A Research Methodology Connecting Meta-Analysis and the On-Line Tools for an Automotive Service Center

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Abstract. This work is oriented to explore a research methodology to connect the meta-analysis and the on-line approach for collecting and the generated keywords from the analysis and to develop the scope for the future researchers. First a thorough study was made to gather the data using the meta-analysis/ research–synthesis/research–integration in to the available literature. Next on-line surveys were conducted to find whether the results obtained by the research integration are comparable with the actual results or not and based upon the comparison , the final results were noted down .

Keywords: Research –Integration , Meta-Analysis, Key-words.

1. Introduction

According to Parasuraman, Zeithaml and Berry, 1988, the service quality is defined as the global judgment or attitude, relating to the superiority of the service and explicated it as involving evaluations of the outcome. It is a balance between what the customer actually receives from the service and the manner in which the service is delivered or in other words service quality is the difference between what the customer wants and what the customer gets .

According to Gerald Barber,et.al, Six Sigma could be understood and defined as metric, methodology and philosophy. As a metric-Six Sigma is 3.4 defects per million opportunities which allows organizations to implement a measurement based strategy that focuses on process improvement and variation reduction. As a methodology-Six Sigma usually follows a well-defined problem solving roadmap and tools such as DMAIC. As a philosophy-Six Sigma aims at reducing the variation in business processes based on customer critical quality issues and data driven decisions. Traditional Zero Defects (ZD) was the exclusive criteria for the bench-marking but now the concept had got changed and the researchers and academicians are making a move from the earlier concepts to the newer ones . By this work , an attempt had been initiated to bridge the gap between the six sigma and the service quality using the meta-analysis and the on-line approach .

A software-oriented and user-defined research for exploratory(data) analysis had been conducted for the generalizations of the theory, principles, policy and practice implications which could thus result in the predictions and possibly for the ultimate control of the events .In investigation, this is an attempt to conduct the a meta-analysis and an on-line approach to enhance the service quality to the six sigma level for an automobile service center .In methodology, on-line questionnaires and the research-integration of

the earlier findings on the similar kinds of the works .In conclusion, the implications had been obtained with the aid of the on-line approaches and the meta-analysis .In the future works , the scope had been generated through the publications from this research work .

2. Objectives of the Work

The main objective of this work was to enhance the service quality to the six sigma level by performing a meta-analysis / research synthesis / research integration on the earlier works and also to apply an on-line approach for the automobile service centers .

2.1 Scope of the Work

The conclusions and the implications of this work provide and insight into the generalizations for the theory, principles, policy and practices. The generated results published from this work do extend the scope further towards the advanced research .

2.2 Concise Report of the Work

This work was based upon the 5-chapter PhD theses pattern. This report is based upon the Five Chapter PhD thesis consisting of the following :

Section I: Introduction-This provides an insight into background of the research; research problems and the hypotheses- statements of the research problems; Justification for the research methodology – Underlying assumptions & hypotheses considerations ; Outline of the 5-chapter PhD theses pattern ; Important definitions and the delimitations of the scope –Key assumptions .

Section II: Literature Review-This provides an insight into the parent disciplines – surveys using the questionnaire , survey classifications ;Immediate disciplines – research design & statistical methods and also about the research questions for the research synthesis / integration .

Section III: Methodology-This provides an insight into the six sigma and the service quality ; Justification for the paradigm & the methodology –procedural steps for the survey and the ethical considerations .

Section IV: Analysis-This provides an insight into the subjects / respondents details ; Patterns of the data collection for each of the research questions separately for the main & the supportive surveys .

Section V: Conclusions and the Implications-This provides an insight into the conclusions on the man survey & the three supportive surveys for the purpose of the generalization into the theory, principles, policy and practice implications.

3. Research Questions / Statements (Online Approach & Meta-Analysis)

3.1 On-Line Approach

On-Line Approach could be defined as the location / area where the results of the research integration could be further analyzed and studied in the form of the models for the collection analysis and interpretation for the generalization and then the standardization of the findings. There were 44 Research questions that were framed based upon the Customer Expectations   and the Customer perceptions. The first 22 Questions for the Customer Expectations and the next   22 Questions for the Customer Perceptions. For the questions related to the Customer Expectations, (Q1-Q4) were from the Tangibles, (Q5-Q9) were from the Reliability, (Q10-Q13) were from the Responsiveness, (Q14-Q17) were from the Assurance and (Q18-Q22) were from the Empathy. For the questions related to the Customer Perceptions,

(Q1-Q4) were from the Tangibles, (Q5-Q9) were from the Reliability, (Q10-Q13) were from the Responsiveness, (Q14-Q17) were from the Assurance and (Q18-Q22) were from the Empathy. The research questions were based upon the Likert Scales (Absolutely Disagree, Strongly Disagree, Slightly Disagree, Neither Disagree nor Agree, Slightly Agree, Strongly Agree & Absolutely Agree) .

3.2 Meta-Analysis/Research-Integration/Research-Synthesis

Meta-Analysis is a systematic and statistical summarization of the findings of the previous and quantitative studies . Also known as the research synthesis and research integration. This also acts as the supplier of the information and as a describer of the phenomenon and the explainer of the phenomenon.

- **RQ1.** Why Six Sigma for the Service Quality ?

- **RQ2.** What are the tools and techniques for the effective implementation of the Six Sigma in the Service Organization(S) ?

- **RQ3.** How to extend the Service Quality to the Six Sigma Service Quality ?

- **RQ4.** What are the research methodologies and the techniques for extending the same ?

- **RQ5.** Are the results of the Questionnaire based on the manual collection of the data and the online collection of the data prove to be the same or the data collected through the on-line is more superior than the manual data collection ?

- **RQ6.** How to extend the work to the Automobile Service Center ?

- **RQ7.** What are the needs and the necessitates of a paperless Automobile Service Center?

4. Covering Methodology

4.1 On-Line Approach

The questionnaire was based upon the RATER attributes – Tangibles , Reliability , Responsiveness , Assurance , Empathy (Parasuraman et.al).

Main Survey

The main survey was launched for the data-collection, data-analysis and the report generation with the necessary graphs appropriately, with the web-links as mentioned below :

- http://www.esurveyspro.com/SurveyResults.aspx?surveyId=205961

There were four direct ways to instruct / invite the people to complete the survey

- By sending the survey URL via an own e-mail program to the recipients of one's own choice,
- By embedding a link to the survey URL in one's own web page,
- By embedding the full survey page in one's own web page
- By creating a recipient list and sending the survey invitations directly from the world wide web

The above mentioned were the ways in which the survey were launched and the data was collected and analyzed. Similarly, for the Supportive Surveys as well.

4.2 Meta-Analysis Approach

The Questionnaire Design and the Development. [12],[13], (The already drafted questionnaire was downloaded from the internet and which was based on the comprehensive review of the existing literature). The Problems associated with the Questionnaire Development. [12],[13]. The Validation of the Questionnaire selected. [3]. .The success stories of the application of the Six Sigma and the Servqual separately. [1],[2],[5],[8],[9],[10] The reason(S) for the delay in the implementation of the Six Sigma strategies. [10] . The criteria for selecting the Six Sigma Projects. [10] The usefulness and the applicability of the tools and techniques for the Six Sigma and the Service Quality. [10] The Critical-Success-Factors for the Six Sigma and the Service Industries. [10] The Critical-to-Quality-Factors for the Six Sigma and the Service Industries. [10] The Critical-to-Cost-Factors for the Six Sigma and the Service Industries. [10] The advantages and the Disadvantages found for the Indian Industries and the Industries Abroad. [10] The Benefits of the Six Sigma for the Six Sigma Industries and the Service Industries. [10] The basic elements of the Six Sigma. [10] The differences between the Service Industries and the Manufacturing Industries. [11] The factors for the Six Sigma Management. [10] The Application(S) of the Six Sigma. [7],[9] The Characteristic(S) of the Six Sigma. [7] The Challenges for the Service Industries as well as for the Six Sigma Industries. [5] The tools and the techniques required for the DMAIC process. [1] The potential area where the Six Sigma could be employed. [1] The reasons for the Six Sigma into the Service Organizations. [2] The problems , outcomes and benefits of the six sigmas in service organizations. [2] The Service Quality Gaps. [4] The contributions of the Six Sigma to the Quality.

5. Results and Discussions

For the strategy development the relevant questions could be framed with: Who ? How ? How Far ? What ? How Much ?

Remember the "MASTER": M-Motivate (Mind); A-Acquire (Knowledge/Information); S-Search (Technology); T-Trigger (Mind Generate/Retrieve); E-Establish (learner-Rapport); R-Review. MASTER- "THE CHOICES (in a research work) ARE THE HINGES OF THE DESTINY "

Meta-Analysis is for the "META-DATA", Remember the "HEARD": H-Honest ; E-Explicit ; A-Authentic ; R-Respectful ; D-Direct HEARD –"A Conclusive Research is like a MEDICINE of KNOWLEDGE "

Controlled Research: Any research that employs adequate procedures to rule out the competing hypothesis.

Process of Enquiry: A dynamic process focusing on the formulation of the Research Questions /Statements seeking the Answers / Solutions through the Controlled Observations and Studies. The benefits associated with the On-line approach were: M-Mathematical (Precision & Accuracy); O-Objectivity; V-Verifiability; I-Impartiality; E- Expertness.

6. Conclusions

6.1 Online Approach

Main Survey [15 KW's + 07 Kw's]

Customer Expectations: Modern Looking Equipment, Appealing physical facilities, Employees neatness, Appealing materials, Problem solving, Promises, Error free records, Prompt services,

customer's help, Employees confident behavior, Safe transactions, Courteous employees, Individual attention, Customer's best interest and Customer's specific needs.

Customer Perceptions: Modern looking eqpts, Appealing physical facilities, Appealing materials, problem solving, time bound services, Employees knowledge and Personal attention.

6.2 Supportive Survey-I

The results summarization calls to focus on the [12 KW's] for the CRM (based upon SA's)Needs, Updated information, Complaints-resolution, Customer-Satisfaction trg., Customer-experience support, Team-work & fellowship, Company-Values & Company-Goals, Working-environment, Customer-delight trg., Customers-relationship, New-Customers & Old-Customers, Customers-visits, Service-Excellence,

6.3 Supportive Survey-Ii

The results summarization calls to focus on the below mentioned for the TQM (based upon SA's):

- Planning Initiative-[08 KW's]: Data-review, process-review, business issues, short-term goals, long-term objectives, plan implementation accountability, implementation measures, review process and stakeholders' feedback.

- Leadership & Commitment-[02 KW's]:voice and KPI's.

- Infrastructure-[02 KW's]: Team-Implementation and individuals trg

- Focus & Roll Out-[07 KW's]: Short-term goals , long-term roll-outs ,customer-supplier involvement, employees' empowerment, accountable personalities and critically lined objectives

- Measurement (Testing & Reporting Systems) - [06 KW's]: Strategies, customer satisfaction ,process improvement, organization improvement, decision-based data and world class benchmarking .

- Education-[10 KW's]: Employee knowledge & skills audit trg, audit trg strategies, need-based trg ,effective curriculum, sources identification, work-based trg, facilitation-based trg, world-class trg and benchmarking

- Resources-[08 KW's]: Needs, facilities & eqpt, time-based needs, customer needs, expertise-based ongoing trg, quality incorporated annual planning & budgeting, supplier's commitment and management inputs.

- Information & Communication-[08 KW's]: Integrated information, comm tools audit, process ownership, comm. strategy, comm.integrations ,comm.benchmarking, systematic periodic updates and customer suppliers.

- Systems Alignment-[07 KW's]: Strategy, appraisals & promotions, ethics, health & safety, marketing & comm., trg -org. processes, employee needs, job-descriptions and customer satisfactions.

- Customer Alignment –[08 KW's]: Strategy, expectations, satisfaction measures, partner-relationships, new products & services, continuous feedback, customer future needs and benchmarking.

- Supplier Alignment-[07 KW's]: Key supplier identification strategy, satisfaction measures, vendor certifications, measures, supplier future reqts.,supplier trg.and supplier feedback.

- Public Responsibility (Linkages)-[09 KW's]: Quality ethics, quality & improvement, quality & environment, quality with safety, marketing & comm., visits, speeches & discussions, health & safety, locations & dept. and public responsibility efforts.

6.4 Supportive Survey-III

The results summarization calls to focus on [15 KW's] for the Customer Expectations of the Service Centers and [10 KW's] for the Customer Perceptions of the Service Centers.

- Customer Expectations –[17 KW's]: up-to-date eqpt., physical facilities, well-dress & neatness, physical facilities & services, promises, sympathy, dependence, time-boundless, record keeping, customer-employee trust, safe transactions, politeness, adequate support, individual attention, personal attention, needs attention and convenient operating hours.

- Customer Perceptions –[13 LW's]: up-to-date eqpt., physical facilities, well-dress & neatness, physical facilities & services, promises, sympathy, dependence, time-boundness, record keeping, customer-employee trust, safe transactions, politeness and adequate support.

7. Meta – Analysis Approach

7.1 Why Six Sigma for the Service Quality ?

- Resolution 1.1: The results of the 99% error free are found in-significant for the real world problems.

- Resolution 1.2: The goals of the six sigma's include the problems-discovery, errors-reduction, Reworks-reduction, Services-expansion, Ultimate problem identification, Qualitative-outputs, Gaps-uncover age and competitive-prices. [08 KW's]

- Resolution 1.3: According to Gerald Barber et al , Reduction In-Costs, process variation, cycle times, customer complaints, scrap rate, delivery time, checking, inspection and scrap rates. Increase In- Overseas sales, new product development, employee-quality attitude, employee-problem solving, profitability and productivity.[15 KW's]

7.2 RQ2.-What are the tools and techniques for the effective implementation of the Six Sigma in the Service Organization(S) ?

- Resolution 2.1: According to dr. Lesley White et al , the tools and the techniques include the brain-storming, control charts, root cause analysis, affinity diagrams, run charts, pareto analysis, scatter plot, process capability analysis, histogram, quality function deployment and regression analysis. And the other include the matrix analysis, normal probability plot, process mapping, analysis of the variance, COPQ, DOE, SIPOC model and taguchi method. [18 KW's]

- Resolution 2.2: The six sigma benefits include Reduction In-Customer Complaints, process variations, costs, scrap rate, checking, inspection, delivery time and cycle time. Increase In Productivity, profitability, company image , employee attitudes, problem solving attitudes , employee Morales, new product development, overseas sales and entry into the new markets. [15 KW's]

- Resolution 2.3: The critical success factors include the linkages to business strategy, customers, project management skills, suppliers and methodology. And the others include the culture change, project selection prioritization, training & education and project tracking & reviews. [09 KW's]

- Resolution 2.4: The application challenges include customers satisfactions, customer needs, unpredictable volumes, unpredictable tasks, qualified information's, quality indicators, quality factors and quality programs. [08 KW's]

- Resolution 2.5: The barriers include the lack of the knowledge, lack of the resources, lack of the education, poor project selections, cultural barriers, insufficient inter-departmental comm., leadership support, process parameters and commitments. [09 KW's]

- Resolution 2.6 The problem causers include high customers satisfactions , customer needs , unpredictable volumes, unpredictable tasks, qualified information's, quality indicators, quality factors and quality programs.[08 KW's]

- Resolution 2.7 The problem solvers include on selecting the correct measures, understanding the performance processes, defining & ranking the defects, training & education, strong leadership, top mgt. commitment, selection of the projects, project mgt. skills, alignment with the corporate business objectives and attaching the success to the financial benefits. [10KW's]

7.3 RQ3. How to extend the Service Quality to the Six Sigma Service Quality ?

- Resolution 3.1:The extension could be very well carried out by conducting the On-Line Surveys based upon the Likert's scale as was carried out in this work. The Main survey was carried-out with the AD-AA (Absolutely Disagree-Absolutely Agree) and the Supportive survey was carried-out with the SD-SA (Strongly Disagree-Strongly Agree).

7.4 RQ4. What are the research methodologies and the techniques for extending the same ?

- Resolution 4.1: Output dictate Processes; Processes dictate performance-variation; Performance Variation dictate Six Sigma Opportunity.

- Resolution 4.2: Six Sigma is inversely proportional to the Defects; The vertical consumer actions are directly proportional to the Horizontal organizational actions.

- Resolution 4.3: Customization is inversely proportional to the Organization; Customization is directly proportional to the Consumers/Customers/ Receivers.

7.5 RQ5. Are the results of the Questionnaire based on the manual collection of the data and the online collection of the data proves to be the same or the data collected through the on-line is more superior than the manual data collection ?

- Resolution 5.1: Always the continuous processes out-perform the non-continuous processes.

- Resolution 5.2: The processes with the feedback mechanism are more superior than the processes with the no-feedback mechanism.

7.6 RQ6. How to extend the work to the Automobile Service Center ?

- Resolution 6.1: The essential strategies to be implemented include Improvement In-customer satisfaction, shareholder values, cost based results, tools, 99.999 % perfections, productivity, profitability and different theories. [08 KW's] Reduction In-Variability, input, time, money, resources and variabilities. [06 KW's]

- Resolution 6.2 : Implementation of the six sigma belt system namely, the white belt, yellow belt, green belt, black belt, master black belt, champion and executive leadership.

- Resolution 6.3: The roles and the responsibilities are of the belts should be clearly defined with the accountability.

- Resolution 6.4: Any of the six sigma designs could be adopted namely, DMAIC, DMADV, DDMAIC, DDMODV, DMADOV, DMEDI, DCCDI, DMAIDV.

- Resolution 6.5: The voice of the customer could be compared with the historical research methods, focus groups , interviews, councils , records of the complaints , testimonials , customer records , active customers ,surveys, observations , warranty records , lost & target customers and the call centers .

7.7 What are the needs and the necessitates of a paperless Automobile Service Center ?

Resolution 7.1 Both the qualitative and the quantitative analysis would be essential for a customer service center before the necessitates could be listed .

Exploration of the Gaps .(Motivation) ; Preparation of the Suitable Questionnaire .

(Acquire the tool) ; Launching of the Questionnaire .

(Search for the solutions) ; Responses –Collection

 (Result – Summary).(Trigger the solutions) ; Exploratory –Data-Analysis(Auto-Generated).

(Retrieve the results) ; Retrieval – Generation of New Knowledge .

Additional Information : Knowledge generated from the Research papers (pl refer to : References-II)

Sl No.: 01- Gap: Competencies-Procedure for gap-Removal : Training and Development

Sl No.: 02-Gap: Ergonomic Product Design and Development-Procedure for gap-Removal : Designing using the Software Tools

Sl No.: 03- Gap: Teaching Deficiencies-Procedure for gap-Removal : Travel and Tourism

Sl No.: 04-Gap: Redesigning of the Service Centers-Procedure for gap-Removal : Free and Open Source Software's with the comparative studies on the modern and the traditional tools

Sl No.: 05- Gap: Results -Procedure for gap-Removal : Brainstorming as a tool for the benchmarking

Sl No.:06- Gap: Action Research- Procedure for gap-Removal : Digitization

Sl No.: 07-Gap: Analysis of the Service Quality-Procedure for gap-Removal :Using the Servqual and the Importance Analysis

Sl No. : 08- Gap : Entrepreneurship- Procedure for the gap-Removal : On-line tools

Sl No.: 09- Gap: CRM- Procedure for gap-Removal : New Approach with the advanced tools

Sl No.: 10-Gap: Redesigning of the maintenance –service-operations-Procedure for gap-Removal : Advanced Methodology

Sl No.: 11- Gap: Alternative Approaches- Procedure for gap-Removal : Multi-Disciplinary Tools

Sl No.: 12- Gap: Engineering / Technology Problems-Procedure for gap-Removal : New approach with the updated tools

Sl No.: 13- Gap: Analysis-Procedure for gap-Removal : Comparative study with the traditional and the modern tools

Sl No.: 14-Gap: Bonding of the Six Sigma with the Service Quality-Procedure for gap-Removal : Literary study approach

Sl No.: 15- Gap: Management of the Engineering projects-Procedure for gap-Removal :A review on the Online approaches

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