Effects of ISO 9001 Certification and KAAE on Performance of Jordanian Firms

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Abstract

This research investigates the effects of ISO 9001 certification and King Abdullah II Award for Excellence (KAAE) on Jordanian firm's performance. Four scale measures of firm's performance were considered, including quality outcomes, customer satisfaction, business performance, and innovation. ISO 9001 certification effect on performance measures was investigated in 130 Jordanian firms from both service (52 %) and industrial (48%) sectors. While, KAAE effect on performance measures was surveyed in twenty four firms. Structural Equation Modeling (SEM) was used to analyze the measurement and structural models for ISO 9001 certification, whereas t-test was used to test the hypotheses related to KAAE. The results showed that the ISO 9001 certification has significant effects on quality outcomes, customer satisfaction and business performance; however, it has no significant effect on innovation. In addition, the KAAE positively affects quality outcomes customer satisfaction, business performance, and innovation. In conclusion, ISO 9001 requirements and guidelines improve the efficiency and effectiveness of quality management systems in Jordanian firms, but they fail to motivate innovation. In order to achieve performance excellence, this research encourages Jordanian firms to participate in KAAE or include its guidelines in their quality management systems.

Key words: ISO 9001 certification; KAAE; firm's performance; SEM

1. Introduction

The International Organization for Standard (ISO) firstly published ISO 9001 quality management system in 1987. Since then, ISO 9001 was revised in the years 1994, 2000 and 2008 respectively. ISO 9001 quality management system requires certain documentation on the operational procedures and managerial actions used to achieve customer requirements [1]. Although intense global competition highlights the importance of quality many years ago [2], only recently the Jordanian manufacturers have realized the need of effective quality system to prove their right to compete in the global market. This understanding has its signs in the increasing number of Jordanian firms holding the ISO 9001 certificates, whose number has already reached 292 firms [3].

Further, the success of the Deming prize in Japan that was established in the 1950's, inspired the establishment of the Malcolm Baldrige National Quality Award (MBNQA) in the year 1987 in the USA and the European Quality Award in the early 1990's [4]. Subsequently, there has been a trend for national quality awards around the world, many of which has been based on the MBNQA constructs, including leadership, quality information and analysis, customer and market focus, strategic quality planning, human resource management, and quality results. In coherence with the international goals of national quality awards, the King Abdullah II Award for Excellence (KAAE) was established in the year 2000 to benefit the Jordanian firms through acting as a guide for performance excellence. Award recipients are recognized as national and international models for performance excellence and receive special preference by Jordan Institution of Standards and Metrology (JISM), the Jordan Customs Department, and Jordan Enterprise Development Corporation. The award is based on complying with five criteria, including leadership, strategic planning, process management, resources management, and results [5].

In most studies, three ISO 9000 related performance constructs, including consistent quality outputs, satisfied customers, and business performance, are the scale measures for evaluating firm's performance [6]. Consistent quality outputs indicates that: (1) when organization's processes are in control and stable, the quality of the outputs would be uniform and consistent [7] and (2) organizations with solid operations and processes will be in the best position to influence the quality of their products and services [8]. Some of the measures commonly used to indicate consistent quality output are costs relating to quality of products, rates of defective products, product performance and reliability levels [9,10]. Further, customer satisfaction, which has been a long sought aim for the organizations, has indications in the

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level of customer service, perceived product quality by customers, and the number of quality audits performed by customer if any [11,12]. Finally, business performance is the final aim for any organization, regardless its mediation by customer satisfaction or quality outcomes. Measures of business performance include profit, cash flow, demand for product, market share and others. Yet, there still exists a significant shortage of literature analyzing the relation between quality management practices and innovation. In this context, this paper considers four scale measures of firm's performance including, consistent quality outputs, satisfied customers, and business performance, and innovation.

A progression of quality improvement programs, including MBNQA and ISO 9000, share a focus on improving and adhering to repeatable organizational processes as the mechanism for improving quality, efficiency, and financial performance [13]. Yet, the success of these processes in achieving their objectives is still debated. Casadesus and Gimenez [14] investigated the effects of the ISO 9001 quality standard implementation on 288 Spanish companies. Results showed that in 65 percent of companies positive internal and external effects of the ISO 9001 standard implementation were recorded. Magd et al. [15] studied the costs, benefits and the satisfaction level with ISO 9000 implementation in 140 ISO 9000 certified manufacturing companies in Saudi Arabia. The results revealed the benefits of ISO 9000 certification exceed the costs of attaining the standards, and ISO 9000 contributed to organizational survival and success. On the other hand, the results of an ISO 9000 mail survey conducted in Japan, South Korea, Hong Kong and Taiwan showed that ISO 9000 certification resulted in improved corporate image, quality improvement, increased customer satisfaction, and improved internal procedures [16]. Dick, et al. [17] studied ISO 9000 certification and its effect on firm's performance represented by return on assets values of the firm. The data was obtained from four hundred ISO 9000 certified manufacturing, construction, retail and service companies as well as another four hundred ISO 9000 non-certified companies in Spain. The results indicated that quality management system certification had some causal influence on business performance. Padma, et al. [18] investigated the effect of ISO 9001 certification on firm's performance, as perceived by the Indian managers. Thirty seven firms were surveyed and the obtained results confirmed that certified firms experienced more reduction in quality related costs, which justified company's seeking for certification of ISO 9001. Benner and Veloso [13] studied the ISO 9000 practices effects on financial performance of companies from a technological perspective. They concluded that: (1) firms that had a very narrow or very broad technological focus had fewer opportunities for complementary interactions resulting from process management practices and thus benefited less than those with limited breadth in technologically related activities, and (2) while performance advantages accrue for earlier adopters in industry, they were competed away over time for later adopters. Singh [6] investigated the relationship between ISO 9000 quality management practices and Australian firm's performance. Three performance constructs including: consistent quality outputs, satisfied customers

and business performance, were developed based on the advocated outcomes of the standard. Four hundred and eighteen ISO 9000 certified companies were surveyed. The results showed that: (1) management policies, plans and actions were negatively related to steady processes, (2) focus on customers and steady processes relationship was statistically insignificant, (3) top management team plays a ubiquitous role, albeit an indirect one increasing steady processes, and (4) strong focus on customers could be of little value in creating steady processes.

Little literature has been directed toward investigating the effects of ISO certification and KAAE on the firms' performance of Jordanian. Therefore, this paper aims at investigating the effects of ISO 9001 certification and KAAE on consistent quality outputs, satisfied customers, business performance, and innovation in Jordanian firms. The remaining of this paper is organized as follows. Section two presents conceptual framework. Section three provides data analysis and discussion. Section four summarizes research results. Finally, section five provides conclusions.

2. Conceptual Framework

2.1. Hypotheses of ISO 9001 certification model:

Quality is now a familiar word that has a variety of interpretations according to its use. Linguistically, it originates from the Latin word 'qualis' which means 'such as the thing really is'. ISO 9001 defines quality as the degree to which a set of inherent characteristics fulfils the requirements [19]. Although quality is a non-quantifiable variable, it has already been established that quality management represents a competitive advantage that sets one company from another [1]. Further, the stated goals of the ISO 9000 series of standards include ensuring to meet the customer's quality requirements and the applicable regulatory requirements, while aiming to enhance customer satisfaction [11]. It is argued that quality is essential to customer satisfaction [20]. Furthermore, the effect of ISO 9001 certification may affect firm's innovation. On the other hand, being the highest level of recognition of quality in Jordan, the KAAE aims at enhancing the competitiveness of Jordanian businesses by promoting quality awareness and performance excellence, recognizing quality and business achievements of Jordanian organizations, and publicizing these organizations' successful performance strategies and sharing them [5].

Consequently, the following hypotheses are built to investigate effect of the ISO 9001 certification and KAAE on firm's performance:

- H1a: ISO 9001 certification/KAAE positively influences firm's quality outcomes.
- H1b: ISO 9001 certification/KAAE positively effects on business performance.
- H1c: ISO 9001 certification/KAAE enhances customer satisfaction.
- H1d: ISO 9001 certification/KAAE has a positive effect on firm's innovation.

Figure 1 depicts the conceptual model relating KAAE with the four performance measures.
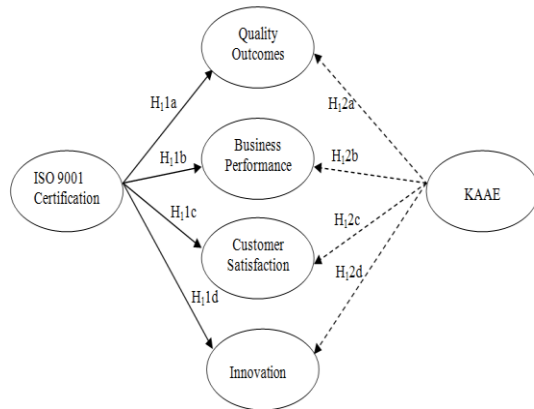

Figure 1: The hypothesized ISO 9001 certification and KAAE models.

2.2. The Survey Instruments:

The data is collected from Jordanian firms received the ISO 9001 certification and those participated in KAAE. The survey adopted in this paper consists of three parts. The first part contains the general and the structural environment of each firm, such as the type, size and status of certification. While the second part is concerned with firms' performance measured by customer satisfaction, quality outputs, business performance and innovation. The third part is dedicated to firms participated in or won the KAAE. The instrument used to measure the scale measure of firm's performance is adapted from literature [21,22]. A five-point Likert scale ranged from very dissatisfactory to a very satisfactory performance is used. Two copies of the survey are prepared in both English and Arabic languages. A pre-test of the questionnaire was done by asking recommendations from ten experts of quality management in academic and industry, who their participation was voluntary. Then, the final copies of the questionnaires were modified based on the feedback received from the pre-test sample. The population for this research covers manufacturing and service ISO 9001 certified Jordanian firms. The firms were contacted through e-mail as well as in person interviews with the company representatives. The total number of firms approached reached 245, however only 130 responded to the questionnaire, and hence a response rate of 53 % was encountered. Similarly, twenty four Jordanian firms participated or won KAAE were contacted with a response rate of 100 %.

3. Data analysis and Discussion

The collected data from ISO 9001 certified firms and KAAE participants were analyzed and are introduced as follows.
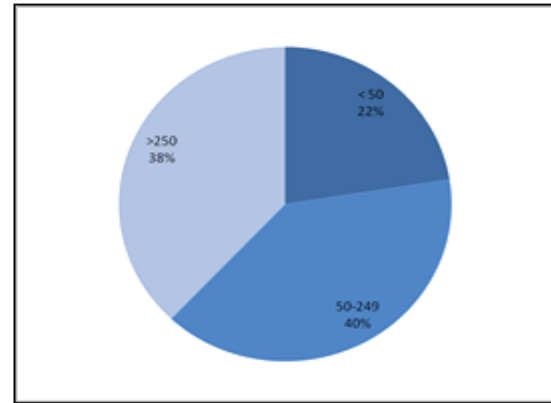
3.1. Descriptive analysis:

The general and structural characteristics data of the one hundred and thirty ISO 9001 certified firms were analyzed and depicted in Fig. 2, where the following remarks are obtained:
a. Regarding the type of organization, 52 % of the firms belong to service whereas 48 % belong to manufacturing.
b. Considering firm size, the medium-size firms; between 50 and 250 employees, constituted the largest percentage of the responding firms with a percentage of 40 %. The small firms of less than 50 employees constitute 22 %, whereas large firms of more than 250 employees contribute 38 % of the surveyed firms.
c. For the size of the quality department, the largest portion (= 67 %) of the firms has less than 10 employees working quality departments.
d. Regarding the respondent position, 57% of the respondents belong to quality and production management, whereas 43% of the respondents belong to the other positions, such as consultant, division managers, and production engineers. Whereas, 13% of the respondents are quality managers, engineers, and inspectors.

Further, 39.2% from the firms possessed more than one quality certificate; such as ISO 9000 and ISO 14001, while 60.8% of the firms gain only the ISO 9000 certification. Furthermore, 10.7 % of the firms obtained the ISO 9000 certification through their personal effort, whereas 89.3 % obtained it through joint effort between a consulting company and the firms' employees. For the duration taken to obtain certification, 70% of the firms took them three months to one year to get ISO 9000 certification, whereas 30% of the firms spent more than year. Finally, 81% of the firms that possess ISO 9001 certification obtained it after the year 2000.
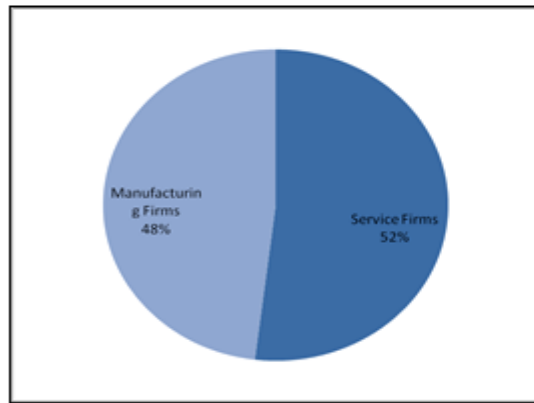
(a) Types of firms.

(b) Size of firms.
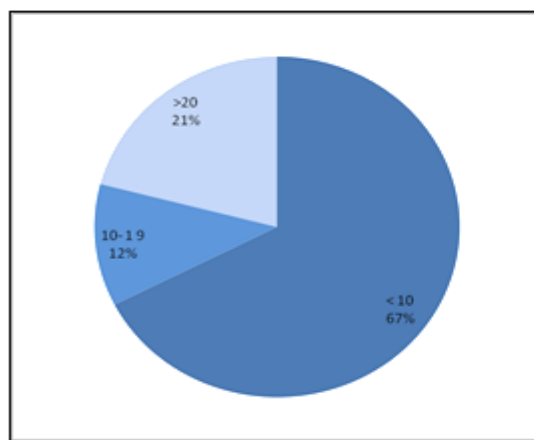
(c) Size of the quality department.

(d) Position distribution.

Figure 2: Descriptive analysis of firms' data.

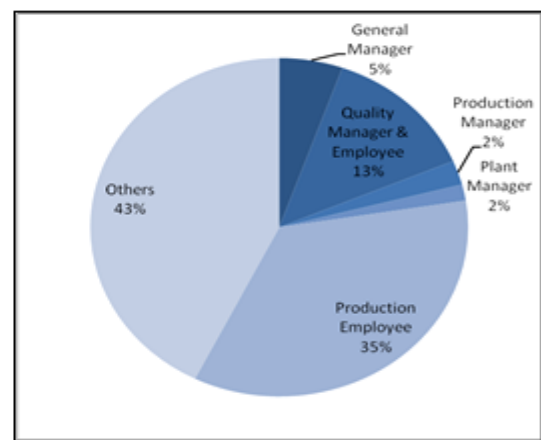For KAAE, almost all the responding firms belong to large-size firms. In addition, 80% of these firms participated once, whereas 20 % participated more than one time.

3.2. Psychometric Properties of Constructs for ISO 9001 certification model:

Structural equation modelling (SEM) was employed to analyze the collected data using AMOS software [23]. Because the structural portion of a full structural equation model involves relations among only latent variables and the primary concern in working with a full model is to assess the extent to which these relations are valid, it is critical that the measurement of each latent variable is proved psychometrically sound [24]. Thus, the validity of the models was checked using three popular tests, including multicollinearity test between each pair of items, the reliability test of the measurement variables, and confirmatory factor analysis (CFA). Table 1 displays the scale measures of each performance measure.

Table 1: The scale measure of firm's performance

Performance Measure	Scale Measures
Quality Outcomes	Costs relating to quality of products (QO1)
	Nonconforming products rate (QO2)
	Product performance and reliability (QO3)
Business Performance	Profits (BP1)
	Demand for products made at the registered site (BP2)
	Market share (BP3)
Customer Satisfaction	Perceived product quality by customers (CS1)
	Consistency in documentation (CS2)
	Customer service (CS3)
Innovation Performance	Level of newness (IN1)
	Use of latest technology (IN2)
	Speed of product development (IN3)
	Number of new products (IN4)
	Early market entrants (IN5)

3.2.1. Multicollinearity test:

Multicollinearity measures the degree by which items measure the same entity and a value of 0.9 or above indicates the possibility that two or more items measure the same entity [25]. In this context, the inter-item correlation coefficients for the measured items were calculated then displayed in Table 2. It is noted that the largest inter-item correlation value is about 0.62, which indicates the absence of multicollinearity.

Table 2: Inter-Item Correlation Matrix for ISO9001 certification model.

Item	ISO 9001	IN3	IN4	IN5	IN1	IN2	BP1	BP2	BP3	CS1	CS2	CS3	QO1	QO2	QO3
ISO 9001	1.000														
IN3	0.114	1.000													
IN4	0.088	0.563	1.000												
IN5	0.056	0.357	0.506	1.000											
IN1	0.055	0.498	0.499	0.361	1.000										
Inn2	0.082	0.585	0.553	0.408	0.594	1.000									
BP1	0.016	0.087	0.074	0.023	0.015	0.007	1.000								
BP2	0.034	0.067	0.042	0.045	0.023	0.047	0.501	1.000							
BP3	0.019	0.041	0.050	0.051	0.026	0.056	0.376	0.572	1.000						
CS1	0.014	0.053	0.095	0.097	0.072	0.070	0.032	0.038	0.038	1.000					
CS2	0.001	0.013	0.034	0.121	0.042	0.076	0.004	0.022	0.013	0.547	1.000				
CS3	0.030	0.053	0.110	0.056	0.040	0.095	0.014	0.007	0.008	0.456	0.600	1.000			
QO1	0.039	0.093	0.054	0.029	0.101	0.026	0.480	0.436	0.393	0.017	0.007	0.012	1.000		
QO2	0.026	0.102	0.064	0.035	0.067	0.017	0.549	0.371	0.397	0.023	0.003	0.017	0.616	1.000	
QO3	0.048	0.064	0.050	0.007	0.024	0.025	0.565	0.393	0.411	0.053	0.000	0.026	0.556	0.608	1.000

3.2.2. Reliability test:

In order to assess the internal consistency between the latent variables Cronbach's alpha (α) reliability coefficient was calculated for all the constructs as shown in Table 3.

Cronbach's α value of 0.6 or above indicates reliability of each construct. In Table 3, it is obvious that all the Cronbach's α coefficients range are larger than the threshold 0.7, which implies good internal consistency. In addition, the overall Cronbach's α is 0.831.

Table 3: Factor loading and reliability coefficient estimates for ISO certification model.

Construct	Scale	Unstandardized estimates[*]			Standardized Estimate[**]	Cronbach's α
		Estimate	Standard Error (SE)	*p* value		
Quality Outcomes	QO1	0.971	0.136	< 0.001	0.668	
	QO2	1.119	0.138	< 0.001	0.772	0.778
	QO3	1.000			0.797	
Business Performance	BP1	0.979	0.135	< 0.001	0.752	
	BP2	1.000			0.727	0.777
	BP3	0.840	0.119	< 0.001	0.723	
Customer Satisfaction	CS1	1.186	0.160	< 0.001	0.801	
	CS2	1.276	0.172	< 0.001	0.794	0.813
	CS3	1.000			0.716	
Innovation	IN1	1.000			0.940	
	IN2	1.013	0.033	< 0.001	0.969	
	IN3	1.000		< 0.001	0.940	0.974
	IN4	1.050	0.035	< 0.001	0.967	
	IN5	0.926	0.050	< 0.001	0.877	

3.2.3. Confirmatory Factor Analysis (CFA):

Confirmatory Factor Analysis (CFA) model is a structural equation modelling technique where the constructs are all co-varied with each other and the goodness-of fit of this model is analysed. Figure 3 shows the CFA model used to test for the validity of ISO certification model.
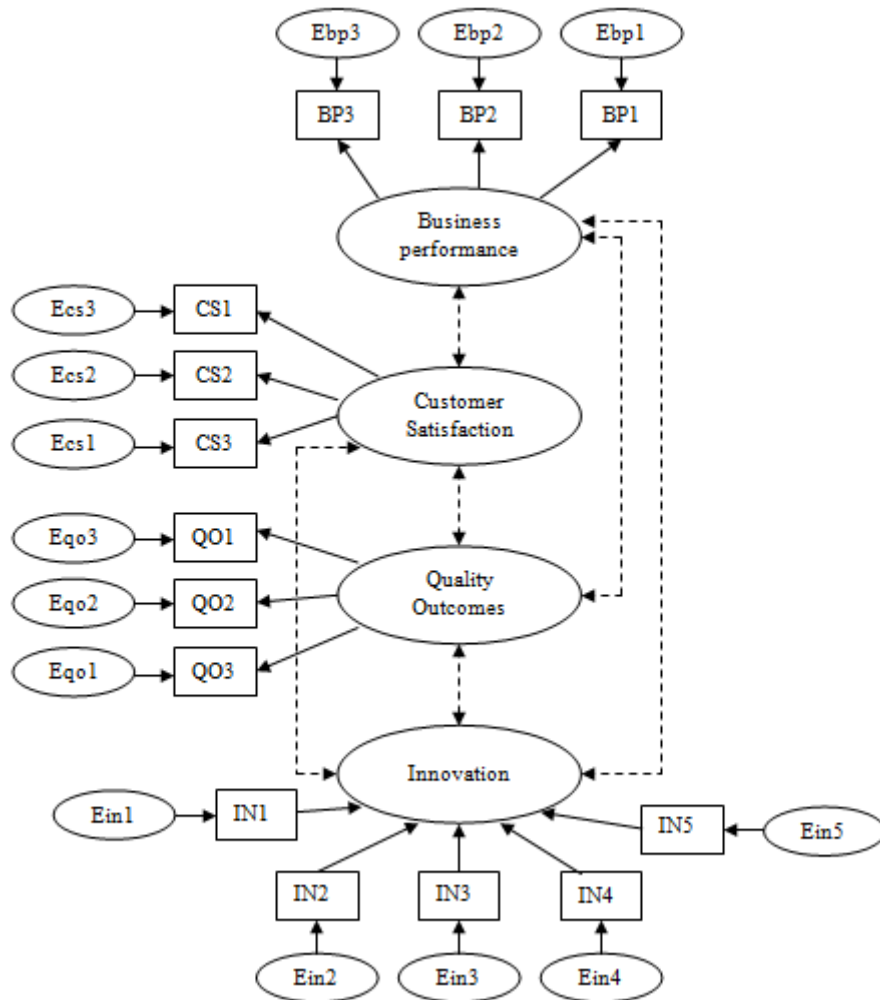
Figure 3: The measurement model.

Byrne [24] provided a description of various indices for CFA, including: (1) Goodness-of-Fit Index (GFI), a measure of the relative amount of variance in the sample covariance matrix that is jointly explained by sigma, (2) Adjusted Goodness-of-Fit Index (AGFI), which differs from GFI only in the fact that it takes account of the degrees of freedom in the specified model and incorporates a penalty for the inclusions of additional parameters. The GFI and AGFI can be classified as absolute indices of fit because they basically compare the hypothesized model with no model at all. Both indices have a range of values between zero and one but values close to one are more indicative of good fit, (3) Normed Fit Index (NFI) and Comparative Fit Index (CFI), which are two indices classified as incremental or comparative indices of fit and have values that range from zero to one but a value of 0.9 has been considered an indicative of good fit. They are derived from the comparison of a hypothesized model with the independence model and each provides a measure of complete co-variation, and (4) Root Mean Square Error of Approximation (RMSEA), that has been recently considered one of the most informative criteria in covariance structure, takes into account the error of approximation in the population. Values of RMSEA above 0.10 indicate a poor fit and a value near 0.06 indicate a good fit.

The estimate values of standardized and unstandardized regression coefficients (factor loading) obtained by conducting CFA analysis are also displayed in Table 3. Obviously, the estimates for each construct are greater than 0.7 with p value less than 0.001 for all items. This result indicates that the measurement constructs demonstrate convergent validity. Further, the GFI= 0.925, AGFI= 0.892, NFI= 0.945, CFI= 0.994 and RMSEA= 0.029, respectively, indicate an acceptable model goodness of fit and reveal the exceptional discriminant and convergent validity of ISO 9001 certification measurement model. Consequently, a structural equation model shown in Fig. 4 is conducted to test the hypotheses relating firm's performance constructs with ISO 9001 certification. The obtained results are: GFI value of 0.924, AGFI value of 0.894, NFI value of 0.944, CFI value of 0.995 and RMSEA value of 0.025. These values of indicate an acceptable model. Consequently, the hypotheses are tested as shown in Table 4.
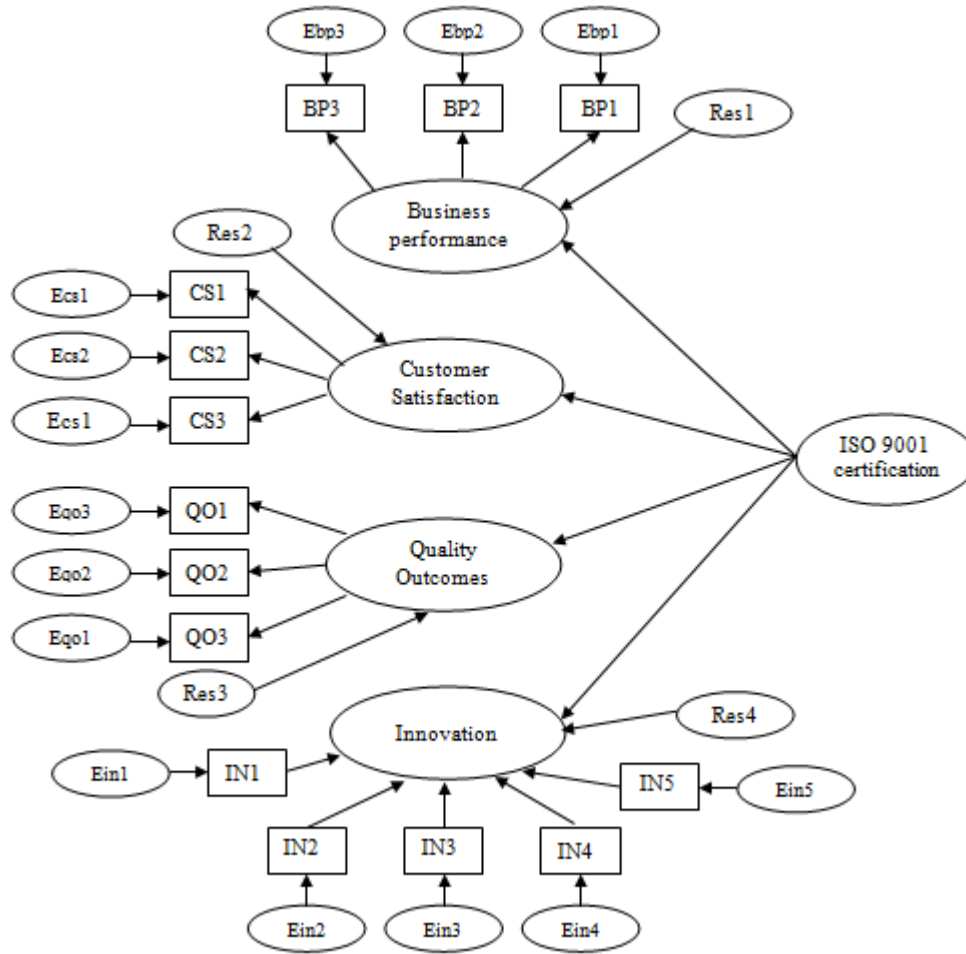
Figure 4: The structural equation model of ISO 9001 certification.

Table 4. The output for the structural equation model for ISO certification model.

Path analysis	Hypothesis	Estimate	*p* value	Decision
Quality Outcomes <--- ISO 9001 certification	H_11a	0.613	< 0.001	Supported
Business Performance <--- ISO 9001 certification	H_11b	0.605	< 0.001	Supported
Customer Satisfaction <--- ISO 9001 certification	H_11c	0.182	0.002	Supported
Innovation <--- ISO 9001 certification	H_11d	0.080	0.540	Not supported

In Table 4, it is found that ISO 9001 certification affect positively firm's performance measured by quality outcomes, customer satisfaction and business performance. That is, hypotheses H11a, H11b, and H11c are supported. However, ISO 9001 certification has no positive effect on firm's innovation; that is, hypothesis H11d is not supported.

3.3. Analysis of KAAE model:

Twenty four firms participated in KAAE were surveyed. The collected data revealed that 79 % of the respondents participated once. The remaining 21 % participated more than once. Due to small sample size, the KAAE model will be analyzed using t-test. The measurement model of KAAE was tested by establishing correlation matrix as shown in Table 5. Obviously, the correlation values are less than 0.8, which indicate that no significant correlation is concluded between each pair of these measures. In addition, the KAAE measurement model is tested with t-test and reliability analysis as shown in Table 6, where it is noted that all t values are significant with less than 0.025 probability level. In addition, all the Cronbach's α values are larger than 0.6. Finally, the overall the overall Cronbach's α equal 0.864. The above results indicate the validity of the measurement model.

Table 5: Bivariate correlation matrix for KAAE measures.

	QO1	QO2	QO3	BP1	BP2	BP3	IN1	IN2	IN3	IN4	IN5	CS1	CS2	CS3
QO1	1													
QO2	0.367	1												
QO3	0.370	0.499	1											
BP1	-0.135	-0.087	0.159	1										
BP2	0.139	-0.060	0.554	0.603	1									
BP3	0.059	-0.062	0.525	0.526	0.632	1								
IN1	0.380	0.250	0.576	0.274	0.684	0.643	1							
IN2	0.509	0.243	0.538	0.075	0.420	0.435	0.399	1						
IN3	0.170	0.193	0.622	0.044	0.560	0.624	0.560	0.343	1					
IN4	0.253	0.231	0.622	0.000	0.483	0.477	0.640	0.148	0.776	1				
IN5	0.211	0.061	0.470	0.168	0.637	0.728	0.530	0.268	0.655	0.775	1			
CS1	0.247	-0.140	0.058	0.000	0.281	0.238	0.040	0.164	0.130	-0.132	0.106	1		
CS2	0.130	-0.215	-0.109	-0.165	0.136	0.184	-0.317	0.226	0.122	-0.158	0.169	0.628	1	
CS3	-0.239	0.000	0.351	0.332	0.729	0.742	0.364	0.265	0.610	0.290	0.421	0.233	0.402	1

Table 6: Descriptive analysis and Cronbach's α estimate for KAAE model.

Construct	Scale measure	Average	Standard Deviation (SD)	*t*-statistic*	*p* value	Cronbach's α
Quality Outcomes	QO2	4.1250	0.53670	10.269	0.000	0.664
	QO3	4.4583	0.58823	12.145	0.000	
Business Performance	BP1	4.0000	0.93250	5.254	0.000	0.864
	BP2	3.8750	0.85019	5.042	0.000	
	BP3	3.9167	0.97431	4.609	0.000	
Customer Satisfaction	CS1	4.1250	0.79741	6.912	0.000	0.662
	CS2	4.1667	0.56466	10.122	0.000	
	CS3	4.3333	0.70196	9.305	0.000	
Innovation	IN1	4.1250	0.85019	6.482	0.000	0.847
	IN2	4.0417	0.62409	8.177	0.000	
	IN3	3.8333	1.04950	3.890	0.001	
	IN4	3.5833	1.13890	2.509	0.020	
	IN5	3.7917	0.83297	4.656	0.000	

Regarding the effect of participating in KAAE on the firm's performance, the t-test for the data averages of each of the four performance constructs is conducted at mean of 3 to test the following hypothesis:

$$H0: \mu i = 3, \ i = 1,\ldots,4 \qquad (1)$$

$$H1: \mu i > 3$$

where i represents the performance measure. The obtained t values are displayed in Table 7, where it is found that all the p values are less than 0.001. This means that null hypothesis in Eq. (1) is rejected for all the four performance measures. In other words, the hypotheses H12a, H12b, H12c, and H12d relating KAAE to the four firm's performance are supported. Hence, KAAE has positively affected quality outcomes, business performance, customer satisfaction, and innovation.

Table 7: The t-test output for the structural equation model for KAAE model.

Path	Hypothesis	N	Mean	SD	Degrees of freedom	*t* statistic	*p* value	Decision
Quality Outcomes <--- KAAE	H_12a	24	4.2917	0.48715	23	12.989	0.000	Supported
Business Performance <--- KAAE	H_12b	24	3.9306	0.81637	23	5.584	0.000	Supported
Customer Satisfaction <--- KAAE	H_12c	24	4.2083	0.53670	23	11.030	0.000	Supported
Innovation <--- KAAE	H_12d	24	3.8750	0.72186	23	5.938	0.000	Supported

4. Results

The ISO 9001 quality management systems standard has been widely accepted around the world. This research reveals two important results. First, a positive understanding and use of ISO 9001 standard by Jordanian firms are reported. Thus, ISO 9001 certification is considered an important tool for improving the efficiency and effectiveness of quality management systems as reflected by improving quality outcomes, customer satisfaction, and business performance. This result was also reached by previous studies conducted in literature. Nevertheless, according to the ISO 9001 certified firms in Jordan, the ISO certification does not motivate firms' innovation, which is due to sticking to standard requirements and operational procedures. The second result is that KAAE acts as effective guidelines for

performance excellence and results in positive effects on quality outcomes, business performance, customer satisfaction, and innovation. This research recommends ISO 9001 certified Jordanian firm to integrate KAAE guidelines in their quality management system in order to achieve competitive performance.

5. Conclusion

This research investigates the effects of ISO 9001 certification and KAAE on Jordanian firm's performance using structural equation modelling and t-test, respectively. Four scale measures for firm's performance were considered, including quality outcomes, customer satisfaction, business performance, and innovation. First, the data were collected from one hundred and thirty ISO 9001 certified firms. Results showed that ISO 9001 certification has significant effect on quality outcomes,

business performance, and customer satisfaction. However, it showed insignificant effect on innovation. Then, KAAE effect on these four measures was surveyed in twenty four firms. According to respondents, this award showed positive effects on all the four performance measures. The results of this research provide evidence to quality managers that KAAE act as effective guidelines for achieving competitive performance, and hence they may consider the implementation of its requirements in their quality management systems.

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