

RESEARCH PAPER

A Systematic Elicitation of the Product Service System (PSS) Based On the Service Quality Metrics SERVQUAL and Implementation of Knowledge Management System

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ABSTRACT

Product Service System (PSS) is a developing field of examination in industry practices in today's global economy, which significantly affects both production and utilization of resources. In order to enable the applicability of a product service system in an industry, it is important to assess the system by using a metric known as the SERVQUAL model, which characterizes the quality as the difference between the customer's expectation and perception with regard to the service delivered to them. It is a multi-dimensional research tool designed to measure quality by capturing the expectancy-confirmation paradigm which suggests the consumer's perceived quality of how well a given delivery meets their expectations of that delivery. In this study, two subscales (tangibility and reliability) from the SERVQUAL metric were extracted and utilized to find the quality level. The present study developed an integrative theoretical model of Knowledge Management System (KMS). Empirical examination of the hypothesized relationships among variables is conducted by means of questionnaire surveys and the collected data from the survey were assessed. The findings of the study revealed that the KMS approach served as a facilitated tool for sharing and utilizing knowledge in different organizations.

KEYWORDS: Product service system; Tangibility; Reliability; Knowledge management system; Customer's expectation; Customer's perception.

1. Introduction

With the rising difficulties from market competitors and environment regulations, manufacturers are putting more accentuation on adding value to customers through provisions of services. The services can provide value without compromising the customer's need. The Product Service System (PSS) is an emerging manufacturing paradigm giving integrated product and service that deliver value in use and it comprises a basis of competitive strategy. Embracing PSS implies that manufacturers have transitioned from the concept of "product foremost and service the second" to "service-based product". One generally accepted definition of

PSS is an "integrated bundle of products and services which aims at creating customer utility and generating value" [6]. PSS assessments must be performed to get data with significant knowledge about customer's need, expectation and priorities [21]. This will help organization with achieving customizations in service and products, whenever required, or plan for investment in a new product or services to meet the expectations of the customer. On the other hand, estimating and surveying PSS is a primary issue as the behaviour of customer towards products and services are changing and making it harder for the service providers to assess and manage services effectively and efficiently [5]. Generally, it was grouped into three as product-oriented, use-oriented and result-oriented PSS [18, 19, 20]. In product-oriented PSS, the product proprietorship was held by the customer, however extra services like maintenance and warranty given by the manufacturer to ensure the performance of product over a given period. In use oriented PSS, the service provider may or

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may not have been the original manufacturer, holds the product proprietorship and customer buys the utilization of the product and its function throughout a given timeframe. The result-oriented PSS focused on the service that replaces the product rather than the use-oriented PSS. As the transition to digitization progresses, rapid advances in Information Technology (IT) enables an organization to move toward the real-time data of the product over the entire Product Life Cycle (PLC); thus decrease the difficulty of product lifecycle management (PLM). SERVQUAL scale was most utilized for the measure of quality [21, 22, 23]. This evaluation instrument is SERVQUAL which is developed for tracking the quality of service and determine the critical significance of consumer perceptions and expectations. It has five major dimensions to measure the service quality such as tangibles, reliability, responsiveness, assurance, and empathy [25]. Knowledge generated in various PLC phases are vital for the entire PLC. The beginning-of-life (BOL) engineering knowledge cannot exclusively be applied by manufacturing organizations to various customer applications, but also help to improve their MOL services like repair and maintenance. The middle-of-life (MOL) data is imperative source of information for designers in BOL phase, particularly the knowledge about failure of components, maintenance, and reliability. For example, the service experience from past similar products is vital for both current product improvement and future products developments as product flaws can be systematically rectified and this is particularly true in PSS scenario [10]. The MOL knowledge will also be valuable for the MOL phase itself as it can improve the quality of the provided service and consistency of service. In the environmental perspectives, the end-of-life (EOL) knowledge will help the Reduce and Redesign in the next lifecycle [11].

Knowledge management was defined as “explicit strategies, tools and practices applied by the management that seek to make knowledge a resource for the organization”. Generally, knowledge management aims to capture and save the past experience data and reuse them to solve the new problems, including both improvement of existing product and development of new product [10]. Knowledge range required in PSS design is broader, because not only the products are considered in the design phase but also the service is considered as a vital component [8]. In PSS scenario, the intensive utilization of knowledge from various disciplines makes

knowledge management even more crucial and challenging than ever [9]. As a business strategy, the PLM concerns various product stakeholders over the entire PLC. As a technology solution, PLM permits creation, transformation and sharing of knowledge along the entire PLC with the aid of using various tools and technologies. The mix of the above two perspective leads to treat PLM as a knowledge management system to support various PLC phases. The knowledge requirement and knowledge management practice in every aspect may be different. In order to better manage knowledge in such case, the focus on knowledge management in each phase must be different as well.

[12] introduced an integrated knowledge framework based on the central class “lifestyle system” to support the PSS design. [13] presented a lifecycle management approach based on knowledge for PSS with the consideration of an ontological representation. They introduced three knowledge-based life cycle method to make engineering processes adaptive to give the involved actors with proper PSS knowledge and to support the stakeholders in their decision-making process. [14] proposed a strategy to help ideation and preliminary design of sustainable PSS within industrial chains based on the Quality Functional Deployment (QFD) approach. It permits defining asset of robust prerequisites for making a new PSS with respect to customer needs and sustainability principles. [15] introduced a coordinated methodology to support the PSS design process into a Virtual Enterprise (VE), which contains various phases from idea management to global network definition. [16] introduced a framework for managing and using PSS design knowledge to support designers in idea generation of integrated combinations of products and services in PSS. The framework had worked fully intent on supporting two design operations among the three PSS design models. [17] studied the principal drivers and barriers that affects the adoption of use-oriented PSS by consumers in the medium and small cities using quantitative approach and found that “environmental concern” and “healthy lifestyle” are the prime drivers affecting the adoption of use-oriented PSS by consumers. [21] examined the knowledge management practice in PSS and recommended that more proper knowledge representation manner and standard knowledge representation form, identification and classification of most significant knowledge for various stakeholders and balanced application of personalization and codification system will be

vital for organization in PSS domain to manage the knowledge.

After the careful reviewing of the various existing research performed so far utilizing the SERVQUAL model, it was found that much research was carried out in SERVQUAL model, however limited research was conducted using the SERVQUAL model to evaluate the Product Service System (PSS). Therefore, using the SERVQUAL model would be a contribution to existing research on Product Service System (PSS) and knowledge management system will help in Product Service System (PSS). This is research gap and to fill this gap, it was proposed to examine the product service system (PSS) based on the service quality metrics SERVQUAL.

2. Theoretical Framework

This study aims to find the service quality level using the SERVQUAL metric from the Manufacturing Company, Automotive industry and Supply Chain Management Company. The

hypothesis therefore posits the elements like Tangibility, Reliability, Responsiveness, Assurance and Empathy of customer expectations and perceptions that influences the service quality. The set of hypotheses included in the study are as follows.

H1- The adoption of KMS approach, significantly enhances the employee's knowledge on tangibility, influencing the customers' quality expectation

H2- The adoption of KMS approach, significantly enhances the employee's knowledge on tangibility, influencing the customers' quality perception

H3- The adoption of KMS approach, significantly enhances the employee's knowledge on reliability, influencing the customers' quality expectation

H4 – The adoption of KMS approach, significantly enhances the employee's knowledge on reliability, influencing the customers' quality perception

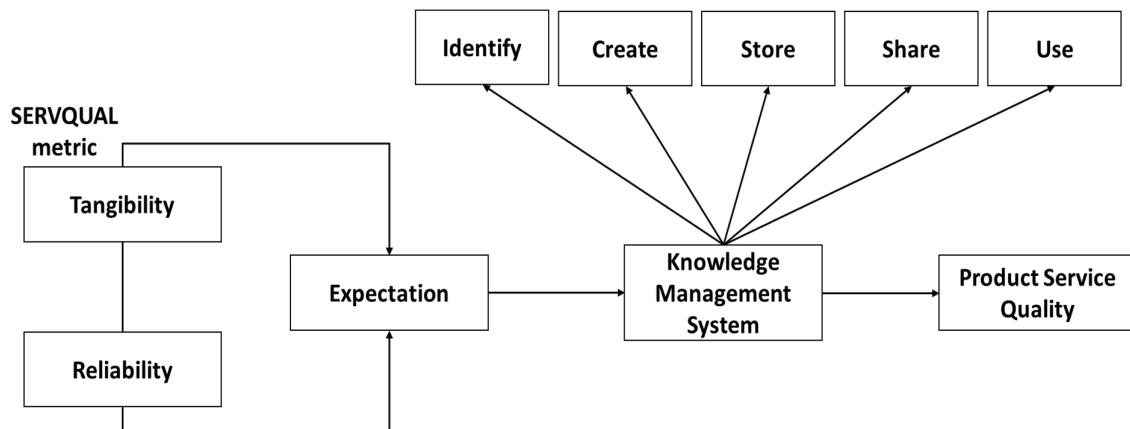


Fig. 1. conceptual framework

3. Research Methodology

3.1. Research design and data collection

The study used a descriptive survey research approach to assess the PSS in an industrial sector using a SERVQUAL metric. Service quality was assessed based on two subscales namely tangibility and reliability. After analysing the results of the two dimensions, a KMS approach was prepared. This KMS approach was employed to improve the worker's knowledge on the service quality. The study used the KMS related questions to measure how the organization is positioned with regard to the basic knowledge processes that are part of the KMS framework i.e., identify, create, store, share and use of knowledge [26].

3.2. Research instrument: questionnaire

To acquire primary data, the questionnaire was distributed to the respondents. The survey method was frequently used to see if the independent variables and the dependent variables are closely connected.

3.3. Study implementation

3.3.1. Assessment before the KMS implementation

The questionnaire is prepared to find out the KMS awareness level of employees in the selected companies. The questionnaire was divided into subgroups as follows: identify, create, store, share and use of knowledge.

3.3.2. Educational intervention programme on KMS

Education intervention programme on KMS was conducted to select according to the plan of work at a convenient time for the workers. The programme was organised with the help of materials prepared by the investigator. The programme includes lectures by experts with videos.

3.3.3. Assessment after the intervention programme

Post assessment for educational intervention programme was done to know the effectiveness of the intervention programme organised on KMS, the same questionnaire with KMS related questions were again provided to the workers after the intervention programme and collected. Responses are gathered and the data processing was done.

3.4. Sample size

A total of 600 samples were selected for the present study (200 samples from each industry namely Manufacturing Company, Automotive Industry and Supply Chain Management Company).

3.5. Target population

A questionnaire was framed, and interviews were conducted to collect the primary data. The questionnaire was issued, and responses were collected from 600 people. For KMS approach, among the total respondents, workers of Manufacturing Company accounted for 200 respondents, workers of Automotive Industry accounted for 200 respondents, and workers of Supply Chain Management Company accounted for 200 respondents. In total, there are 600 workers took part in the survey related to KMS approach.

3.6. Sampling techniques

The stratified random sample approach was used to collect data for this investigation. The chosen component of the aggregate or totality from which the aggregate or totality is appraised or assumed can be included in sampling.

3.7. Data collection procedures

To ensure that the analysis is valid and trustworthy, the study uses both primary and secondary data. To collect primary data, the researcher designed a questionnaire and have conducted interview with the respondents. Whereas, for the secondary data, review of published literature and other related sources were used. The information was gathered from Medline/PubMed, the Centre for Reviews and Dissemination, the Cochrane Library, Ingenta, and OVID, among other places.

3.8. Statistical method

For quantitative data processing, the present study used the Standard Statistical Package for Social Sciences (SPSS) version 20. Data analysis was carried out after data gathering and compilation. The results were interpreted with the help of different analytical methods.

4. Results and Discussions

H1- The adoption of KMS approach, significantly enhances the employee's knowledge on tangibility, influencing the customers' quality expectation

Expectations of service quality are greatly influenced by the observable features of a service. These make up the elements of a service's exterior design that affect external client pleasure. Price, ranking in relation to competitors, marketing communication and actualization, and word-of-mouth impacts are the essential components of tangibility [27], which raises customers' expectations for the quality of their services [28].

Tab. 1. Employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality expectation
One-Sample Test

| | t | df | Sig. (2-tailed) | Test Value = 0 | | |
|--|--------|-----|-----------------|-----------------|---|-------|
| | | | | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| The company will have modern looking equipment. | 19.721 | 199 | .153 | 2.850 | 2.56 | 3.14 |
| The physical facilities at the company will be visually appealing. | 19.702 | 199 | .161 | 2.810 | 2.53 | 3.09 |

| | | | | | | |
|---|--------|-----|------|-------|------|------|
| Employees will be neat appearing. | 21.059 | 199 | .149 | 2.970 | 2.69 | 3.25 |
| Materials associated with the service (such as pamphlets or statements) will be visually appealing. | 24.053 | 199 | .102 | 3.250 | 2.98 | 3.52 |

The table above shows the One-Sample t-test for employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality expectation in automotive industry. Where the results infer that the employee's knowledge on tangibility before the implementation of KMS approach showed a two-

tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on tangibility before the implementation of KMS approach does not have any influence on customers' quality expectation in automotive industry.

Tab. 2. Employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality expectation
One-Sample Test

| | t | df | Sig. (2-tailed) | Test Value = 0 | | |
|---|---------|-----|-----------------|-----------------|---|-------|
| | | | | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Knowledge workers identify the available information about tangible elements of the services in the company. | 86.112 | 199 | .000 | 4.280 | 4.18 | 4.38 |
| Knowledge workers know from each other who knows what information about tangible elements. | 48.409 | 199 | .000 | 3.795 | 3.64 | 3.95 |
| Knowledge workers look for existing information on tangible elements in order to avoid repeating the previous efforts. | 73.468 | 199 | .000 | 3.890 | 3.79 | 3.99 |
| Knowledge workers adopt explicit strategies for knowledge development on the techniques that are essentially meant for tangible products. | 55.091 | 199 | .000 | 3.775 | 3.64 | 3.91 |
| Knowledge workers use clear techniques for acquiring new knowledge on tangible products. | 50.418 | 199 | .000 | 3.440 | 3.31 | 3.57 |
| Knowledge workers develop networks to create knowledge on tangible products. | 47.286 | 199 | .000 | 3.720 | 3.56 | 3.88 |
| In our organisation, there is a clear strategy for storing knowledge on tangible products for future usage. | 52.128 | 199 | .000 | 3.960 | 3.81 | 4.11 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to tangible products. | 115.105 | 199 | .000 | 4.575 | 4.50 | 4.65 |

| | | | | | | |
|--|---------|-----|------|-------|------|------|
| Knowledge workers usually understand and retell what they learned about tangible products in their own way. | 83.756 | 199 | .000 | 4.705 | 4.59 | 4.82 |
| Knowledge workers spend enough time to share ideas and experiences with each other about visually appealing materials associated with the service. | 121.156 | 199 | .000 | 4.660 | 4.58 | 4.74 |
| Knowledge workers consciously develops knowledge sharing habit with respect to tangible products. | 38.602 | 199 | .000 | 3.165 | 3.00 | 3.33 |
| Knowledge workers are encouraged to share their ideas about tangible products with other colleagues. | 52.138 | 199 | .000 | 3.980 | 3.83 | 4.13 |
| Knowledge workers apply available knowledge on the services of tangible elements to improve their jobs. | 112.356 | 199 | .000 | 4.355 | 4.28 | 4.43 |
| Knowledge workers apply available knowledge to innovate new solutions on the services of tangible elements. | 69.711 | 199 | .000 | 3.965 | 3.85 | 4.08 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to tangible products. | 92.993 | 199 | .000 | 4.465 | 4.37 | 4.56 |

The table above shows the One-Sample t-test for employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality expectation in automotive industry. Where the results infer that the employee's knowledge on tangibility after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's

knowledge on tangibility after the implementation of KMS approach have a significant influence on customers' quality expectation in automotive industry, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on tangibility after the implementation of KMS approach in automotive industry.

Tab. 3. Employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality expectation
One-Sample Test

| | t | df | Sig. (2-tailed) | Test Value = 0 | | |
|--|--------|-----|-----------------|-----------------|---|-------|
| | | | | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| The company will have modern looking equipment. | 21.129 | 199 | .114 | 3.060 | 2.77 | 3.35 |
| The physical facilities at the company will be visually appealing. | 20.422 | 199 | .132 | 2.830 | 2.56 | 3.10 |
| Employees will be neat appearing. | 20.760 | 199 | .127 | 3.070 | 2.78 | 3.36 |

| | | | | | | |
|---|--------|-----|------|-------|------|------|
| Materials associated with the service (such as pamphlets or statements) will be visually appealing. | 22.077 | 199 | .088 | 3.170 | 2.89 | 3.45 |
|---|--------|-----|------|-------|------|------|

The table above shows the One-Sample t-test for employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality expectation in manufacturing company. Where the results infer that the employee's knowledge on tangibility before the implementation of KMS approach

showed a two-tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on tangibility before the implementation of KMS approach does not have any influence on customers' quality expectation in manufacturing company.

Tab. 4. Employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality expectation
One-Sample Test

| | t | df | Sig. (2-tailed) | Test Value = 0 | | |
|---|---------|-----|-----------------|-----------------|---|-------|
| | | | | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Knowledge workers identify the available information about tangible elements of the services in the company. | 85.165 | 199 | .000 | 4.285 | 4.19 | 4.38 |
| Knowledge workers know from each other who knows what information about tangible elements. | 49.373 | 199 | .000 | 3.825 | 3.67 | 3.98 |
| Knowledge workers look for existing information on tangible elements in order to avoid repeating the previous efforts. | 74.552 | 199 | .000 | 3.905 | 3.80 | 4.01 |
| Knowledge workers adopt explicit strategies for knowledge development on the techniques that are essentially meant for tangible products. | 55.091 | 199 | .000 | 3.775 | 3.64 | 3.91 |
| Knowledge workers use clear techniques for acquiring new knowledge on tangible products. | 50.324 | 199 | .000 | 3.455 | 3.32 | 3.59 |
| Knowledge workers develop networks to create knowledge on tangible products. | 46.721 | 199 | .000 | 3.720 | 3.56 | 3.88 |
| In our organisation, there is a clear strategy for storing knowledge on tangible products for future usage. | 50.920 | 199 | .000 | 3.950 | 3.80 | 4.10 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to tangible products. | 117.258 | 199 | .000 | 4.580 | 4.50 | 4.66 |
| Knowledge workers usually understand and retell what they learned about tangible products in their own way. | 89.120 | 199 | .000 | 4.725 | 4.62 | 4.83 |

| | | | | | | |
|--|---------|-----|------|-------|------|------|
| Knowledge workers spend enough time to share ideas and experiences with each other about visually appealing materials associated with the service. | 124.255 | 199 | .000 | 4.670 | 4.60 | 4.74 |
| Knowledge workers consciously develops knowledge sharing habit with respect to tangible products. | 38.787 | 199 | .000 | 3.180 | 3.02 | 3.34 |
| Knowledge workers are encouraged to share their ideas about tangible products with other colleagues. | 53.454 | 199 | .000 | 4.010 | 3.86 | 4.16 |
| Knowledge workers apply available knowledge on the services of tangible elements to improve their jobs. | 114.134 | 199 | .000 | 4.360 | 4.28 | 4.44 |
| Knowledge workers apply available knowledge to innovate new solutions on the services of tangible elements. | 69.711 | 199 | .000 | 3.965 | 3.85 | 4.08 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to tangible products. | 96.421 | 199 | .000 | 4.480 | 4.39 | 4.57 |

The table above shows the One-Sample t-test for employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality expectation in manufacturing company. Where the results infer that the employee's knowledge on tangibility after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that

employee's knowledge on tangibility after the implementation of KMS approach have a significant influence on customers' quality expectation in manufacturing company, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on tangibility after the implementation of KMS approach in manufacturing company.

Tab. 5. Employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality expectation
One-Sample Test

| | t | df | Sig. (2-tailed) | Test Value = 0 | | | |
|---|--------|-----|-----------------|-----------------|---|-------|--|
| | | | | Mean Difference | 95% Confidence Interval of the Difference | | |
| | | | | | Lower | Upper | |
| The company will have modern looking equipment. | 52.127 | 199 | .081 | 4.150 | 3.99 | 4.31 | |
| The physical facilities at the company will be visually appealing. | 36.927 | 199 | .096 | 3.810 | 3.61 | 4.01 | |
| Employees will be neat appearing. | 58.611 | 199 | .068 | 3.930 | 3.80 | 4.06 | |
| Materials associated with the service (such as pamphlets or statements) will be visually appealing. | 36.337 | 199 | .102 | 3.660 | 3.46 | 3.86 | |

The table above shows the One-Sample t-test for employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality expectation in supply chain management company. Where the results infer that the employee's knowledge on

tangibility before the implementation of KMS approach showed a two-tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on tangibility before the implementation of KMS approach does not have any influence on customers'

quality expectation in supply chain management company.

Tab. 6. Employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality expectation
One-Sample Test

| | t | df | Sig. (2-tailed) | Test Value = 0 Mean Difference | 95% Confidence Interval of the Difference | |
|--|---------|-----|-----------------|--------------------------------------|--|-------|
| | | | | | Lower | Upper |
| Knowledge workers identify the available information about tangible elements of the services in the company. | 90.088 | 199 | .000 | 4.320 | 4.23 | 4.41 |
| Knowledge workers know from each other who knows what information about tangible elements. | 50.278 | 199 | .000 | 3.835 | 3.68 | 3.99 |
| Knowledge workers look for existing information on tangible elements in order to avoid repeating the previous efforts. | 76.294 | 199 | .000 | 3.900 | 3.80 | 4.00 |
| Knowledge workers adopt explicit strategies for knowledge development on the techniques that are essentially meant for tangible products. | 57.116 | 199 | .000 | 3.780 | 3.65 | 3.91 |
| Knowledge workers use clear techniques for acquiring new knowledge on tangible products. | 51.473 | 199 | .000 | 3.480 | 3.35 | 3.61 |
| Knowledge workers develop networks to create knowledge on tangible products. | 48.090 | 199 | .000 | 3.765 | 3.61 | 3.92 |
| In our organisation, there is a clear strategy for storing knowledge on tangible products for future usage. | 50.814 | 199 | .000 | 3.940 | 3.79 | 4.09 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to tangible products. | 117.545 | 199 | .000 | 4.585 | 4.51 | 4.66 |
| Knowledge workers usually understand and retell what they learned about tangible products in their own way. | 95.290 | 199 | .000 | 4.740 | 4.64 | 4.84 |
| Knowledge workers spend enough time to share ideas and experiences with each other about visually appealing materials associated with the service. | 124.771 | 199 | .000 | 4.675 | 4.60 | 4.75 |
| Knowledge workers consciously develops knowledge sharing habit with respect to tangible products. | 40.585 | 199 | .000 | 3.215 | 3.06 | 3.37 |
| Knowledge workers are encouraged to share their ideas about tangible products with other colleagues. | 56.986 | 199 | .000 | 4.070 | 3.93 | 4.21 |
| Knowledge workers apply available knowledge on the services of tangible elements to improve their jobs. | 110.396 | 199 | .000 | 4.360 | 4.28 | 4.44 |
| Knowledge workers apply available knowledge to innovate new solutions on the services of tangible elements. | 70.203 | 199 | .000 | 3.980 | 3.87 | 4.09 |

| | | | | | | |
|--|---------|-----|------|-------|------|------|
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to tangible products. | 100.065 | 199 | .000 | 4.485 | 4.40 | 4.57 |
|--|---------|-----|------|-------|------|------|

The table above shows the One-Sample t-test for employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality expectation in supply chain management company. Where the results infer that the employee's knowledge on tangibility after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on tangibility after the implementation of KMS approach have a significant influence on customers' quality expectation in supply chain management company, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on

tangibility after the implementation of KMS approach in supply chain management company.

H2- The adoption of KMS approach, significantly enhances the employee's knowledge on tangibility, influencing the customers' quality perception

One of the hallmarks of a service is tangibility. It speaks of goods that are reachable physically. Additionally, a lot of scholars described tangibles as a physical facility like materials, equipment, and so forth. Because occasionally a customer will value a product based on its appearance or physical characteristics. Therefore, the physical forms or appearance of the products must demonstrate their ability to offer a high level of service. Additionally, according to experts, tangibles are just as important as empathy [29].

Tab. 7. Employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality perception
One-Sample Test

| | t | df | Sig. (2-tailed) | Test Value = 0 | | 95% Confidence Interval of the Difference | |
|---|--------|-----|-----------------|-----------------|--|---|-------|
| | | | | Mean Difference | | Lower | Upper |
| company has modern looking equipment. | 35.265 | 199 | .138 | 3.450 | | 3.26 | 3.64 |
| company's facilities are physically appealing. | 33.368 | 199 | .245 | 3.730 | | 3.51 | 3.95 |
| company's reception desk employees are neat appearing. | 36.849 | 199 | .126 | 3.970 | | 3.76 | 4.18 |
| Materials associated with the service (such as pamphlets or statements) are visually appealing. | 79.749 | 199 | .095 | 4.570 | | 4.46 | 4.68 |

The table above shows the One-Sample t-test for employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality perception in automotive industry. Where the results infer that the employee's knowledge on tangibility before the implementation of KMS approach showed a two-

tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on tangibility before the implementation of KMS approach does not have any influence on customers' quality perception in automotive industry.

Tab. 8. Employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality perception
One-Sample Test

| | t | df | Sig. (2-tailed) | Test Value = 0 Mean Difference | 95% Confidence Interval of the Difference | |
|--|--------|-----|-----------------|--------------------------------------|--|-------|
| | | | | | Lower | Upper |
| Knowledge workers identify the available information about tangible elements of the services in the company. | 62.640 | 199 | .000 | 4.020 | 3.89 | 4.15 |
| Knowledge workers know from each other who knows what information about tangible elements. | 47.247 | 199 | .000 | 3.480 | 3.33 | 3.63 |
| Knowledge workers look for existing information on tangible elements in order to avoid repeating the previous efforts. | 75.239 | 199 | .000 | 4.145 | 4.04 | 4.25 |
| Knowledge workers adopt explicit strategies for knowledge development on the techniques that are essentially meant for tangible products. | 67.637 | 199 | .000 | 4.155 | 4.03 | 4.28 |
| Knowledge workers use clear techniques for acquiring new knowledge on tangible products. | 65.537 | 199 | .000 | 4.075 | 3.95 | 4.20 |
| Knowledge workers develop networks to create knowledge on tangible products. | 62.591 | 199 | .000 | 3.845 | 3.72 | 3.97 |
| In our organisation, there is a clear strategy for storing knowledge on tangible products for future usage. | 52.991 | 199 | .000 | 3.460 | 3.33 | 3.59 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to tangible products. | 40.306 | 199 | .000 | 2.385 | 2.27 | 2.50 |
| Knowledge workers usually understand and retell what they learned about tangible products in their own way. | 30.373 | 199 | .000 | 2.085 | 1.95 | 2.22 |
| Knowledge workers spend enough time to share ideas and experiences with each other about visually appealing materials associated with the service. | 29.289 | 199 | .000 | 2.080 | 1.94 | 2.22 |
| Knowledge workers consciously develops knowledge sharing habit with respect to tangible products. | 30.577 | 199 | .000 | 2.010 | 1.88 | 2.14 |

| | | | | | | |
|--|--------|-----|------|-------|------|------|
| Knowledge workers are encouraged to share their ideas about tangible products with other colleagues. | 34.077 | 199 | .000 | 2.420 | 2.28 | 2.56 |
| Knowledge workers apply available knowledge on the services of tangible elements to improve their jobs. | 32.729 | 199 | .000 | 2.675 | 2.51 | 2.84 |
| Knowledge workers apply available knowledge to innovate new solutions on the services of tangible elements. | 33.466 | 199 | .000 | 2.725 | 2.56 | 2.89 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to tangible products. | 35.414 | 199 | .000 | 2.975 | 2.81 | 3.14 |

The table above shows the One-Sample t-test for employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality perception in automotive industry. Where the results infer that the employee's knowledge on tangibility after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's

knowledge on tangibility after the implementation of KMS approach have a significant influence on customers' quality perception in automotive industry, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on tangibility after the implementation of KMS approach in automotive industry.

Tab. 9. Employee's knowledge on tangibility before the implementation of KMS approach influencing the customers' quality perception
One-Sample Test

| | | t | df | Sig. (2-tailed) | Test Value = 0 Mean Difference | 95% Confidence Interval of the Difference | |
|-----------|---|--------|-----|-----------------|-----------------------------------|---|-------|
| | | | | | | Lower | Upper |
| company | has modern looking equipment. | 21.725 | 199 | .165 | 3.040 | 2.76 | 3.32 |
| company's | physical facilities are visually appealing. | 20.027 | 199 | .264 | 2.870 | 2.59 | 3.15 |
| company's | reception desk employees are neat appearing. | 23.965 | 199 | .119 | 3.290 | 3.02 | 3.56 |
| Materials | associated with the service (such as pamphlets or statements) are visually appealing. | 21.107 | 199 | .134 | 3.000 | 2.72 | 3.28 |

The table above shows the One-Sample t-test for employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality perception in manufacturing company. Where the results infer that the employee's knowledge on tangibility before the implementation of KMS approach

showed a two-tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on tangibility before the implementation of KMS approach does not have any influence on customers' quality perception in manufacturing company.

Tab. 10. Employee's knowledge on tangibility after the implementation of KMS approach influencing the customers' quality perception

| One-Sample Test | | | | | | |
|--|--------|-----|-----------------|--------------------------------------|--|-------|
| | t | df | Sig. (2-tailed) | Test Value = 0 Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Knowledge workers identify the available information about tangible elements of the services in the company. | 60.399 | 199 | .000 | 4.005 | 3.87 | 4.14 |
| Knowledge workers know from each other who knows what information about tangible elements. | 47.093 | 199 | .000 | 3.485 | 3.34 | 3.63 |
| Knowledge workers look for existing information on tangible elements in order to avoid repeating the previous efforts. | 73.679 | 199 | .000 | 4.135 | 4.02 | 4.25 |
| Knowledge workers adopt explicit strategies for knowledge development on the techniques that are essentially meant for tangible products. | 67.121 | 199 | .000 | 4.160 | 4.04 | 4.28 |
| Knowledge workers use clear techniques for acquiring new knowledge on tangible products. | 65.766 | 199 | .000 | 4.085 | 3.96 | 4.21 |
| Knowledge workers develop networks to create knowledge on tangible products. | 62.178 | 199 | .000 | 3.845 | 3.72 | 3.97 |
| In our organisation, there is a clear strategy for storing knowledge on tangible products for future usage. | 54.155 | 199 | .000 | 3.475 | 3.35 | 3.60 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to tangible products. | 40.306 | 199 | .000 | 2.385 | 2.27 | 2.50 |
| Knowledge workers usually understand and retell what they learned about tangible products in their own way. | 29.936 | 199 | .000 | 2.105 | 1.97 | 2.24 |
| Knowledge workers spend enough time to share ideas and experiences with each other about visually appealing materials associated with the service. | 28.910 | 199 | .000 | 2.100 | 1.96 | 2.24 |
| Knowledge workers consciously develops knowledge sharing habit with respect to tangible products. | 29.870 | 199 | .000 | 2.030 | 1.90 | 2.16 |
| Knowledge workers are encouraged to share their ideas about tangible products with other colleagues. | 34.147 | 199 | .000 | 2.395 | 2.26 | 2.53 |
| Knowledge workers apply available knowledge on the services of tangible elements to improve their jobs. | 32.865 | 199 | .000 | 2.645 | 2.49 | 2.80 |
| Knowledge workers apply available knowledge to innovate new solutions on the services of tangible elements. | 33.713 | 199 | .000 | 2.710 | 2.55 | 2.87 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to tangible products. | 35.541 | 199 | .000 | 2.975 | 2.81 | 3.14 |

The table above shows the One-Sample t-test for employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality perception in manufacturing company. Where the results infer that the employee's knowledge on tangibility

after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on tangibility after the implementation of KMS approach have a significant influence on customers' quality

perception in manufacturing company, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on tangibility after the implementation of KMS approach in manufacturing company.

Tab. 11. Employee's knowledge on tangibility before the implementation of KMS approach influencing the customers' quality perception
One-Sample Test

| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|---|--------|-----|-----------------|-----------------|---|-------|
| | | | | | Lower | Upper |
| company has modern looking equipment. | 34.867 | 199 | .097 | 3.320 | 3.13 | 3.51 |
| company's physical facilities are visually appealing. | 26.913 | 199 | .176 | 3.400 | 3.15 | 3.65 |
| company's reception desk employees are neat appearing. | 29.930 | 199 | .164 | 3.830 | 3.58 | 4.08 |
| Materials associated with the service (such as pamphlets or statements) are visually appealing. | 92.857 | 199 | .054 | 4.590 | 4.49 | 4.69 |

The table above shows the One-Sample t-test for employee's knowledge on tangibility before the implementation of KMS approach in influencing the customers' quality perception in supply chain management company. Where the results infer that the employee's knowledge on tangibility before the implementation of KMS approach

showed a two-tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on tangibility before the implementation of KMS approach does not have any influence on customers' quality perception in supply chain management company.

Tab. 12. Employee's knowledge on tangibility after the implementation of KMS approach influencing the customers' quality perception

| | One-Sample Test | | | Test Value = 0 | | |
|---|-----------------|-----|-----------------|-----------------|---|-------|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Knowledge workers identify the available information about tangible elements of the services in the company. | 62.697 | 199 | .000 | 4.000 | 3.87 | 4.13 |
| Knowledge workers know from each other who knows what information about tangible elements. | 49.271 | 199 | .000 | 3.510 | 3.37 | 3.65 |
| Knowledge workers look for existing information on tangible elements in order to avoid repeating the previous efforts. | 73.032 | 199 | .000 | 4.115 | 4.00 | 4.23 |
| Knowledge workers adopt explicit strategies for knowledge development on the techniques that are essentially meant for tangible products. | 65.994 | 199 | .000 | 4.120 | 4.00 | 4.24 |
| Knowledge workers use clear techniques for acquiring new knowledge on tangible products. | 63.579 | 199 | .000 | 4.050 | 3.92 | 4.18 |
| Knowledge workers develop networks to create knowledge on tangible products. | 59.372 | 199 | .000 | 3.785 | 3.66 | 3.91 |
| In our organisation, there is a clear strategy for storing knowledge on tangible products for future usage. | 51.661 | 199 | .000 | 3.450 | 3.32 | 3.58 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to tangible products. | 41.281 | 199 | .000 | 2.360 | 2.25 | 2.47 |

| | | | | | | |
|--|--------|-----|------|-------|------|------|
| Knowledge workers usually understand and retell what they learned about tangible products in their own way. | 29.903 | 199 | .000 | 2.145 | 2.00 | 2.29 |
| Knowledge workers spend enough time to share ideas and experiences with each other about visually appealing materials associated with the service. | 29.603 | 199 | .000 | 2.090 | 1.95 | 2.23 |
| Knowledge workers consciously develops knowledge sharing habit with respect to tangible products. | 30.360 | 199 | .000 | 2.070 | 1.94 | 2.20 |
| Knowledge workers are encouraged to share their ideas about tangible products with other colleagues. | 32.669 | 199 | .000 | 2.460 | 2.31 | 2.61 |
| Knowledge workers apply available knowledge on the services of tangible elements to improve their jobs. | 32.363 | 199 | .000 | 2.660 | 2.50 | 2.82 |
| Knowledge workers apply available knowledge to innovate new solutions on the services of tangible elements. | 34.479 | 199 | .000 | 2.765 | 2.61 | 2.92 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to tangible products. | 35.509 | 199 | .000 | 3.010 | 2.84 | 3.18 |

The table above shows the One-Sample t-test for employee's knowledge on tangibility after the implementation of KMS approach in influencing the customers' quality perception in supply chain management company. Where the results infer that the employee's knowledge on tangibility after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on tangibility after the implementation of KMS approach have a significant influence on customers' quality perception in supply chain management company, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on tangibility after the implementation of KMS approach in supply chain management company.

H3- The adoption of KMS approach, significantly enhances the employee's knowledge on reliability, influencing the customers' quality expectation

The ability to deliver the promised service consistently and precisely is known as reliability. This reduction suggests that the company area upholds its promises regarding delivery, service arrangement, problem resolution, and value. Customers should cooperate with business units or corporations that honour their commitments, particularly those related to their premises about administrative outcomes and centre support characteristics. Any firm will be able to tell that customers prefer and desire the unwavering quality [32; 33; 34, 30].

Tab.13. Employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality expectation

| | t | df | Sig. (2-tailed) | One-Sample Test | | |
|--|--------|-----|-----------------|-----------------|---|-------|
| | | | | Test Value = 0 | | |
| | | | | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| When company promise to do something by a certain time, they do. | 20.644 | 199 | .173 | 2.970 | 2.68 | 3.26 |
| When a customer has a problem, company will show a sincere interest in solving it. | 20.296 | 199 | .186 | 3.070 | 2.77 | 3.37 |
| The company will perform the service right the first time. | 20.779 | 199 | .169 | 2.990 | 2.70 | 3.28 |
| The company will provide the service at the time they promise to do so. | 21.713 | 199 | .153 | 2.950 | 2.68 | 3.22 |
| The company will insist on error free records | 24.880 | 199 | .115 | 3.390 | 3.12 | 3.66 |

The table above shows the One-Sample t-test for employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality expectation in automotive industry. Where the results infer that the employee's knowledge on reliability before the implementation of KMS approach showed a two-

tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on reliability before the implementation of KMS approach does not have any influence on customers' quality expectation in automotive industry.

Tab. 14. Employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality expectation

| One-Sample Test | | | | Test Value = 0 | | |
|--|--------|-----|-----------------|-----------------|---|-------|
| | t | Df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Knowledge workers identify the problem and shows a sincere interest in solving it. | 33.045 | 199 | .000 | 2.825 | 2.66 | 2.99 |
| Knowledge workers gets help from others in identifying the problem. | 32.141 | 199 | .000 | 2.190 | 2.06 | 2.32 |
| Knowledge workers look for error free records in order to ensure good service. | 50.581 | 199 | .000 | 3.695 | 3.55 | 3.84 |
| Knowledge workers adopt explicit strategies to complete the work within the stipulated time. | 65.454 | 199 | .000 | 3.960 | 3.84 | 4.08 |
| Knowledge workers use clear techniques for solving the customer problems in a quicker way. | 57.954 | 199 | .000 | 3.930 | 3.80 | 4.06 |
| Knowledge workers develop interest in providing the service on time. | 77.246 | 199 | .000 | 3.930 | 3.83 | 4.03 |
| In our organisation, there is a clear strategy for storing knowledge on product services. | 83.005 | 199 | .000 | 4.110 | 4.01 | 4.21 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to product services. | 31.622 | 199 | .000 | 2.430 | 2.28 | 2.58 |
| Knowledge workers usually understand and retell what they learned about product services in their own way. | 37.749 | 199 | .000 | 3.200 | 3.03 | 3.37 |
| Knowledge workers spend enough time to share ideas and experiences with each other about maintaining the error free records. | 42.245 | 199 | .000 | 3.465 | 3.30 | 3.63 |
| Knowledge workers consciously develops knowledge sharing habit with respect to product services. | 40.060 | 199 | .000 | 3.410 | 3.24 | 3.58 |
| Knowledge workers are encouraged to share their ideas about product services with other colleagues. | 41.687 | 199 | .000 | 3.375 | 3.22 | 3.53 |
| Knowledge workers apply available knowledge on the services to satisfy the customers. | 94.304 | 199 | .000 | 4.320 | 4.23 | 4.41 |
| Knowledge workers apply available knowledge in solving the customer's problems. | 47.359 | 199 | .000 | 3.775 | 3.62 | 3.93 |

| | | | | | | |
|---|--------|-----|------|-------|------|------|
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to product services. | 73.088 | 199 | .000 | 3.875 | 3.77 | 3.98 |
|---|--------|-----|------|-------|------|------|

The table above shows the One-Sample t-test for employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality expectation automotive industry. Where the results infer that the employee's knowledge on reliability after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's

knowledge on reliability after the implementation of KMS approach have a significant influence on customers' quality expectation in automotive industry, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on reliability after the implementation of KMS approach in automotive industry.

Tab. 15. Employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality expectation

| One-Sample Test | | | | | | |
|--|--------|-----|-----------------|-----------------|---|-------|
| | t | df | Sig. (2-tailed) | Test Value = 0 | 95% Confidence Interval of the Difference | |
| | | | | Mean Difference | Lower | Upper |
| When company promise to do something by a certain time, they do. | 19.990 | 199 | .146 | 3.020 | 2.72 | 3.32 |
| When a customer has a problem, company will show a sincere interest in solving it. | 19.853 | 199 | .168 | 2.890 | 2.60 | 3.18 |
| The company will perform the service right the first time. | 20.424 | 199 | .107 | 2.810 | 2.54 | 3.08 |
| The company will provide the service at the time they promise to do so. | 18.594 | 199 | .276 | 2.770 | 2.47 | 3.07 |
| The company will insist on error free records | 18.860 | 199 | .248 | 2.690 | 2.41 | 2.97 |

The table above shows the One-Sample t-test for employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality expectation in manufacturing company. Where the results infer that the employee's knowledge on reliability before the implementation of KMS approach

showed a two-tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on reliability before the implementation of KMS approach does not have any influence on customers' quality expectation in manufacturing company.

Tab. 16. Employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality expectation

| One-Sample Test | | | | | | |
|--|--------|-----|-----------------|-----------------|---|-------|
| | t | df | Sig. (2-tailed) | Test Value = 0 | 95% Confidence Interval of the Difference | |
| | | | | Mean Difference | Lower | Upper |
| Knowledge workers identify the problem and shows a sincere interest in solving it. | 33.159 | 199 | .000 | 2.825 | 2.66 | 2.99 |
| Knowledge workers gets help from others in identifying the problem. | 32.248 | 199 | .000 | 2.170 | 2.04 | 2.30 |
| Knowledge workers look for error free records in order to ensure good service. | 49.770 | 199 | .000 | 3.690 | 3.54 | 3.84 |

| | | | | | | |
|--|--------|-----|------|---------|--------|--------|
| Knowledge workers adopt explicit strategies to complete the work within the stipulated time. | 64.727 | 199 | .000 | 3.955 | 3.83 | 4.08 |
| Knowledge workers use clear techniques for solving the customer problems in a quicker way. | 57.954 | 199 | .000 | 3.930 | 3.80 | 4.06 |
| Knowledge workers develop interest in providing the service on time. | 78.442 | 199 | .000 | 3.935 | 3.84 | 4.03 |
| In our organisation, there is a clear strategy for storing knowledge on product services. | 80.869 | 199 | .000 | 4.085 | 3.99 | 4.18 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to product services. | 32.183 | 199 | .000 | 2.455 | 2.30 | 2.61 |
| Knowledge workers usually understand and retell what they learned about product services in their own way. | 36.044 | 199 | .000 | 3.085 | 2.92 | 3.25 |
| Knowledge workers spend enough time to share ideas and experiences with each other about maintaining the error free records. | 39.693 | 199 | .000 | 3.350 | 3.18 | 3.52 |
| Knowledge workers consciously develops knowledge sharing habit with respect to product services. | 38.105 | 199 | .000 | 3.295 | 3.12 | 3.47 |
| Knowledge workers are encouraged to share their ideas about product services with other colleagues. | 38.947 | 199 | .000 | 3.255 | 3.09 | 3.42 |
| Knowledge workers apply available knowledge on the services to satisfy the customers. | 85.249 | 199 | .000 | 4.28000 | 4.1810 | 4.3790 |
| Knowledge workers apply available knowledge in solving the customer's problems. | 45.675 | 199 | .000 | 3.75500 | 3.5929 | 3.9171 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to product services. | 69.114 | 199 | .000 | 3.85000 | 3.7402 | 3.9598 |

The table above shows the One-Sample t-test for employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality expectation manufacturing company. Where the results infer that the employee's knowledge on reliability after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's

knowledge on reliability after the implementation of KMS approach have a significant influence on customers' quality expectation in manufacturing company, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on reliability after the implementation of KMS approach in manufacturing company.

Tab. 17. Employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality expectation

| | One-Sample Test | | | Test Value = 0 Mean Difference | 95% Confidence Interval of the Difference | |
|--|-----------------|-----|-----------------|--------------------------------------|--|-------|
| | t | df | Sig. (2-tailed) | | Lower | Upper |
| | | | | | | |
| When company promise to do something by a certain time, they do. | 26.913 | 199 | .193 | 3.400 | 3.15 | 3.65 |
| When a customer has a problem, company will show a sincere interest in solving it. | 29.930 | 199 | .108 | 3.830 | 3.58 | 4.08 |

| | | | | | | |
|---|--------|-----|------|-------|------|------|
| The company will perform the service right the first time. | 26.180 | 199 | .227 | 3.000 | 2.77 | 3.23 |
| The company will provide the service at the time they promise to do so. | 39.261 | 199 | .083 | 3.910 | 3.71 | 4.11 |
| The company will insist on error free records | 28.532 | 199 | .114 | 3.450 | 3.21 | 3.69 |

The table above shows the One-Sample t-test for employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality expectation in supply chain management company. Where the results infer that the employee's knowledge on reliability before the implementation of KMS approach

showed a two-tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on reliability before the implementation of KMS approach does not have any influence on customers' quality expectation in supply chain management company.

Tab. 18. Employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality expectation
One-Sample Test

| | t | df | Sig. (2-tailed) | Test Value = 0 | 95% Confidence Interval of the Difference | |
|--|--------|-----|-----------------|-----------------|---|-------|
| | | | | Mean Difference | Lower | Upper |
| Knowledge workers identify the problem and shows a sincere interest in solving it. | 33.674 | 199 | .000 | 2.880 | 2.71 | 3.05 |
| Knowledge workers gets help from others in identifying the problem. | 32.036 | 199 | .000 | 2.265 | 2.13 | 2.40 |
| Knowledge workers look for error free records in order to ensure good service. | 51.919 | 199 | .000 | 3.730 | 3.59 | 3.87 |
| Knowledge workers adopt explicit strategies to complete the work within the stipulated time. | 64.662 | 199 | .000 | 3.930 | 3.81 | 4.05 |
| Knowledge workers use clear techniques for solving the customer problems in a quicker way. | 56.539 | 199 | .000 | 3.940 | 3.80 | 4.08 |
| Knowledge workers develop interest in providing the service on time. | 81.877 | 199 | .000 | 3.945 | 3.85 | 4.04 |
| In our organisation, there is a clear strategy for storing knowledge on product services. | 84.365 | 199 | .000 | 4.100 | 4.00 | 4.20 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to product services. | 32.601 | 199 | .000 | 2.550 | 2.40 | 2.70 |
| Knowledge workers usually understand and retell what they learned about product services in their own way. | 36.555 | 199 | .000 | 3.090 | 2.92 | 3.26 |
| Knowledge workers spend enough time to share ideas and experiences with each other about maintaining the error free records. | 40.230 | 199 | .000 | 3.325 | 3.16 | 3.49 |

| | | | | | | |
|---|--------|-----|------|-------|------|------|
| Knowledge workers consciously develops knowledge sharing habit with respect to product services. | 37.916 | 199 | .000 | 3.305 | 3.13 | 3.48 |
| Knowledge workers are encouraged to share their ideas about product services with other colleagues. | 39.063 | 199 | .000 | 3.250 | 3.09 | 3.41 |
| Knowledge workers apply available knowledge on the services to satisfy the customers. | 43.719 | 199 | .000 | 3.320 | 3.17 | 3.47 |
| Knowledge workers apply available knowledge in solving the customer's problems. | 38.088 | 199 | .000 | 3.330 | 3.16 | 3.50 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to product services. | 42.428 | 199 | .000 | 3.365 | 3.21 | 3.52 |

The table above shows the One-Sample t-test for employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality expectation supply chain management company. Where the results infer that the employee's knowledge on reliability after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on reliability after the implementation of KMS approach have a significant influence on customers' quality expectation in supply chain management company, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on reliability

after the implementation of KMS approach in supply chain management company.

H4- The adoption of KMS approach, significantly enhances the employee's knowledge on reliability, influencing the customers' quality perception

Being dependable to the customer is what reliability is all about. Customers should pay close attention to reliability issues because they measure how much a component's impact affects the system reliability. Taking the consumer at an organization framework is a fundamental way to illustrate this concept. An organization framework's dependability is most strongly influenced by its weakest component [35].

Tab. 19. Employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality perception
One-Sample Test

| | t | Df | Sig. (2-tailed) | Test Value = 0 | 95% Confidence Interval of the Difference | |
|--|--------|-----|-----------------|-----------------|---|-------|
| | | | | Mean Difference | Lower | Upper |
| When the company promises to do something by a certain time, it does so. | 21.211 | 199 | .128 | 2.890 | 2.62 | 3.16 |
| When you have a problem, the company shows a sincere interest in solving it. | 23.985 | 199 | .164 | 3.150 | 2.89 | 3.41 |
| The company performs the service right the first time. | 20.393 | 199 | .102 | 2.660 | 2.40 | 2.92 |
| The company provides its service at the time it promises to do so. | 21.513 | 199 | .147 | 2.980 | 2.71 | 3.25 |
| The company insists on error free record | 22.197 | 199 | .156 | 3.280 | 2.99 | 3.57 |

The table above shows the One-Sample t-test for employee's knowledge on reliability before the implementation of KMS approach in influencing

the customers' quality perception in automotive industry. Where the results infer that the employee's knowledge on reliability before the

implementation of KMS approach showed a two-tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on reliability before the

implementation of KMS approach does not have any influence on customers' quality perception in automotive industry.

Tab. 20. Employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality perception

| One-Sample Test | | | | | | |
|--|---------|-----|-----------------|-----------------|---|--------|
| | t | Df | Sig. (2-tailed) | Test Value = 0 | 95% Confidence Interval of the Difference | |
| | | | | Mean Difference | Lower | Upper |
| Knowledge workers identify the problem and shows a sincere interest in solving it. | 51.495 | 199 | .000 | 3.46000 | 3.3275 | 3.5925 |
| Knowledge workers gets help from others in identifying the problem. | 54.067 | 199 | .000 | 3.81500 | 3.6759 | 3.9541 |
| Knowledge workers look for error free records in order to ensure good service. | 61.072 | 199 | .000 | 4.02500 | 3.8950 | 4.1550 |
| Knowledge workers adopt explicit strategies to complete the work within the stipulated time. | 107.994 | 199 | .000 | 4.52500 | 4.4424 | 4.6076 |
| Knowledge workers use clear techniques for solving the customer problems in a quicker way. | 71.045 | 199 | .000 | 4.61000 | 4.4820 | 4.7380 |
| Knowledge workers develop interest in providing the service on time. | 111.875 | 199 | .000 | 4.61000 | 4.5287 | 4.6913 |
| In our organisation, there is a clear strategy for storing knowledge on product services. | 38.933 | 199 | .000 | 3.18000 | 3.0189 | 3.3411 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to product services. | 52.668 | 199 | .000 | 3.99500 | 3.8454 | 4.1446 |
| Knowledge workers usually understand and retell what they learned about product services in their own way. | 107.002 | 199 | .000 | 4.36000 | 4.2796 | 4.4404 |
| Knowledge workers spend enough time to share ideas and experiences with each other about maintaining the error free records. | 72.044 | 199 | .000 | 4.02000 | 3.9100 | 4.1300 |
| Knowledge workers consciously develops knowledge sharing habit with respect to product services. | 84.569 | 199 | .000 | 4.42000 | 4.3169 | 4.5231 |
| Knowledge workers are encouraged to share their ideas about product services with other colleagues. | 33.682 | 199 | .000 | 3.22500 | 3.0362 | 3.4138 |
| Knowledge workers apply available knowledge on the services to satisfy the customers. | 62.616 | 199 | .000 | 4.04000 | 3.9128 | 4.1672 |

| | | | | | | |
|---|--------|-----|------|---------|--------|--------|
| Knowledge workers apply available knowledge in solving the customer's problems. | 48.446 | 199 | .000 | 3.48500 | 3.3431 | 3.6269 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to product services. | 72.754 | 199 | .000 | 4.15000 | 4.0375 | 4.2625 |

The table above shows the One-Sample t-test for employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality perception automotive industry. Where the results infer that the employee's knowledge on reliability after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's

knowledge on reliability after the implementation of KMS approach have a significant influence on customers' quality perception in automotive industry, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on reliability after the implementation of KMS approach in automotive industry.

Tab. 21. Employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality perception
One-Sample Test

| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|--|--------|-----|-----------------|-----------------|---|-------|
| | | | | | Lower | Upper |
| When the company promises to do something by a certain time, it does so. | 20.323 | 199 | .251 | 2.790 | 2.52 | 3.06 |
| When you have a problem, the company shows a sincere interest in solving it. | 18.906 | 199 | .314 | 2.640 | 2.36 | 2.92 |
| The company performs the service right the first time. | 22.478 | 199 | .195 | 3.190 | 2.91 | 3.47 |
| The company provides its service at the time it promises to do so. | 19.147 | 199 | .295 | 2.820 | 2.53 | 3.11 |
| The company insists on error free record | 22.490 | 199 | .183 | 3.160 | 2.88 | 3.44 |

The table above shows the One-Sample t-test for employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality perception in manufacturing company. Where the results infer that the employee's knowledge on reliability before the implementation of KMS approach

showed a two-tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on reliability before the implementation of KMS approach does not have any influence on customers' quality perception in manufacturing company.

Tab. 22. Employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality perception
One-Sample Test

| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|--|---------|-----|-----------------|-----------------|---|-------|
| | | | | | Lower | Upper |
| Knowledge workers identify the problem and shows a sincere interest in solving it. | 52.618 | 199 | .000 | 4.000 | 3.85 | 4.15 |
| Knowledge workers gets help from others in identifying the problem. | 106.730 | 199 | .000 | 4.375 | 4.29 | 4.46 |

| | | | | | | |
|--|--------|-----|------|-------|------|------|
| Knowledge workers look for error free records in order to ensure good service. | 71.857 | 199 | .000 | 4.025 | 3.91 | 4.14 |
| Knowledge workers adopt explicit strategies to complete the work within the stipulated time. | 84.604 | 199 | .000 | 4.425 | 4.32 | 4.53 |
| Knowledge workers use clear techniques for solving the customer problems in a quicker way. | 33.436 | 199 | .000 | 3.175 | 2.99 | 3.36 |
| Knowledge workers develop interest in providing the service on time. | 72.297 | 199 | .000 | 4.100 | 3.99 | 4.21 |
| In our organisation, there is a clear strategy for storing knowledge on product services. | 49.742 | 199 | .000 | 3.525 | 3.39 | 3.66 |
| Knowledge workers sure about what kind of knowledge should be stored with respect to product services. | 79.174 | 199 | .000 | 4.200 | 4.10 | 4.30 |
| Knowledge workers usually understand and retell what they learned about product services in their own way. | 68.637 | 199 | .000 | 4.150 | 4.03 | 4.27 |
| Knowledge workers spend enough time to share ideas and experiences with each other about maintaining the error free records. | 66.081 | 199 | .000 | 4.050 | 3.93 | 4.17 |
| Knowledge workers consciously develops knowledge sharing habit with respect to product services. | 60.540 | 199 | .000 | 3.825 | 3.70 | 3.95 |
| Knowledge workers are encouraged to share their ideas about product services with other colleagues. | 47.552 | 199 | .000 | 3.450 | 3.31 | 3.59 |
| Knowledge workers apply available knowledge on the services to satisfy the customers. | 41.453 | 199 | .000 | 2.275 | 2.17 | 2.38 |
| Knowledge workers apply available knowledge in solving the customer's problems. | 31.462 | 199 | .000 | 2.025 | 1.90 | 2.15 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to product services. | 31.661 | 199 | .000 | 1.975 | 1.85 | 2.10 |

The table above shows the One-Sample t-test for employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality perception manufacturing company. Where the results infer that the employee's knowledge on reliability after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's

knowledge on reliability after the implementation of KMS approach have a significant influence on customers' quality perception in manufacturing company, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on reliability after the implementation of KMS approach in manufacturing company.

Tab. 23. Employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality perception

| One-Sample Test | | | | | | | |
|--|--------|-----|-----------------|-----------------------------------|---|-------|--|
| | t | df | Sig. (2-tailed) | Test Value = 0 Mean Difference | 95% Confidence Interval of the Difference | | |
| | | | | | Lower | Upper | |
| When the company promises to do something by a certain time, it does so. | 35.991 | 199 | .128 | 3.830 | 3.62 | 4.04 | |
| When you have a problem, the company shows a sincere interest in solving it. | 25.814 | 199 | .195 | 3.320 | 3.06 | 3.58 | |
| The company performs the service right the first time. | 26.719 | 199 | .186 | 3.650 | 3.38 | 3.92 | |
| The company provides its service at the time it promises to do so. | 37.171 | 199 | .104 | 3.870 | 3.66 | 4.08 | |
| The company insists on error free record | 30.035 | 199 | .143 | 3.420 | 3.19 | 3.65 | |

The table above shows the One-Sample t-test for employee's knowledge on reliability before the implementation of KMS approach in influencing the customers' quality perception in supply chain management company. Where the results infer that the employee's knowledge on reliability before the implementation of KMS approach

showed a two-tailed p-value greater than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on reliability before the implementation of KMS approach does not have any influence on customers' quality perception in supply chain management company.

Tab. 24. Employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality perception

| One-Sample Test | | | | | | | |
|--|---------|-----|-----------------|-----------------------------------|---|-------|--|
| | t | df | Sig. (2-tailed) | Test Value = 0 Mean Difference | 95% Confidence Interval of the Difference | | |
| | | | | | Lower | Upper | |
| Knowledge workers identify the problem and shows a sincere interest in solving it. | 35.942 | 199 | .000 | 3.230 | 3.05 | 3.41 | |
| Knowledge workers gets help from others in identifying the problem. | 37.064 | 199 | .000 | 3.775 | 3.57 | 3.98 | |
| Knowledge workers look for error free records in order to ensure good service. | 127.069 | 199 | .000 | 4.780 | 4.71 | 4.85 | |
| Knowledge workers adopt explicit strategies to complete the work within the stipulated time. | 305.982 | 199 | .000 | 4.945 | 4.91 | 4.98 | |
| Knowledge workers use clear techniques for solving the customer problems in a quicker way. | 110.255 | 199 | .000 | 4.610 | 4.53 | 4.69 | |
| Knowledge workers develop interest in providing the service on time. | 35.835 | 199 | .000 | 2.830 | 2.67 | 2.99 | |
| In our organisation, there is a clear strategy for storing knowledge on product services. | 51.999 | 199 | .000 | 3.780 | 3.64 | 3.92 | |

| | | | | | | |
|--|---------|-----|------|-------|------|------|
| Knowledge workers sure about what kind of knowledge should be stored with respect to product services. | 135.060 | 199 | .000 | 4.275 | 4.21 | 4.34 |
| Knowledge workers usually understand and retell what they learned about product services in their own way. | 54.594 | 199 | .000 | 3.660 | 3.53 | 3.79 |
| Knowledge workers spend enough time to share ideas and experiences with each other about maintaining the error free records. | 133.792 | 199 | .000 | 4.615 | 4.55 | 4.68 |
| Knowledge workers consciously develops knowledge sharing habit with respect to product services. | 38.147 | 199 | .000 | 3.505 | 3.32 | 3.69 |
| Knowledge workers are encouraged to share their ideas about product services with other colleagues. | 88.342 | 199 | .000 | 4.115 | 4.02 | 4.21 |
| Knowledge workers apply available knowledge on the services to satisfy the customers. | 38.750 | 199 | .000 | 3.270 | 3.10 | 3.44 |
| Knowledge workers apply available knowledge in solving the customer's problems. | 102.831 | 199 | .000 | 4.110 | 4.03 | 4.19 |
| Knowledge workers can make appropriate learning goals (short/long-term goals) with respect to product services. | 57.423 | 199 | .000 | 4.160 | 4.02 | 4.30 |

The table above shows the One-Sample t-test for employee's knowledge on reliability after the implementation of KMS approach in influencing the customers' quality perception supply chain management company. Where the results infer that the employee's knowledge on reliability after the implementation of KMS approach showed a two-tailed p-value less than 0.05 for all the variables. Hence, the results suggest that employee's knowledge on reliability after the implementation of KMS approach have a significant influence on customers' quality perception in supply chain management company, which indicates the rejection of null hypothesis. The results thus showed a greater influence on employee's knowledge on reliability after the implementation of KMS approach in supply chain management company.

5. Conclusions

Knowledge management systems (KMS) have been implemented by many organizations to aid in the management of the intellectual property and the development of sustainable competitive advantages. However, despite the efforts of

academics and practitioners with regard to promoting the use of KMS, the rate of adoption remains relatively low. This study analysis the adoption of KMS approach, significantly enhances the employee's knowledge on tangibility and reliability thus influences the customer's quality expectation and perceptions. It was found that the adoption of KMS approach, enhances the employee's knowledge on tangibility and reliability and thus influences the customer's quality expectation and perceptions.

References

- [1] S. Phumbua and B. Tjahjono, Towards product-service systems modelling: a quest for dynamic behaviour and model parameters. *International Journal of Production Research*, Vol. 50, No. 2, (2012), pp. 425-442.
- [2] T. C. Kuo and M. L. Wang, The optimisation of maintenance service levels to support the product service system. *International Journal of*

- Production Research*, Vol. 50, No. 23, (2012), pp. 6691-6708.
- [3] C. Durugbo and J. C. Riedel, Readiness assessment of collaborative networked organisations for integrated product and service delivery. *International Journal of Production Research*, Vol. 51, No. 2, (2013), pp. 598-613.
- [4] Y. Xin, V. Ojanen and J. Huiskonen, Knowledge management in product-service systems—a product lifecycle perspective. *Procedia CIRP*, Vol. 73, (2018), pp. 203-209.
- [5] S. Lee, Y. Geum, S. Lee and Y. Park, Evaluating new concepts of PSS based on the customer value: Application of ANP and niche theory. *Expert systems with Applications*, Vol. 42, No. 9, (2015), pp. 4556-4566.
- [6] M. Boehm and O. Thomas, Looking beyond the rim of one's teacup: a multidisciplinary literature review of Product-Service Systems in Information Systems, Business Management, and Engineering & Design. *Journal of cleaner production*, Vol. 51, (2013), pp. 245-260.
- [7] D. Tang, R. Zhu, J. Tang, R. Xu and R. He, Product design knowledge management based on design structure matrix. *Advanced Engineering Informatics*, Vol. 24, No. 2, (2010), pp. 159-166.
- [8] Y. Nemoto, F. Akasaka and Y. Shimomura, A framework for managing and utilizing product-service system design knowledge. *Production Planning & Control*, Vol. 26, Nos. 14-15, (2015), pp. 1278-1289.
- [9] D. Zhang, D. Hu, Y. Xu and H. Zhang, A framework for design knowledge management and reuse for Product-Service Systems in construction machinery industry. *Computers in industry*, Vol. 63, No. 4, (2012), pp. 328-337.
- [10] R. Roy, J. Mehnen, S. Addepalli, L. Redding, L. Tinsley and C. Okoh, Service knowledge capture and reuse. *Procedia CIRP*, Vol. 16, (2014), pp. 9-14.
- [11] C. Vila, J. V. Abellán-Nebot, J. C. Albiñana and G. Hernández, An approach to sustainable product lifecycle management (Green PLM). *Procedia engineering*, Vol. 132, (2015), pp. 585-592.
- [12] D. Baxter, R. Roy, A. Doultsinou, J. Gao and M. Kalta, A knowledge management framework to support product-service systems design. *International journal of computer integrated manufacturing*, Vol. 22, No. 12, (2009), pp. 1073-1088.
- [13] M. Abramovici, Y. Aidi and H. B. Dang, Knowledge-based lifecycle management approach for product service systems (PSS). In *IFIP International Conference on Product Lifecycle Management* pp. 239-248. Springer, Berlin, Heidelberg.
- [14] M. Peruzzini, E. Marilungo & M. Germani, Structured requirements elicitation for product-service system. *International Journal of Agile Systems and Management*, Vol. 8, Nos. 3-4, (2015), pp. 189-218.
- [15] E. Marilungo, M. Peruzzini & M. Germani, An Integrated Method to Support PSS Design within the Virtual Enterprise. *Procedia CIRP*, Vol. 30, (2015), pp. 54-59.
- [16] Y. Nemoto, F. Akasaka & Y. Shimomura, A framework for managing and utilizing product-service system design knowledge. *Production Planning & Control*, Vol. 26, Nos. 14-15, (2015), pp. 1278-1289.
- [17] A. D'Agostin, J. F. de Medeiros, G. Vidor, M. Zulpo & C. F. Moretto, Drivers and barriers for the adoption of use-oriented product-service systems: A study with young consumers in medium and small cities. *Sustainable Production and Consumption*, Vol. 21, (2020), pp. 92-103.
- [18] P. Gaiardelli, B. Resta, V. Martinez, R. Pinto & P. Albores, A classification model

- for product-service offerings. *Journal of cleaner production*, Vol. 66, (2014), pp. 507-519.
- [19] A. S. Santoso and A. Erdaka, Customer loyalty in collaborative consumption model: Empirical study of CRM for product-service system-based e-commerce in Indonesia. *Procedia computer science*, Vol. 72, (2015), pp. 543-551.
- [20] M. Catulli, M. Cook and S. Potter, Consuming use orientated product service systems: A consumer culture theory perspective. *Journal of Cleaner Production*, Vol. 141, (2017), pp. 1186-1193.
- [21] C. Basfirinci and A. Mitra, A cross cultural investigation of airlines service quality through integration of Servqual and the Kano model. *Journal of Air Transport Management*, Vol. 42, (2015), pp. 239-248.
- [22] R. Liu, L. Cui, G. Zeng, H. Wu, C. Wang, S. Yan and B. Yan, Applying the fuzzy SERVQUAL method to measure the service quality in certification & inspection industry. *Applied Soft Computing*, Vol. 26, (2015), pp. 508-512.
- [23] G. J. Udo, K. K. Bagchi and P. J. Kirs, Using SERVQUAL to assess the quality of e-learning experience. *Computers in Human Behavior*, Vol. 27, No. 3, (2011), pp. 1272-1283.
- [24] A. Parasuraman, V. A. Zeithaml and L. L. Berry, A conceptual model of service quality and its implications for future research. *Journal of marketing*, Vol. 49, No. 4, (1985), pp. 41-50.
- [25] M. Alosaimi. The role of knowledge management approaches for enhancing and supporting education. Business administration. Université Panthéon-Sorbonne - Paris I, 2016. English. NNT :2016PA01E064. tel-01816021
- [26] E. Ismagilova, E. L. Slade, N. P. Rana and Y. K. Dwivedi, The effect of electronic word of mouth communications on intention to buy: A meta-analysis. *Inform. Syst. Front.* (2019), pp. 1-24.
- [27] J. Santos, From intangibility to tangibility on service quality perceptions: a comparison study between consumers and service providers in four service industries. *Manag. Serv. Qual. Int. J.* Vol. 12, (2002), pp. 292-302.
- [28] Miklós Pakurár, Hossam Haddad, János Nagy, József Popp and Judit Oláh. The Service Quality Dimensions that Affect Customer Satisfaction in the Jordanian Banking Sector. Retrieved (2020), from sustainability: <file:///C:/Users/KCCo/Downloads/sustainability-11-01113.pdf>
- [29] B. J. Ali & G. Anwar, Capital Structure and Firm Profitability in Developing Countries. *GOYA*, Vol. 68, No. 374, (2021), pp. 163-174.
- [30] J. Spacey, 10 types of service quality. Retrieved (2020), from simplicable: <https://simplicable.com/new/service-quality>
- [31] B. J. Ali, Impact of consumer animosity, boycott participation, boycott motivation, and product judgment on purchase readiness or aversion of Kurdish consumers in Iraq. *Journal of Consumers Affaires*; (2021), pp. 1-20.
- [32] B. J. Ali, Iraq Stock Market and its Role in the Economy. Retrieved from (2016), <https://www.amazon.com/Iraq-Stock-Market-Role-Economy/dp/3659634271>
- [33] B. J. Ali, Brand Building in the Consumer Electronics Industry in Iraq. Retrieved from (2014). <https://www.amazon.com/Brand-Building-Consumer-Electronics-Industry/dp/6200248699>
- [34] a. Gopalakrishnan, What does it mean ASSURANCE in Customer Service with suitable story ? (2017).

- [35] Retrieved 2020, from specialties.bayt: <https://specialties.bayt.com/en/specialties/q/297270/what-does-it-mean-assurance-in-customer-service-with-suitable-story/#:~:text=Assurance%20means%20developing%20operational%20controls,satisfied%20while%20protecting%20the%20organization.>

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