The Impact of Applying Deming's Model on Institutional Performance in Air Navigation: A Study on Quality and Customer Satisfaction

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Abstract

This study investigates the influence of applying Deming's model on the institutional performance of air navigation, with a specific focus on the concept of quality and its alignment with the present and future needs and expectations of customers. The research was conducted within the Department of Air Traffic in Kuwait, specifically within the Air Navigation Services Company, utilizing a sample of 206 employees. To achieve its objectives, the researcher developed a questionnaire as the primary research tool, designed to assess the relationship between the application of the Deming model and institutional performance. The study reveals several significant findings. Firstly, there exists a statistically significant relationship at a significance level of $\alpha \leq 0.05$ between the practices of the Deming model and the promotion of administrative innovation within the Air Navigation Company in Kuwait. Additionally, the research demonstrates a statistically significant effect at the $\alpha \leq 0.05$ level of Deming model practices on internal institutional innovation. Moreover, a similar statistically significant effect at $\alpha \leq 0.05$ was observed for Deming Model Management practices on creating value within the Air Navigation Company in Kuwait. Among the key recommendations arising from this study is the importance of assessing the quality of air navigation services from the perspective of customers, particularly in light of the application of the Deming model. Understanding customer perceptions and expectations can play a pivotal role in further enhancing the quality and effectiveness of air navigation services. This research contributes valuable insights into the application of Deming's model in the context of air navigation, shedding light on its potential benefits in terms of innovation, quality, and value creation.

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Introduction

The concept of total quality and the Deming model represent contemporary management paradigms grounded in a cohesive framework of principles and ideas that hold the promise of optimizing organizational performance, bolstering productivity, augmenting profitability, and burnishing reputations on both domestic and global fronts (Douglas & Fredendall, 2004). In an era marked by a proliferation of companies and institutions spanning various industries and sectors, it has become imperative to diligently cultivate the fundamental elements and quality systems that can secure international acclaim, aligning with universally accepted quality standards (Gupta et al., 2005). In this context, enterprises must chart a course toward the inexorable tide of globalization, where only those distinguished by the hallmark of quality in their products and services can thrive and endure (Al Tai, 2013). True differentiation in the competitive arena can only be attained when an unwavering commitment to quality permeates every facet of an organization's operations—be it inputs, outputs, or processes. At its core, the Deming model stands as a cornerstone for continual development and the relentless pursuit of performance improvement (Spencer, 1994). It serves as the guiding compass for institutions aspiring to a singular and paramount objective: attaining customer satisfaction. Grounded in empirical evidence and fostering an environment that nurtures individuals capable of working with unwavering zeal, exceptional competence, and unswerving dedication across all spheres of endeavor (Prajogo, 2006). The focal point of this research delves into the realm of institutional performance, a sphere of paramount significance given its pivotal role in fueling both economic and societal development within Kuwait. In the fabric of Kuwait's political, economic, and social tapestry, the pursuit of prosperity for its people stands as the ultimate lodestar. However, a pressing issue arises as many institutions and non-governmental organizations in Kuwait have regrettably overlooked the application of the Deming model. In some instances, they remain blissfully unaware of the very concept of total quality, thereby casting a long shadow over their operational efficacy. This oversight reverberates with profound consequences, especially affecting foreign non-governmental organizations. The tangible repercussions are manifest in their inability to meet the expectations and desires of their clientele and the beneficiaries of their services (Nasser, 2004). The exigency of the hour compels these institutions to undertake a critical self-assessment, diligently appraising their services and embarking on a journey of enhancement. It is only through the augmentation of their institutional performance that they can effectively serve as catalysts for socio-economic betterment, drawing strength from the quality of services they deliver. Consequently, our research endeavors to answer a fundamental query: What is the nexus between the implementation of the Deming model and the institutional performance of the Kuwait Air Navigation Company?

The importance of this research is manifold. Firstly, it sheds an illuminating spotlight on the elemental bedrock of institutional performance, thereby benefiting society at large. Secondly, it is indispensable for the success and flourishing of institutions. By dissecting the Deming model, we aim to contribute to the development and comprehensive evaluation of institutional performance. This empowerment will enable institutions to better serve their clients while safeguarding the interests of their stakeholders, fostering the well-being and prosperity of the wider society (Nasser, 2004). Thirdly, this study offers a systematic model that can be readily adopted by concerned institutions and non-governmental organizations to enhance and elevate their performance. By elucidating the impact of implementing total quality management principles across all facets of their operations, our research equips these entities with a roadmap to success. Lastly, this study augments the corpus of knowledge in the field of total quality management, enriching academic libraries with a comprehensive applied study in this specialized domain. With a comprehensive set of objectives, our research endeavor aims

to discern the profound impact of applying the Deming model on the institutional performance of air navigation. We have stratified our investigation into several sub-objectives: firstly, we endeavor to ascertain the present state of Deming model implementation and its influence on institutional performance. Secondly, we seek to identify the benchmarks for institutional performance as endorsed by organizations and corporations. Lastly, we endeavor to delve into the application of the Deming model with respect to institutional performance indicators. As we navigate through the vast landscape of total quality management and the Deming model, it becomes apparent that a diverse tapestry of research endeavors has contributed significantly to our understanding of these contemporary management paradigms. These studies traverse a wide spectrum of applications and implications, further enriching our comprehension of TQM principles in diverse contexts. Nailufar, Ekosiswoyo, and Mulyono's analysis (2019) offers insights into the implementation of TQM in clothing sewing training, emphasizing its resonance in the domain of education and training. Meanwhile, Douglas and Fredendall's exploration (2004) scrutinizes the Deming management model, probing its effectiveness in the realm of service industries. Further diversifying our perspective, Es-haghi and Sepehr's study (2016) investigates the impact of training interventions, utilizing the Deming model to reduce unsafe behaviors. In another empirical context, Elhuni and Ahmad (2014) conduct a rigorous examination of total quality elements based on the Deming management model within the Libyan oil industry, contributing insights that resonate across various industrial sectors. Muhammad Din and colleagues' comparative analysis (2021) casts a wider net, comparing excellence models across American, European, and Japanese contexts, offering a rich mosaic of insights. Expanding our horizons, Saad, Noor, and Sharofiddin's theoretical framework (2020) probes the effects of applying Total Quality Management within Saudi Arabia's societal framework, drawing inspiration from Deming's Model. Turning our gaze toward the academic realm, Padro's exploration (2009) offers a thoughtful appraisal of the applicability of Deming's system of profound knowledge within the context of universities. Our journey continues with Kiraz and Açikgöz's innovative fuzzy-logic-based approach (2021) to the EFQM model, opening new vistas for performance enhancement. Finally, Dill's comprehensive cross-national analysis (1995) provides a global panorama, dissecting quality assurance policies in higher education through.

Literature Review
Principles of Total Quality

In a world marked by intense international and local competition, the culture of quality has gained prominence. This prominence has been especially evident since the inception of the World Trade Organization and the subsequent global convergence toward it. Science, serving as both its protector and regulator of economic relations among nations, plays a pivotal role. Notably, in 1976, the International Organization for Standardization (ISO) introduced the ISO 9000 series, focusing on quality management and assurance. These standards have since provided a framework for developing specifications and quality systems. These specifications aim to ensure that products or services not only meet actual requirements and needs but are also free from defects arising from technical specifications or organizational structural errors (Başaran, 2016). Quality has become a crucial competitive tool in the contemporary landscape. In an era of globalization and the growing influence of multinational corporations, no organization can effectively confront the challenges posed by globalization without embracing quality as a core priority (Blanco, 2010). This emphasis on quality gave rise to the concept of Total Quality Management (TQM). Total Quality Management (TQM) prioritizes a set of fundamental principles. First, it embraces a broader understanding of quality, extending beyond product quality to encompass various facets of an organization's operations. Second, TQM fosters inclusive participation, encouraging every member within the organization to

actively contribute to the ongoing enhancement of quality. Third, it highlights the pivotal role of leadership, with a particular emphasis on strong and pragmatic leadership starting from senior management down the organizational hierarchy. Finally, TQM places a central focus on customers, aiming not just to meet but to consistently exceed their expectations and satisfaction levels (Kristensen, 2010). These principles collectively underscore the holistic and customer-centric approach that defines TQM as a comprehensive management philosophy.

Definition of Quality in Context
The term "quality," etymologically derived from the Latin word "Qualitas," originally referred to the inherent nature of a person or the characteristics of historical monuments. These characteristics were associated with the precision and perfection of statues, castles, and palaces, often used for boasting or protection. Over time, the concept of quality evolved with the emergence of management science and the industrial revolution. The modern understanding of quality encompasses multifaceted dimensions, taking into account the complexities of today's competitive landscape (Mohsen, 2016). Numerous definitions of quality exist. For instance, the European Organization for Quality Control defines it as "a set of characteristics that characterize a specific product and determine its capabilities to meet the needs and requirements of the consumer" (Sahib and Sultan, 2004). Quality is also viewed as a measure of customer satisfaction and pertains to the alignment of product or service characteristics with both its intended purpose and consumer needs (Blanco, 2010).

Dimensions of Service Quality
Quality, whether in the context of a product or service, is a multi-dimensional concept that plays a crucial role in determining customer satisfaction and its alignment with their needs. In the domain of marketing services, researchers have identified various dimensions or components that collectively contribute to the overall perception of service quality. Among these dimensions, three primary aspects stand out. First, there is the dimension of Physical Quality, which is closely linked to the service environment and the tangible elements that customers encounter when interacting with the service. Second, Organizational Quality comes into play, encompassing the image projected by the service organization and the overall impression it leaves on customers. Lastly, Interactive Quality, perhaps one of the most critical dimensions, arises from the interactions that take place between customers and the organization's workforce, shaping their perception of the service (Başaran, 2016; Prajogo, 2006). These dimensions collectively constitute the intricate tapestry of service quality, influencing customer satisfaction and the success of service-oriented businesses.

Historical Development of the Quality Concept
While the concept of quality has ancient roots, it did not formally emerge as a management function until relatively recently. Modern management now recognizes quality as an equal function alongside others such as procurement, engineering, and marketing research. This recognition warrants the attention of senior management within institutions. The historical evolution of the quality concept can be segmented into three key stages, each representing a significant shift in how quality was perceived and managed. The first stage, Testing, was characterized by the reliance on international British standards to determine quality. Testing procedures involved measurements, calibration, and comparisons with predefined requirements to assess compliance. Quality verification in this phase aimed to ensure that products or services met specified standards before reaching customers. However, it primarily centered on product inspection and lacked mechanisms to prevent errors or defects (Başaran, 2016). The second stage, Quality Control, marked a notable advancement. It encompassed a range of activities and statistical methods aimed at enhancing the quality of goods or services.

Quality control extended beyond mere inspection and encompassed efforts to ensure that product design, production processes, and post-production activities aligned with established specifications (Quality, 2006). The third and transformative stage, Quality Assurance, introduced the concept of Total Quality Control. This systematic approach sought to integrate the efforts of all organizational parties and groups within an entity. Its overarching objective was to build, maintain, and continually improve quality. Importantly, Total Quality Control aimed to achieve these outcomes in a way that allowed for economical production and efficient service evaluation, all while ensuring complete customer satisfaction (Callejo, 2012). This stage marked a paradigm shift in how organizations approached and embraced quality management.

Institutional Performance Appraisal

The measurement and evaluation of performance have become paramount concerns for organizations and institutions. These assessments serve diverse purposes and employ varied methodologies. Notably, the focus has shifted from evaluating organizational outputs to examining the processes themselves and paying attention to standards beyond quantitative and numerical indicators (Tawfiq, 2014). Given the contemporary pressures and challenges faced by organizations, it has become evident that systems and indicators for evaluating institutional performance have assumed vital importance. Institutional performance is seen as an integrated system, influenced by both internal and external environmental factors (Callejo, 2012).

Concept and Evaluation of Institutional Performance

In understanding institutional performance appraisal, it is imperative to define its constituent elements. Institutional performance is characterized by its integration with the organization's internal and external environment. It encompasses three core dimensions:

Individual Performance: This dimension relates to the performance of individuals within their specialized organizational units.

Organizational Unit Performance: Within the broader framework of the institution's policies, this dimension considers the performance of organizational units.

Institutional Performance: This broader dimension evaluates the institution's performance within its economic, social, and cultural context. Notably, institutional performance is distinct from individual and unit performance but is influenced by both, along with external environmental factors (Prajogo, 2006).

Objectives of Institutional Performance Appraisal

Institutions and companies pursue several objectives through the implementation of institutional performance evaluation processes. Key objectives include:

Verification: Confirming the local units' ability to achieve the institution's objectives by assessing the variance between planned and actual outcomes. This process identifies organizational strengths and weaknesses (Callejo, 2012).

Efficiency: Evaluating the efficient utilization of resources, particularly human and financial resources, and minimizing waste to maintain service quality (Callejo, 2012).

Performance Improvement: Providing insights to help managers align performance with specific goals. Evaluation models offer foundations for enhancing institutional performance levels.

Development: Contributing to the development of organizational units by diagnosing and addressing departmental problems and obstacles. This is accomplished through the application of specific principles and standards (Chin, 2010).

Competition: Fostering a competitive atmosphere among various institution departments through reinforcement of reward and punishment mechanisms.

Satisfaction: Achieving higher levels of satisfaction among customers and employees by continuously improving services and products. This entails the establishment of criteria for measuring satisfaction with provided services (Callejo, 2012). In conclusion, this literature review has illuminated the evolution of quality management principles, the dimensions of service quality, the historical development of quality management, and the significance of institutional performance appraisal. These concepts serve as a foundational framework for understanding the potential impact of Deming's model application on the institutional performance of the Kuwait Air Navigation Company.

Research Hypotheses

To fulfill the study's objectives, the following hypotheses will be tested:

Main Hypothesis 1: There is a statistically significant relationship, with a significance level of $\alpha \leq 0.05$, between the application of Deming's model and the promotion of administrative innovation within the air navigation services company.

Main Hypothesis 2: There is a statistically significant effect, with a significance level of $\alpha \leq 0.05$, resulting from the practices of implementing the Deming model within the air navigation services company. This main hypothesis stems from the following sub-hypotheses:

- **Sub-Hypothesis 1:** There is a statistically significant effect, at a significance level of $\alpha \leq 0.05$, for total quality management practices on internal institutional innovation.
- **Sub-Hypothesis 2:** There is a statistically significant effect, at a significance level of $\alpha \leq 0.05$, for total quality management practices on value creation within the air navigation services company.

Study Methodology:

Study Design: This research employed a survey-based approach to investigate the impact of applying Deming's model on institutional performance within the Air Navigation Services Company in Kuwait.

Participants: The study population consisted of 206 employees working in the Air Traffic Department of the Air Navigation Services Company. A purposive sampling method was utilized to select participants for this study. The participants were chosen based on their relevance to the research objectives.

Data Collection Instrument: To collect data and address the study's objectives, a questionnaire was developed. The questionnaire was designed to evaluate the opinions of participants regarding the application of Deming's model and its impact on various aspects of institutional performance, including administrative innovation, internal institutional innovation, and value creation. The questionnaire was structured based on the formulated hypotheses and research objectives, ensuring that it effectively captured the relevant dimensions of Deming's model and its influence.

Questionnaire Design: The questionnaire was designed in collaboration with the Air Navigation Services Company in Kuwait. It comprised two main sections:

1. **Demographic Information:** This section collected personal data about the respondents, including information on sex, age, and academic qualifications. These demographic characteristics were included to analyze potential correlations between respondents' backgrounds and their opinions.

2. **Likert-Scale Questions:** The core of the questionnaire consisted of a series of Likert-scale questions. Respondents were asked to rate their opinions and perceptions on a five-point scale, which provided flexibility in assessing the relative importance and impact of each variable. These Likert-scale questions were directly aligned with the study's hypotheses and objectives.

Data Collection Procedure: The data collection process involved the distribution of the questionnaire to the selected participants within the Air Traffic Department. Researchers administered the questionnaire in a structured manner, ensuring consistency and reliability in responses. Clear and concise instructions were provided to the participants, guiding them on how to complete the questionnaire accurately and honestly.

Data Analysis: Collected data underwent a comprehensive statistical analysis using software such as SPSS (Statistical Package for the Social Sciences). The analysis included descriptive statistics, including frequencies, percentages, means, and standard deviations, to summarize the data. Furthermore, inferential statistics, such as correlation analysis and regression analysis, were employed to examine relationships between variables and to test the study's hypotheses.

Ethical Considerations: Ethical considerations were rigorously observed throughout the research process. Informed consent was obtained from all participants, ensuring their full understanding of the study's purpose, the use of their responses, and their right to withdraw from participation without facing any consequences. To protect the privacy and confidentiality of participants, their responses remained anonymous.

Results and Discussion

After laying the theoretical foundation for this study, which provides the context and framework for our specific investigation, we turn to field studies as a pivotal stage in the research process. Field studies are essential for gathering data and insights related to our research domain. This chapter encompasses various methodological approaches and techniques employed to conduct the field study.

Stability and Validity of the Questionnaire

The reliability and validity of the questionnaire, a key data collection instrument, were rigorously assessed to ensure the credibility and trustworthiness of our research findings. The researcher employed Cranach's Alpha stability coefficient, a widely recognized measure of questionnaire reliability. This coefficient assesses the extent of consistency and internal reliability among the survey questions and is a crucial indicator of the survey's stability. A high value, close to one, indicates strong stability, suggesting that the data collected is dependable and consistent. Additionally, the validity coefficient, derived from the square root of the stability coefficient, verifies that the questionnaire accurately measures the intended constructs. The validity coefficient also ranges between zero and one. The results of this analysis, as displayed in the table below (table 1), demonstrate that the stability coefficient, calculated for the 25 statements related to the impact of applying Deming's model on institutional performance, is 0.896, signifying a high level of stability. The validity coefficient is equally impressive, registering at 0.947. These high coefficients underscore the reliability and sincerity of the statements and affirm their suitability for inclusion in our study.

Table 1: Reliability and Validity Coefficients for Survey Questions

Honesty coefficient	Factor Alpha Cronbach	number of questions	interlocutor	questionnaire
0.871	**0.785**	**9 phrases**	The effect of applying Deming's model	The effect of applying Deming's model on institutional performance indicators
0.855	**0.731**	**8 phrases**	The level of application of change under the Deming model	
0.886	**0.785**	**8 phrases**	Technological and cultural change under the application of the Deming model	

These robust stability and validity coefficients provide confidence in the questionnaire's ability to accurately measure the constructs under investigation. With this strong foundation in place,

we proceed to analyze the data collected and discuss our findings, shedding light on the relationship between the application of Deming's model and institutional performance within the Air Navigation Services Company in Kuwait.

Data analysis:

Data analysis was a crucial phase in this research, involving a thorough examination of the responses collected through the survey lists. The statistical software SPSS was employed for this purpose. The analysis encompassed two primary methodologies: descriptive statistics and inferential statistical tests. Descriptive statistics included computations of frequency distributions, relative frequencies, arithmetic means, and standard deviations for specific variables within the research sample. On the other hand, inferential statistics played a vital role in interpreting the data and drawing meaningful conclusions. Several statistical tests were conducted, including reliability analysis, Pearson correlation analysis, and simple linear regression analysis. The initial focus was on descriptive statistics, particularly the distribution of respondents by gender. The findings revealed that the majority of respondents were male, constituting 65% of the sample, while females accounted for 35% (table 2 and figure 2). These insights provided valuable demographic context for the subsequent analyses, laying the foundation for a comprehensive exploration of the research objectives and hypotheses.

Table 2: Frequency distribution of the study sample according to sex (gender)

(%) percentage	duplicates	class	variable
65%	**134**	**male**	Type
35%	**72**	**feminine**	
100%	**206**	the total	

The research sample was further analyzed based on age distribution (table 3), shedding light on the demographics of the respondents. The data revealed a prominent percentage of respondents within the age bracket of 30 to less than 40 years, comprising 57.30% of the sample. Conversely, the age group of individuals aged more than 50 years exhibited the lowest representation, constituting only 1.9% of the research sample. This insightful breakdown, illustrated through a table and figure, emphasized the predominant age range among the respondents and underscored the need to consider generational perspectives and experiences in the subsequent analyses and interpretations of the study.

Table 3: Distribution of respondents according to age

(%) percentage	duplicates	class	variable
22.3 %	46	Less than30 years old	the age
57.30%	118	From30 o less than40 years old	
18.4%	38	From40 to less than 50years old	
1.9%	4	50 years and over	
%100	**206**	the total	

Moreover, table 4 provides a comprehensive overview of the distribution of sample members based on their educational qualifications. The data underscores that the largest percentage of respondents held a bachelor's degree, constituting 62.10% of the sample. In contrast, the category labeled as "other education" had the lowest representation, with a rate of 21.4%. This educational breakdown, visually depicted through a table and figure, highlights the predominance of bachelor's degree holders within the research sample, emphasizing the significance of this educational background in the subsequent analyses and interpretations of the study's findings.

Table 4: Frequency distribution of the study sample according to academic qualification

(%) percentage	duplicates	class	variable
% 62.1	128	Bachelor's	Educational Qualification
% 16.5	34	Master's	
% 21.4	44	High School	
%100	**206**	the total	

Analyzing the results of inferential statistics

The study employed inferential statistics to delve into the perspectives of the research sample concerning the management practices of the Yameng model and their influence on enhancing the management innovation of the Air Navigation Company. This exploration was structured around three primary axes, with the first axis focusing on the impact of applying the Deming model. The degree of agreement within the research sample regarding various aspects of the Deming model's effect is illustrated in Table 5. The data in this table reveals that the study sample predominantly leaned towards agreement with the questionnaire statements, as reflected in an average score of 3.89 and a standard deviation of 0.580. These findings signify a positive inclination within the sample towards the dimensions of the Deming model's impact, shedding light on the potential favorable reception of this model within the context of the Air Navigation Company.

Table 5: Description of the study sample's opinions about the effect of applying Deming's model

The result	standard deviation	SMA	Strongly Agree		OK		neutral		I do not agree		Strongly Disagree		The effect of applying Deming's model	M
			%	K	%	K	%	K	%	K	%	K		
Strongly agree	0.84	4.35	%51	104	%40	82	%6	12	%2	4	%2	4	institutional performance indicators	1
OK	1.10	3.84	%30	62	%44	90	%11	22	%12	24	%4	8	Progress towards the organization's strategic goals is made on a regular basis	2
OK	0.98	4.03	%36	74	%43	88	%12	24	%8	16	%2	4	The internal systems are dealt with with flexibility that helps them to develop according to the changes that may occur through the application of the Deming model	3
OK	1.07	4.04	%41	84	%38	78	%9	18	%10	20	%3	6	Deming's model strives to provide the ultimate in quality	4
OK	0.90	4.07	%32	66	%52	108	%8	16	%6	12	%2	4	There is a vast difference between Deming's model and other models	5
OK	0.85	3.97	%26	54	%52	108	%14	28	%8	16	%0	0	Total quality management goes hand in hand with organizational development	6
OK	1.28	3.58	%29	60	%32	66	%15	30	%17	34	%8	16	Total quality management goes hand in hand with organizational development	7
erased a hand	1.29	3.39	%19	40	%40	82	%13	26	%17	34	%12	24	There are advanced methods for assessing the financial position	8
OK	1.09	3.48	%14	28	%48	98	%18	36	%16	32	%6	12	There is a plan to reduce the processing time of transactions	9
OK	0.58	3.89	The overall score of the questionnaire											

Additionally, the second axis of inquiry aimed to assess the research sample's perspectives regarding the level of change implementation under the Deming model. This axis consisted of a series of questions designed to gauge the degree of agreement within the sample. The results of this assessment are presented in Table 6. Analysis of the data from this table indicates that the study sample, on average, tended to agree with the questionnaire statements related to the level of change implementation under Deming's model. The average score of 3.43, along with a standard deviation of 0.970, signifies a favorable disposition within the sample towards this aspect of the Deming model, suggesting a positive perception of its effectiveness within the Air Navigation Company.

Table 6: Description of the study sample's opinions about the level of implementation of change under the Deming model

| The result	standard deviation	SMA	Strongly Agree		OK		neutral		I do not agree		Strongly Disagree		ferries	M
			%	K	%	K	%	K	%	K	%	K		
OK	1.08	3.63	%18	38	%49	100	%16	32	%13	26	%5	10	The company's planning and development structure is changed when Deming's model is applied	1
OK	1.28	3.42	%19	40	%41	84	%14	28	%15	30	%12	24	Firms applying Deming's model are changing and developing the planning structure	2
neutral	1.31	3.21	%16	32	%36	74	%18	38	%15	30	%16	32	Companies adjust their organizational structure for the planning and development department	3
neutral	1.34	3.22	%19	40	%39	80	%18	36	%16	32	%17	34	The company merges planning and development departments with each other	4
OK	1.20	3.46	%19	40	%39	80	%18	36	%17	34	%8	16	Statistical methods contribute to quality control	5
OK	1.17	3.43	%17	34	%41	84	%19	40	%16	32	%8	16	A mechanism is available to follow up developments in the field of service provision	6
neutral	1.26	3.13	%14	28	%30	62	%26	54	%16	32	%15	30	There are instructions and regulations that explain the role of the employee in achieving the goals	7
OK	0.97	3.43	The overall score of the questionnaire											

Hypothesis testing phase:
In the first hypothesis test, denoted as F1, the researcher aimed to investigate whether there is a statistically significant relationship at the level of α≤0.05 between the management practices of applying Deming's model and the promotion of administrative innovation in the company. To evaluate this hypothesis, the researcher employed the Pearson correlation coefficient as a statistical measure to assess the strength and direction of the relationship between total quality management practices and the promotion of administrative innovation within the Air Navigation Company in Kuwait. The results of this analysis, as presented in Table 7, revealed several important findings. First, the P-value, calculated to be 0.000, is less than the significance level of 5%. Consequently, the null hypothesis was rejected in favor of the alternative hypothesis, indicating that a statistically significant correlation exists between the practices of applying Deming's model and the promotion of administrative innovation. Second, the positive sign of the correlation coefficient (r > 0) indicates a direct relationship between total quality management practices and the promotion of administrative innovation. In other words, as one variable increases, so does the other, and vice versa. Third, the Pearson correlation coefficient value, which stands at 0.718, is relatively high. This high value suggests a robust relationship between the two variables. Correlation coefficients typically range between -1 and 1, with higher values indicating stronger relationships. In summary, the results of this hypothesis test confirm that there is indeed a statistically significant relationship at the level of α≤0.05 between the practices of applying the Deming model and the promotion of administrative innovation within the Air Navigation Company.

Table 7: Pearson correlation coefficient

| Total Quality Management Practices (x)	variants	
0.718	Correlation coefficient value	Fostering administrative innovation
0.000	P. Value	(y)

In the first sub-hypothesis test, the research aims to investigate whether there is a statistically significant effect, at the level of significance α≤0.05, for the practices of applying Deming's model on internal institutional innovation. To assess this hypothesis, the researcher employed the Simple Linear Regression model, a widely used method for estimating the parameters of linear regression models. The Simple Linear Regression model allows for the examination of the impact of an independent variable (Deming's model) on a dependent variable (internal institutional innovation). This method is chosen for its linear and unbiased estimates, making it suitable for this analysis. The researcher recognized the importance of ensuring that the estimated regression models do not encounter measurement issues due to deviations from the assumptions of the Least Squares method (OLS), commonly used in regression model estimation. One of the key assumptions tested is the normality of random errors in the estimated regression models. To validate this crucial hypothesis, the Kolmogorov-Smirnov test was employed. The results of this test indicated that the random errors in the estimated regression models indeed follow a normal distribution. This conclusion is supported by the test's significance result, which is greater than the significance level (0.05). These findings confirm the validity of the hypothesis that the random errors in the estimated regression models adhere to a normal distribution, as represented in Figure 1. This validation is crucial for ensuring the reliability of subsequent analyses related to the impact of Deming's model on internal institutional innovation.
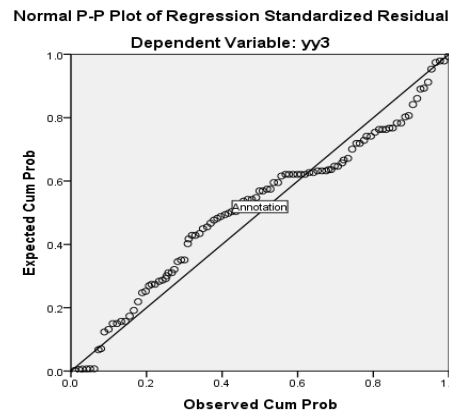
Figure 1: Random errors in the estimated regression models

Hetroscedasticity test
Another critical assumption examined in this analysis is the issue of variation stability, also known as heteroscedasticity. This issue arises when the variances of errors (residuals) in the estimated regression models are not constant and fluctuate with changes in the values of the independent variables. To assess the extent of heteroscedasticity, the researcher employed the Goldfeld-Quandt test. In this test, if the significance value (P-Value) is greater than 0.05, it indicates that the variance is stable. Conversely, if the P-Value is less than 0.05, it suggests that there is instability in the variance. The researcher's analysis revealed that there is no problem with variation stability, as indicated by the P-Value exceeding 0.05. This outcome suggests that the variances of errors in the estimated regression models remain stable, as illustrated in Figure 2. The confirmation of stable variances reinforces the reliability of subsequent analyses related to the impact of Deming's model on internal institutional innovation.
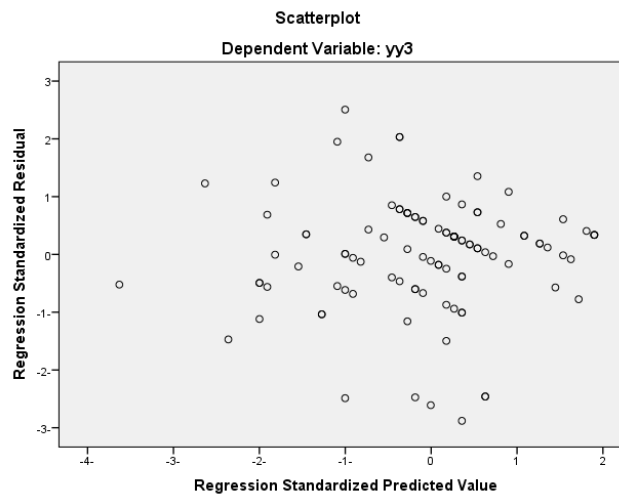
Figure 2: Hetroscedasticity test

IMOs' analysis of the first sub-hypothesis:
In analyzing the first sub-hypothesis, which asserts a statistically significant effect of applying Deming's model on internal institutional innovation, the results presented in Table 8 confirm a significant and positive relationship between the application of Deming's model and the advancement of administrative innovation. The positive sign of the regression coefficient signifies a direct relationship, indicating that implementing Deming's model practices leads to an increase in administrative innovation. Moreover, the statistical significance of the regression coefficient (1.031) emphasizes the validity of this relationship. Conversely, the regression coefficient for the intercept (-0.427) is not statistically significant, implying its

insignificance in this context. The coefficient of determination (R2) at 35% illustrates the extent to which changes in Deming's model application explain variations in administrative innovation. This finding highlights the substantial impact of Deming's model on enhancing internal institutional innovation within the Air Navigation Company in Kuwait, providing valuable insights for further improving administrative practices and overall organizational performance. Consequently, the study accepts the hypothesis, affirming a statistically significant effect at the $\alpha \leq 0.05$ level for the practices of Deming's model on internal institutional innovation.

Table 8: Results of IMOs analysis

| feature estimation method	$y = \beta 0 + \beta 1x$ $y = -.427 + 1.031 x$			
OLS (Ordinary Least Squares)	Sig	T	(β)	
	0.98	-1.660	-0.427	fixed amount
	0.000	15.806	1.031	total quality management practices
	Sample volume) N =(103			
	Modified coefficient of determination) R^2 =(.358)			
	F =(0.000)		Calculated (F) test value = 249.83	

Second sub-hypothesis test:

To assess the second sub-hypothesis, which posits a statistically significant effect of Deming's model management practices on value creation, the researcher employed a Simple Linear Regression model. This approach aimed to determine the impact of Deming's model (independent variable) on value creation (dependent variable). Ordinary Least Squares (OLS) regression was chosen due to its effectiveness in estimating parameters for linear regression models, known for providing linear and unbiased estimates. Among various estimation methods, OLS stands out for its minimal variance. To ensure the validity of the regression model, the researcher addressed potential measurement issues, focusing on fundamental assumptions. One critical assumption examined the normality of random errors. Through the Kolmogorov-Smirnov test, it was confirmed that the random errors in the estimated regression models adhered to a normal distribution. The test's significance level exceeded 0.05, indicating conformity to the normal distribution, as depicted in Figure 3. These robust statistical analyses laid the foundation for evaluating the relationship between Deming's model management practices and value creation, allowing for informed conclusions regarding their statistical significance and direction of influence.
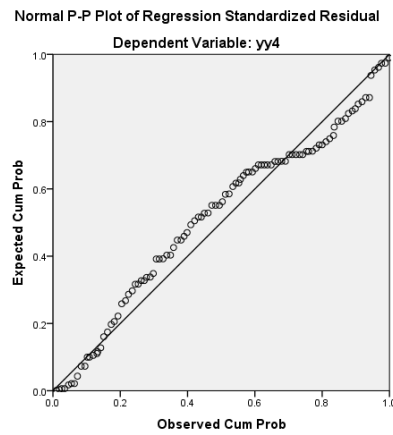
Figure 3: Kolomogrov-Siminrov test

Moreover, the issue of heteroscedasticity, which occurs when the error variances (residuals) of the dependent variable values in the estimated regression models are not constant and change with variations in the independent variables, was considered. To assess the extent of this issue, the Goldfeld-Quandt test was conducted. A significance value (P-Value) greater than 0.05 suggests variance stability, while a P-Value less than 0.05 indicates variance instability. The researcher's analysis confirmed the stability of variances, as depicted in Figure 4. This finding further strengthens the validity of the regression model, indicating that fluctuations in error variances did not compromise the integrity of the statistical analysis.
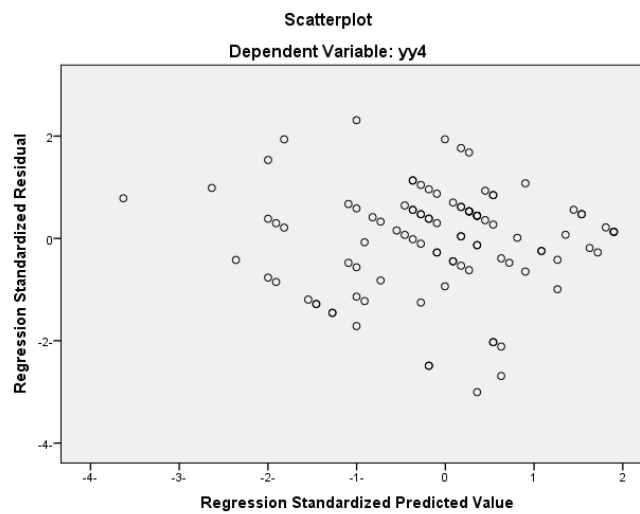
Figure 4: Goldfield-Quant test

Regression analysis for the second sub-hypothesis:

In the context of the regression analysis conducted to examine the second sub-hypothesis, which seeks to ascertain the statistically significant impact of total quality management practices (treated as the independent variable) on value creation within institutional performance (the dependent variable), several noteworthy observations emerge from the findings presented in Table 9: First, the regression coefficient associated with the independent variable representing total quality management practices stands at 1.424. Importantly, this coefficient demonstrates strong statistical significance, with a p-value of 0.000, which falls well below the conventional 5% threshold. This statistical significance underlines the substantial influence wielded by this coefficient on the dependent variable. Notably, the positive sign of the regression coefficient signals a direct relationship between the two variables. Consequently, an increase in total quality management practices corresponds to a proportional

increase in value creation within institutional performance. Equally significant is the regression coefficient pertaining to the constant term, which registers at -2.23. This coefficient, too, is statistically significant, with a p-value of 0.000, underscoring its pivotal role in the model. Additionally, considering the magnitude of the regression coefficient (1.424), it implies that a one-unit change in the independent variable (total quality management practices) results in a 1.424-unit change in the dependent variable (value creation). Furthermore, the coefficient of determination (R2) for this regression stands at 47%. This metric signifies that the independent variable (total quality management practices) can account for 47% of the variances observed in the dependent variable (value creation). This substantial R2 value underscores a moderate-to-strong relationship between the two variables. Collectively, these findings present compelling evidence supporting the statistical significance of the regression model. Consequently, the hypothesis postulating the existence of a statistically significant effect, at a significance level of α≤0.05, for total quality management practices on value creation can be confidently accepted.

Table 9: Regression analysis of the third hypothesis

feature estimation method	$y = \beta 0 + \beta 1x$ $y = -2.23 + 1.424 x$			
method of least squaresOLS (Ordinary Least Squares)	**Sig**	**T**	**(b)** regression coefficients	**variants**
	0.000	**-7.98**	-2.23	**fixed amount**
	0.000	20.09	1,424	**Deming model management practices**
	Sample sizeN = (103)			
	Adjusted coefficient of determinationR ² = (0.474)			
	Significance testF = (0.000)		**F = test value (403.59)**	

Finally, table 10 serves as a concise summary of the research study's hypothesis testing outcomes. "Imposition" provides a concise overview of the hypotheses being examined, outlining the specific objectives or inquiries addressed within the research. "Result," on the other hand, delivers the ultimate findings or verdicts arising from the hypothesis testing phase. These findings essentially reveal whether each hypothesis was validated or refuted, based on a meticulous analysis of research data and statistical assessments. For the First Major Hypothesis, the proposition centered on establishing a statistically significant relationship at the α (alpha) ≤ 0.05 significance level between the application of Deming's model and the enhancement of administrative innovation within the Air Navigation Company. The result documented for this hypothesis is "Acceptance of the imposition," underscoring that the research outcomes supported and affirmed this hypothesis. The Second Main Hypothesis encompasses two sub-hypotheses, The First Sub-Hypothesis advanced the notion that Deming's model practices exert a statistically significant influence at the α ≤ 0.05 significance level on internal institutional innovation. The result is documented as "Acceptance of the imposition," signifying that the research data presented compelling evidence in favor of this hypothesis. Second Sub-Hypothesis was suggested that there exists a statistically significant effect at the α ≤ 0.05 significance level for Deming model management practices on value creation. Much like the preceding hypotheses, the result is denoted as "Acceptance of the imposition," indicating that the research findings robustly supported this hypothesis. In summary, all the primary hypotheses and their corresponding sub-hypotheses received

acceptance, thereby suggesting that the research outcomes harmonize with and corroborate the examined relationships and impacts. This alignment is underscored by the consistent notation of "Acceptance of the imposition" for each hypothesis.

Table 10: Summary of the hypothesis testing results

The result	imposition		
Acceptance of the imposition	There is a statistically significant relationship at the level of $\alpha \leq 0.05$ between the practices of Deming's model and the promotion of administrative innovation in the Air Navigation C	The first major hypothesis	
Acceptance of the imposition	There is a statistically significant effect at the level of significance $\alpha \leq 0.05$ for Deming's model practices on internal institutional innovation	first sub	The second main hypothesis
Acceptance of the imposition	There is a statistically significant effect at the level of $\alpha \leq 0.05$ for Deming model management practices on value creation.	second sub	

Applications

The current study has numerous practical applications. Firstly, organizations can use the Deming model to systematically identify and rectify quality issues in their products or services. This can result in improved product quality, fewer defects, and greater customer satisfaction. Secondly, businesses can apply Deming's principles to streamline their internal processes. This leads to increased operational efficiency, reduced costs, and faster delivery times, benefiting both the organization and its customers. Thirdly, the Deming model emphasizes the importance of involving employees in decision-making and improvement efforts. By implementing this approach, companies can boost employee morale, engagement, and productivity. Fourthly, organizations can use the Deming model to better understand and meet customer needs. This can lead to the development of products and services that align more closely with customer expectations, increasing loyalty and market share. Fifthly, the model promotes the use of data and statistical analysis in decision-making. This data-driven approach helps organizations make more informed choices, reduce uncertainty, and achieve better results. Sixthly, Deming's model encourages organizations to identify and mitigate risks systematically. This proactive risk management approach can help prevent costly errors and disruptions. Lastly, companies can adopt a culture of continuous improvement inspired by the Deming model. This ongoing commitment to getting better can result in long-term success and a competitive edge in the marketplace.

Conclusion:

In summary, this study underscores the pivotal role of the Deming model in enhancing organizational performance and innovation within the Air Navigation Services Company in Kuwait. The Deming model's holistic and continuous improvement approach, involving all levels and aspects of operations, stands out as a valuable strategy to meet customer expectations and boost market competitiveness. The study's findings, which reveal significant relationships and positive impacts of Deming model practices on various facets of the organization, provide valuable insights for both academic research and practical applications. The Deming model emerges as a catalyst for fostering innovation, improving internal processes, and elevating the quality of services, ultimately contributing to the institution's success.

Limitations and Future Research Directions:

Acknowledging its limitations, this study highlights the need for further exploration and expansion of research in this area. The reliance on self-reported data and the study's specific organizational context calls for caution in generalizing findings. For future research, avenues include cross-industry comparisons, longitudinal investigations into long-term effects, and comparative analyses with other quality management approaches. Additionally, studying

customer perceptions and exploring the international application of the Deming model could yield valuable insights. Despite these limitations, this study underscores the Deming model's potential and sets the stage for further research endeavors to uncover its broader implications and benefits.

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