start while the customer is making his way to the warehouse. When the sale is made and rung up on the cash register, a purchasing order can then be sent automatically to the warehouse via the company intranet. A computer terminal at the warehouse would make a beep to signal that there is an in-store delivery request together with the list of purchasing products on the monitor. The request is then immediately developed into a picking route by the picking leader and then taken up by a picker. This would mean that the picking process is started 5 minutes to 10 minutes earlier than under the old system.

After implementation of the proposed improvement action plan on the in-store's delivery process at the ABC Company, customers waiting times were noticeably reduced almost immediately. Apparently the link between sales office and the warehouse shorten the waiting time by 5-10 minutes because the picking process start while the customer is making his way to the warehouse instead of after arriving there.

The other recommendations will require more time to effectively reduce the delays now occurring. However, putting someone in charge should have some immediate effect as there will be someone with responsibility for overseeing the process and planning and verifying the picks. Then, over time, having a person in charge who is experienced should reduce the amount of time that it takes to work out problems as they arise and should result in a smoother, more efficient picking system.

Training employees will give them the opportunity to understand the latest developments within the company. Whether it is new machinery or new social media tools, employees need to learn to use tools and develop new strategies to take on more challenging work and further reduce delays over time. Employee training will lead to increased customer satisfaction with company work performance, and employees will gain confidence in their tasks because of increased knowledge and skills. The knowledge and skills should also translate into further reductions in warehouse process time as employees become

increasingly familiar with effective picking strategies, use of equipment and proper execution of each step of the process in which they are involved.

The pick planning and verification will reduce much the unnecessary time and effort that now occurs due to picking errors and unplanned picks. Giving thought to better routing of the picking efforts and verifying the correctness of the information provided to the picker will reduce warehouse inefficiency.

When the Company sets up the store's warehouse KPIs as a control on the picking process to track and improve the picking process performance, this will help the company know the time required for the picks. This can reduce the actual picking process time for each item in the store's warehouse from 30 minutes to 10 minutes.

Setting up a system to track delays related to equipment will provide management with the data to make decisions about the need for additional equipment. In the meantime, setting up a process and training employees to ensure that equipment is returned to its proper location will reduce time wasted due to equipment being unavailable. Data obtained in the interviews with the employees indicates that the process of bring the products to the customer receiving point can be reduced from 15 minutes to 5 minutes if equipment availability is improved on days with high volume of in-store delivery usage.

Compared to the previous process, the time required in the store's warehouse process after the improvement action plan is implemented can be reduced from 55 minutes to 15 minutes and the customer will receive the product after the waiting time has been reduced from 90 minutes to 35 minutes. A substantial reduction in customer waiting time produces positive effects on customer satisfaction. However, the company needs to ensure that the improvements are sustained and that continuous incremental improvement can be made in the in-store delivery process over time. Thus, control and continuous improvement of the store's warehouse process performance is very important in order to ensure company success in the future.

Control Phase

The last phase of the DMAIC model is the Control phase, in which methods are developed to make the improvements sustainable. The best controls will also ensure that system improvements are maintained. After improving the store's warehouse process to reduce the time involved, the company needs to not only repeat the new and improved processes, but also needs to work toward continuous improvement in those processes.

The continuous improvement is carried out as a part of an improvement process. ABC Company will need to set up the revised system to ensure that the improvement action plan not only maintains the improved state but also provides the direction for future improvement. Therefore, the researcher has proposed a set of Key Performance Indicators (KPIs) as a control system, to ensure there is a sustained improvement effort and to monitor operations in all areas of the in-store delivery system. The KPIs recommended by the researcher will set targets for the in-store delivery process, its steps, and for customer satisfaction with the process. ABC Store's warehouse Key Performance Indicators should be in line with the overall company KPIs. For example, the researcher has set some initial KPIs related to Customer Complaint behavior, as an indicator of Customer Satisfaction.

The overall Key Performance Indicator of store's warehouse, in terms of time, has been defined as the number of minutes required for picking time, divided by the total number of picking times. In other words the overall KPI is a mean average overall picking time for the in-store delivery system. The time that it takes to pick is the time that the customer

has to wait. Another KPI recommended by the researcher to achieve is based on the ratio of target waiting time divided by average waiting time per month. The company target recommended by the researcher is to reduce customer waiting time.

The target KPI for maximum number of customer complaints, has been defined as the number of complaints per month, divided by total order per month (21/2000=1.05%) Once major reductions in process time begin to stabilize, this complaint-related KPI goal will be further reduced by 1% per month. The researcher recommends the KPI goals for the picking process that are shown in Table 4.These KPIs goals provide a clear target that employees will understand and be able to take specific action to accomplish.

Table 4: KPI of Picking Time

Quantitative												
Pick 1	Pick 2	Pick 3	Pick 4	Pick 5	Pick 6	Pick 7	Pick 8	Pick 9	Pick 10	Average Waiting Time Per Month	Target Waiting Time	KPI Achievement Ratio
10	15	20	25	30	35	40	45	50	55	32.5	30 Minutes	92%

Qualitative				
Complaints Per Month (A)	Total Orders Per Month (B)	Ratio of Complaints To Orders (C) = A/B	Target KPI For Complaints from Customer (D)	KPI Achievement Ratio (E) = D/C
21	2000	1.05%	1% of total order	95%

Source: Authors

CONCLUSION AND RECOMMENDATION

This research applied the DMAIC (Define, Measure, Analyze, Improve, and Control) model to improve the in-store delivery waiting time which is likely to have an effect on customer satisfaction. The DMAIC model helped the researcher and selected members of those involved in the process under study to define and understand the process problem, measure the company's current performance, and analyze the root causes of the in-store delivery delays. Together they produced an improvement plan that both reduced the time required for in-store delivery and recommended changes in order to achieve sustainability for the improved company operations.

In the future, the company might want to consider paperless picking to replace traditional paper picking to further reduce the picking process. Technologies such as radio-frequency, light directed system or voice recognition could be employed to shorten the picking process, improve accuracy and prioritize orders.

The implication of the study is that by using the DMAIC process and various associated tools such as observation, interviews, process flowcharts, cause-and-effect analysis, and brainstorming, problems in processes can be identified for either reduction or elimination.

The DMAIC process can be used by management to develop improvement action plans similar to the one developed here for the in-store delivery process.

Companies such as ABC Company will benefit from using the DMAIC model as it can help companies improve their in-store delivery service and improve the efficiency of their in-store warehouse's process. However, the problems identified and the solutions provided were specifically developed for ABC Company and its in-store delivery process, hence adjustment need to be made when apply to other processes or other stores.

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