RFID Utilization through Supply Chain Management and Logistics Performance

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Abstract - **This research aimed to study the adoption of RFID (Radio Frequency Identification) in the operation of automotive parts industry in Thailand to increase the potential and effectiveness in supply chain and logistics management. The sample groups were 99 manufacturing firms in automotive parts industry in Thailand. The questionnaire respondents were IT leaders or those users related to RFID system. The data were gathered and a structure equation model was placed here for the testing model. The research result found that paying attention to RFID technology on the aspect of Supply chain management could help the organization to gain competitive advantages and save costs of inventory management. RFID using could also reduce the problems of errors in inventory counting and led to more transparency of inventory. Besides, paying attention to RFID technology usage also led to the efficiency in transportation because the organization would be able to follow up the transportation processes and checking the route of automotive parts.**

Keywords - **RFID Utilization, Supply Chain Management, Logistics Performance**

I. INTRODUCTION

Business and industrial operations consist of many aspects that result on their success and efficiency in marketing competition [1]. The entrepreneurs have placed the business strategies for their organization to have the good financial performance and result on Operational Performance.

In world organization, there are outstanding and interesting industries for instance, automobile industry. From the data of Organization International des Constructers d' Automobiles (OICA), it was found that in B.E. 2558, any regions in the world had the total amount of automobile manufacturing at 90,683,072 and there were three nations in the group of ASEAN nations with the automobile manufacturing potential. They were Thailand at 1,915,420 units, Indonesia 1,098,780 units, and Malaysia 614,671 units. The growth of automobile industry has rapidly expanded, thus many strategies such as Supply Chain, Logistics, and Information Technology are brought to use in management for the successful organization [2].

From the growth in productivity rates that keep increasing either on the amount of production and automobile distribution in Thailand, it would rather have the good result for the relevant industry which is the automobile parts industry. The automobile parts industry is considered as significant as it can form income, employment, added values to trade and economic growth ratios of the nation. This has resulted from various domestic factors that facilitate for the growth either on the domestic or international demands such as tax ratio, location of manufacturing sector, transportation, and wages as well as support

the public and private policy [3]. From the export information of automotive parts industry of Thailand in 2015 during January – June from Thailand Automotive industry as of 2015 had the total export values of 8,096 million US dollar. By the top third exporting automotive parts are other parts and accessories with export values of 3,634.77 million US dollar, second by vehicle tyres with export values of 1,839.67 million US dollar and electric equipment to start explosion with export values of 1,615.59 million US dollar. Besides, there is the part exporting in the group of motorcycle which is the other parts and accessories for motorcycles with the export values of 273.50 million US dollar.

It can be seen that automotive parts industry is important since it can generate a lot of money for the country. Increasing the automotive parts industry efficiency is crucial especially in the era that businesses competition have not only take place with the competitors in the country however, more competitors from international since the entering into AEC. This requires all sectors to consider on the product quality, product price and competitive ability thus, the domestic manufacturer of automotive parts industry shall develop themselves to increase the competitive opportunities for the organization and form the confidence for the automobile manufacturers.

RFID (Radio Frequency identification) technology is then brought to use with hope to increase the potential and efficiency in the operation in automotive parts industry as well as increase the Logistics and Supply Chain management efficiency [2]. In order to resolve the problems on the errors in products counting in which take long time, transportation process, and data outdate that the management cannot receive the Real-time information. From the study of [4], it is found that using RFID technology can increase the effectiveness and efficiency in work improvement and reduce the production cost. Besides, on the aspect of Logistics management, it has rapidly developed through the adoption of computer technology and networking systems to work

with RFID technology via the automobile manufacturing firms such as BMW. RFID technology is used to check the movement of container between the manufacturers and suppliers with RFID Tag posting and Real-time location system (RTLS) installation throughout the plant areas [5].

From the ability of RFID technology that enters to help in the automotive parts industry operation, the researcher needs to study how to operate to increase the competitive ability and efficiency in the transparency of Supply chains, production process control, and logistics to form the competitive advantage. Logistics and Supply chain management can reflect the success in Operational performance of the automotive parts industry.

II. LITERATURE REVIEW

Literature subjects related to this research are RFID Technology, Supply Chain Management and Logistics Performance.

A. RFID Technology

Radio Frequency Identification (RFID) or RFID technology was invented in 1948 and firstly brought to use in WWII in identifying the planes whether which party they belong to in order to prevent that fault attack [6]. RFID technology aimed to develop to enhance or replace Barcode technology to identify identity and automatic following [7]. Besides, RFID technology can track back the inventory such as checking on raw material, work-in-process, finished goods [8]. In addition, it has the ability in efficient Supply Chain Management and Logistics management; this helps save employees' working time since it can reduce the work process to counting the inventory and data record. Besides, the management can also bring the information to compose in this organization operational decision since the database is Real-time. At present, RFID technology is applied to help increase the efficiency and effectiveness or in any services. Besides, RFID technology can reduce damages and prevent errors in the operation that might happen. Therefore, RFID technology is brought to use as part to establish the strategic to help in

management and operation in the organization and solving the problems in the organization.

B. Supply Chain Management

Supply Chain Management is the mix between business processes from the raw material suppliers or manufacturing industry to the consumers [9]. Thus, the work system of Supply Chain covers all relevant direct and indirect units to response to the need of customers in Supply Chain including the producers and Supplier, transportation, warehouse, retails or even the customers themselves. In each organization, all the functions are gathered from the receiving of raw material until the part that required by customers including new product development, marketing, distribution, financial, and customer services thus, Supply Chain has the main role for the firms that stressed on the competitive business advantage. The organization can add values to the whole company's products by the use of the overall company's resources [10].

Thus, the effective Supply Chain management would be the crucial thing to keep with the competitive advantage in products and services [11]. Thus, the supply Chain strategy has the aim to reduce cost as well as integrate for the better system in the production and distribution for higher customer's satisfaction. Supply Chain Management is the process to control the flow of product data by it aims at the strategic management, partner, transportation, and marketing including with the understanding in resources arrangement and transportation until distribution. From the research of [12] it can reduce the amount of inventory and results on the reduction in the circulation costs in the operation. This also leads to the reduction in costs of product and can effectively generate the price advantage in the marketing competition.

C. Logistics Performances

Logistics system is the flowing process of the products in the whole system of Supply Chain from the transportation input, products movement in the warehouse and shipment. It is a crucial part in supply chain that connects all the information for the conformance in the

operation of warehouse and transportation. Brining logistics to apply results from products distribution in automotive parts industry of Thailand, Logistics management then plays the role in the products transportation process starting from the raw materials transportation into the production and pass to the distributors then from sellers to customers.

From the literature reviews, Logistics are the processes of effective operational planning, flow controlling and raw materials and products storing as well as the information from the production point until the consumers at the least costs with the aim to improve customers services to the utmost satisfaction [12]. If there is the effective Logistics system management, it would lead to the quick management that helps reducing the cost of Supply Chain Management and to increase the competitive potential of the organization.

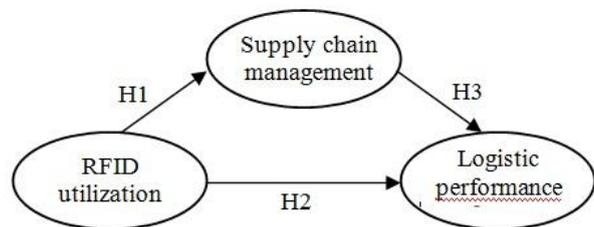## III. RESEARCH FRAMEWORK AND HYPOTHESIS

A. Research Framework

Fig. 1 Research Framework

B. Research Hypothesis

H_1: Using RFID can have the positive impact on the Supply chain Management.

H_2: Using RFID has the positive impact on logistics Performance.

H_3: Supply chain management has the positive impact on logistics performance.

IV. RESEARCH METHODOLOGY

A. Research Sample Assumption

To analyze Structure Equation Model, it requires having sufficient and suitable data for the model indicator. The minimum of data can

compute from formula p(p+1)/2; where p is an indicator of the model. . The returned 99 of questionnaire can reverse equation, thus (p+1) equal to 14 indicated that the indicator of a model should not be more than 13.

B. Research Tool

The questionnaire was used as a tool for data gathering from research samples. The questionnaire was constructed from the review of the literature and designed to meet with the research objectives. The questionnaire comprised of three parts: gives importance of RFID technology in business, gives importance of RFID technology in transportation, utilization of technology RFID. The questions used Likert's 7 scales to obtain the attitudes from respondents.

C. Validity and Reliability Validity Testing

The discriminate and convergent validity is tested by the factor analysis, AVE, and correlation between latent variables. Usually, there were many of questions representing for each factor or variable. If the questions represented different variable. The research tested the reliability of internal consistency by Cronbach's alpha after the questionnaire was designed. The score ranged from 0 to 1 and the score acceptance for this research were more than 0.7 [13]. This research was designed to test the reliability for two times. First before the sampling that 30 questionnaires were piloted to test and adjust for the term if the score was less than 0.7. Second, reliability testing was treated again after completed all sampling data collection.

D. Convergent Validity and Discriminant Validity

The researchers measured Convergent Validity by Confirm Factor Analysis. If the research model was converged, the value of factor loading should be greater than 0.6 [14]. And AVE should more than 0.5. The squared correlation values were ranged from 0.85 to 0.92 the discriminant validity could be checked from the comparison between average variance extracted (AVE) value and the squared correlation [15]. Finally, the researcher proved on the discriminant validity of the instrument by examining the square root which should be more than the squared

correlation as recommended by [16].

E. Multicollinearity Testing

Due to the structural equation model was based on the regression analysis, thus this research must go through Multicollinearity testing. The assumption of regression analysis had a limitation that each variable should not be highly correlated with other. The Tolerance and Variance Inflation Factor (VIF) measurement were used for testing. Tolerance should more than 0.1 or VIF should less than 10(VIF = 1 / Tolerance) to accept that they have no multicollinearity problem.

V. THE CONSTRUCT MODEL

This model was constructed to measure that RFID utilization has a positive effect on supply chain management and logistics performance and then to measure that RFID utilization has a positive effect on supply chain management and RFID utilization has a positive effect on logistics performance. And supply chain management has a positive effect on logistics performance.

The finding show that RFID utilization affects supply chain management and logistics performance. And supply chain management affects logistics performance. The measurement model by confirmatory factor analysis , In this research, the goodness of fit is show as follows : Chi-square = 83.508, Degrees of freedom = 58, CMIN = 83.508, CMIN/DF = 1.440, P-value = .016, GFI = .904, AGFI = .826, and RMSEA = .067.

VI. HYPOTHESIS TESTING
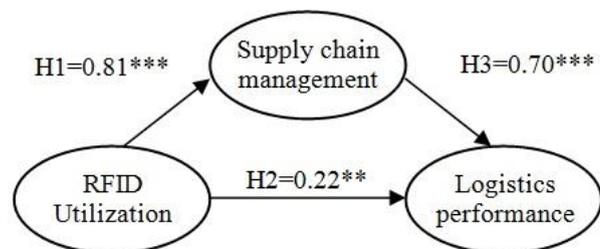
H_1: Using RFID can have the positive impact on the Supply chain Management. This hypothesis was supported with standard regression weight of 0.81 (P < .001).

H₂: Using RFID has the positive impact on logistics Performance. This hypothesis was supported with standard regression weight of 0.22(P < .01).

H₃: Supply chain management has the positive impact on logistics performance. This hypothesis was supported with standard regression weight of 0.70 (P < .001).

VII. CONCLUSIONS AND DISCUSSIONS

This research aimed to study and test on the RFID utilization toward supply chain management, logistics Performance and supply chain management toward logistics Performance. The investigation was conducted with 99 operations in an automotive parts industry of Thailand. According to the hypotheses testing in Fig. 5, it was found that the organization that brought RFID technology to use and manage inventory in general aimed to apply to investigate and control the amount of inventory. The adoption allows the organization to immediately know the amount of raw materials when they were sold so the organization can recognize the stock and amount of ready-product. This allowed the organization to have the information for operational decision.

When having the systematic inventory by the organization applying RFID technology into the supply chain management process, it would lead the organization to have the competitive advantage and can save the costs of inventory management. Bringing RFID technology to use allows the organization to follow up the movements of products on Real-time. Besides, using RFID technology can reduce the errors in inventory counting and promote toward better transparency inventory. If it has effective supply chain management, the organization will be able to save the cost of transportation. Thus, good supply chain management involves with the Logistics process on the aspect of transportation since RFID technology adopting in transportation process allows the organization to follow up the transportation process and tracking the routes of automobile parts. Moreover, it would allow the organization to recognize the origin of the automobile parts. If there is any errors in production process, the organization will be able to recall the under standard parts back.

When brining RFID technology to use in the organization, it would result on the organization to have effective operational performance in which would partly help the organization to reduce the costs of inventory management. The organization will be able recognize the level of inventory in the operation, form convenience in the organizational operation and partly help the organization to have the immediate information for work analysis.

In this case, the research had conformed and supported the future study on RFID utilization on operational performance through supply chain management and logistics performance of automotive part industry.

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(Arranged in the order of citation in the same fashion as the case of Footnotes.)

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