Technical Article

Checking the Quality of Weld Inspection Using SERVQUAL Model and Importance-Performance Analysis

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Abstract

The existence of various industries such as energy, propulsion, construction, machinery, military and power plants have led Iran to become one of the major users of weld science and technology and other joining methods in the Middle East. The economic significance of welding is to a degree that more than 50% of the gross industrial product of the various countries and 42% of the Iran economy are said to be related to welding. The quality of the inspection services will be effective in increase the safety of the structures and reduce the impact of disasters and costs. The goal of this study is to identify the effective components in the quality of the welding inspection and ultimately provide the possibility of improving the performance of welding inspection companies in the country. This study is carried out as a descriptive and sectional study from employers of a technical inspection company using a 25-items questionnaire with standardized 5-point Likert scale and adjusted SERVQUAL in six dimensions of competence, reliability, accountability, service guarantee, security / secrecy and independence/ Impartiality. Data analysis was done by t-paired test using SPSS software. Based on the quality of the welding inspection services, the security / secrecy dimension has the highest gap and independence has the lowest gap and competence dimension has the highest quality. According to the importance –performance analysis, the dimensions of responsiveness power and guarantee of the evaluated services of company are located in the first area of importance-performance matrix. The results can be effective in assessing the competitive position of the organization and identifying opportunities for improving the inspection companies.

Keywords: Quality, SERVQUAL Model, Importance-Performance Analysis.

1. Introduction

Welding is one of the most important and most sensitive production processes used in manufacturing equipment parts, industrial machinery, steel structure, pressure vessels, etc. The welding inspector is required to ensure the quality of welding products which is necessary in design and implementation of inspection processes in accordance with international guidelines. Ensuring from quality level will be effective in reducing incidents, increasing safety, reducing costs and increasing customer satisfaction. Analysis of quality gap model and SERVQUAL scale can provide managers with suitable tools to diagnose service quality defects systematically [1]. This study attempts to measure the quality of welding inspection services in order to have a properly understand of the services of technical that inspection company must provide and whether services are appropriate to customers' expectations and the extent of the difference between them. An essential element in quality assurance is assessing the current quality level to develop a suitable strategy for upgrading to the desired level. In this process, identifying the improvement priorities for the optimal allocation of resources is essential to focus on corrective actions. In this regard, the importance-performance analysis model is well-suited. The increasing importance of the IPA model in identifying the problem and the identification of the system's weaknesses and strengths in identifying priorities and adopting improvement strategies, has led the model to be used in various research and operational fields [2]. Several models of studies in the field of quality guarantee services are as follows:
Fallah et al [3]. Investigated the quality of radiographic images in referral hospitals in Sari. In this sectional study, the quality of more than 1200 radiographic images (radiographs) from common tests for adults in two referral hospitals of Sari was evaluated based on the European Commission's quality guidelines and the reference book of the Merrill Atlas. This assessment was carried out in two sections: Anatomical Indicators and Radiographic Indicators.
Khajeh [4] assessed the use of the SERVQUAL model and the fuzzy logic of educational services at Azad University of Qom. Based on the findings of

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this study, the highest quality gap in the dimensions of the factors was significant. Ismaili and et al [5]. Attempted to assess the quality of rehabilitation services using importance-performance analysis in selected rehabilitation centers in Tehran. In order to evaluate the quality of the services of the center, a quality of service questionnaire was used and the data were analyzed using SPSS software. According to the results, all dimensions of the quality of services in the selected centers in the first area of the matrix were importance-performance and at the optimal level. Ziviyar et al [6].
have examined the factors affecting customer satisfaction by using the SERVQUAL model. In this research, a questionnaire was used to assess the quality of banking services and satisfaction of customers in Esfahan. The findings of this research indicate that four dimensions of reliability, accountability, guarantee and empathy on customer satisfaction have had a significant impact on the quality of service of Mellat banks in Esfahan province, but the apparent and physical dimensions of the service have no effect on customer satisfaction with the quality of services. Bahreini et al[7], assessed the quality of services provided by the Islamic Azad University of the Ali Abad Katoul from five different dimensions by using the SERVQUAL model, and based on the QFD technique, they obtained a correlation analysis of the characteristics of the services according to the student's requirements. The gaps from bottom to top were tangible factors, reliability, empathy, guarantee and accountability. Sabetghadam et al [8]., have met the technical inspection requirements according to ISO 3834[9-15] of welding quality management standards and their role in improving product quality and reducing welding issues in their research.
Establishment of the quality system EN729 [16-19] /ISO3834 as the foundation of management in improving the quality of the weld industry is recommended since the presence and activity of international companies in the IRAN, especially in the huge projects of oil, gas and petrochemicals, become the reasons for sending the personnel to provide services according to internationally accepted standards by welding industry activists.
Nowadays, quality and technical inspection, and most importantly, the selection of proper inspection, in particular welding inspection, to ensure that damage is inadequate and other effective factors in the sudden failure in parts and also in structures in the industry is very important. Assessing the quality of welding inspection by identifying and quantifying gap in different dimensions of services in meeting customer expectations will make the organization having better prioritization for the development and advancement of its future technical inspection services. The evaluation of the properties and the quality of welded joints, the evaluation of the suitability of the welded structure for the intended purpose and the customer's compliance and the quality required by the product is one of the most important tasks of the welding inspector.

2. Materials and Methods

The present study is a descriptive and survey based on the purpose of the applied research and data collection method. The statistical society is a technical inspection company. In this study, the views of the employers of this company have been used. This descriptive and sectional study was carried out on employers of a technical inspection company using a 25-item questionnaire with 5-point Likert scale standardized and adjusted of SERVQUAL in six dimensions of competence, reliability, accountability, service guarantee, security / secrecy and independence. SPSS software was used to analyze the data. SERVQUAL is one of the most used tools and one of the techniques for assessing service quality and can help in challenging existing service issues. Importance-performance analysis by assessing customer satisfaction and its findings provides valuable information for managers to take into account the expectations of customers for improving the quality of services.
By determining the average of importance and average of perceptions in each dimension, a two-dimensional matrix including x axes (importance) and y axis (performance) was drawn. The analyzes are based on the position of dimensions in the regions of this matrix. Processes with high-importance -poor performance is vulnerable and should have priority in improving. The processes with high importance and high-performance are maintained as a competitive advantage. Low-importance and performance processes do not require any additional investment, and processes with low-importance and high-performance should be eliminated or exploited appropriately [9].

3. Results and Discussion

Of the 10 samples, 80% were male and 20% were female and the highest density was for men.80% was in the age of 30-45and 20% in the age of 46-60 years. The average expectations and perceptions scores are presented in Table (1). The quality gap is the difference between expectations of perception.
Based on the findings, the expectations of the inspectors in terms of security / secrecy and independence are higher than the current situation. Based on the importance and performance of the organization under study (Table2), four areas are recognized as follows :
- Indifferent area: competence and independence
- Waste area: security / secrecy
- Area of focus or weakness: reliability
- Acceptable Area: Accountability and Service

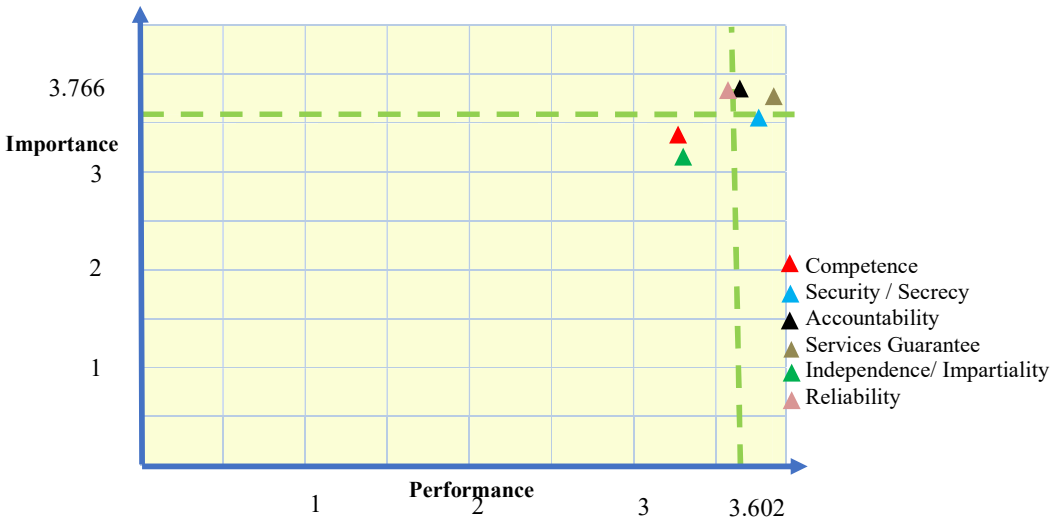

Fig. 1. Importance-Performance Analysis in studied Technical and Engineering Company.

Table. 1. Average expectations and perceptions scores and service quality gaps in each dimensions of the quality of welding inspection services.

Dimensions of Quality	Perception	Expectations	Quality Gap
Competence	3.575±0.60150	3.5±0.71686	0.75±0.77325
Security / Secrecy	3.78±0.49396	3.82±0.27406	-0.4±0.45019
Accountability	4.02±0.42635	3.74±0.31340	0.28±0.32931
Services Guarantee	4.04±0.45019	3.92±0.49171	0.12±0.28597
Independence/ Impartiality	3.4±0.73786	3.5±0.74536	0.1±0.80966-
Reliability	4.125±0.51707	3.7±0.64334	0.425±0.4572

Table. 2. Value of the importance and performance of the qualitative characteristics of studied technical and engineering company using geometric mean.

Dimensions of Quality	Importance	Performance
Competence	3.493	3.356
Security / Secrecy	3.73	3.753
Accountability	3.984	3.654
Services Guarantee	4.006	3.8633
Independence/ Impartiality	3.291	3.40
Reliability	4.094	3.59

Guarantee Fig. 1. shows the position of the dimensions of service quality in the studied technical and engineering company.

As you can see, the dimension of the quality of competence and independence has the low priority and are the next dimension of reliability that should be focused on them. Security / secrecy dimension in the area of waste of resources and the dimensions of accountability and service provision are located in the first area of matrix of important and performance which indicates that the level of importance and performance of the dimensions of accountability and service guarantee are high and only users of these dimensions services are already satisfied. The main gap in the model of the importance-performance analysis is in the area of waste and focus is on reliability and security / secrecy dimensions. The organization's strategy should be able to take advantage of the resources allocated to security/ secrecy dimension more effectively in other parts. In the dimensions of accountability and service quality which represents the strength of the organization, the continuation of the current strategy is proposed.

The findings also indicate that employers care about reliability. But they are not satisfied with the organization's performance in this dimension which should be focused on it.

4. Conclusions

1. Due to the importance of welding inspections in the country's economy and industry, quality in this industry has a double impact.
2. Ensuring the quality of the welding which is result of the welding inspection service, requires the adequacy of the various departments involved in the

production including raw materials of equipment, manpower, standards, production processes, management, etc. and establishing a standard of welding quality management ISO 3834 will be very effective. Although quality is defined according to the customer's opinion, it is evident that compliance with welding inspection standards is a requirement that is not distorted by the customer's request.

3. Minimum quality in welding inspection is a desirable and acceptable standard of society and has characteristics that prevent harm to society and maximize of the quality is to the extent that the customer pays for it.

4. Deploying a customer satisfaction system ISO 10002 is also recommended to enhance the organization's ability in appropriate respond and access of complainants to a free process and creating a customer-centric approach.

5. In this study, the quality of technical inspection services in six dimensions of the SERVQUAL model was investigated and finally, the importance-performance analysis was performed.

6. Based on the findings, the expectations of welding inspector in terms of security / secrecy and independence are higher than the current situation.

7. The highest expectations are in terms of independence and security / secrecy, and the least on competence.

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