An Evaluation of ISO 9000 International Quality Standards Implementation at Vocational-Technical Schools

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Executive Summary

This study surveys and measures the extent to which ISO 9000 international quality policies and procedures are related to problem solving and decision-making by employees of four vocational-technical schools located in the State of Pennsylvania, USA, during May 2001. Mediating variables include length of vocational-technical experience and the length of ISO 9000 implementation time. The results were representative, statistically significant, and tended to suggest that ISO 9000 quality policy and procedural knowledge were associated with improved problem solving and decision-making.

This research is multi-method, reports selected results from the quantitative survey stage, and is soon to be followed by qualitative, in-depth focus groups at eleven school locations. It is being conducted by the Institute for Research in Training and Development, Pennsylvania State University, and is funded by the Pennsylvania Department of Education.

Paul Krueger & Ajay Nair: A Survey of ISO 9000 International Quality Standards Implementation at Vocational-Technical Schools
1. **Overview**

George W. Bush has stated that the United States is currently in an “educational recession,” and has threatened to have their “federal money yanked away” if they do not improve their performance (McCaleb, 2000). The ISO 9000 standards have recently emerged from industry as one potential solution to the problems associated with education in the United States. Several schools around the country are experimenting with these international standards. The Pennsylvania Department of Education has funded the implementation and piloting of ISO 9000 at eleven vocational-technical schools, the Jefferson County Schools in Colorado have adopted a program for continuous quality improvement based upon the standards (Jefferson County Schools, 2000), and the National Governors’ Association is coordinating efforts in some states to explore the possibility of establishing a common framework to measure quality based on the principles of ISO 9000 (Program Approval or Accreditation Processes, 1997).

1.1 **ISO 9000 Standards**

“You don’t have to do this. Survival is not compulsory,” commented the late quality expert, W. Edwards Deming, when asked about the importance of adopting and implementing the ISO 9000 international quality assurance standards (Johnson, 1993, p. v). The Eros behind ISO was the driving force of global free trade, as reflected by the signing of the Global Agreement on Tariffs and Trade by over 120 nations. ISO was viewed as a variant of the Greek *isos* that meant equal, and was seen as one way for the reduction of trade barriers by the establishment of a common set of quality standards that transcended national boundaries (Kantner, 1994). The Thanatos implied by Deming was driven by global competition, which tended to challenge the survival of organizations that failed to adopt competitive standards.

ISO 9000 was issued by the International Organization for Standardization of Geneva, Switzerland, and adopted by the European Community in 1987 as their standard for quality assurance (Sarin, 2000). These standards were revised in 1994 and again in 2000 (Conti, 1999). Survey questions used to measure the relationships specified in this research were operationized from these standards.

1.2 **ISO 9000 Applied to Vocational-Technical Education**

In the field of vocational-technical education, assessment served as a tool for “determining how and to what extent quality improvement systems (were) changing educational practices and outcomes” (Brown, 1997, p. 1). The traditional focus of assessment was on the
economic outcomes for students in areas such as job placement and earnings. Since the
passage of the Perkins Act of 1990 in the United States, measures of accountability have
shifted more in the direction of student learning (Inger, 1995). Towards this end, Izadi (1996)
suggested that ISO 9000 provided a standardized framework for the measurement and
documentation of curriculum, course objectives, and administrative procedures that functioned
to improve student learning outcomes.

2. Research Problem

No formal studies were found that evaluated the feasibility of implementing the ISO 9000
quality standards as a method to improve the performance of secondary level vocational-
technical schools. What effects that applied knowledge of these standards would have on
employee decision-making and problem solving had not been measured.

2.1 Knowledge of Quality Policy and Procedures

The ISO 9000 standards were a procedural approach to quality assurance (Clark &
Moreland, 1998). Reliability through process standardization was emphasized for people,
places and things involved in the production of products and services. Improved knowledge by
employees of these ISO 9000 quality policies and procedures has been shown to improve
private sector organizational performance as measured by a reduction of process non-
conformances (Krueger, 1999).

2.2 Decision-making and Problem Solving

It has been suggested that ISO 9000 standard requirements allowed management to
identify problems and develop a plans of action for correcting problems (Waks, 1999). This
research measured the extent to which ISO 9000 quality policy and procedural knowledge
tended to improve employee problem solving and decision-making in vocational-technical
schools.

3. Method

The employees of eleven publicly funded vocational-technical schools in the State of
Pennsylvania, USA, have been implementing the ISO 9000 international quality assurance
standards. The Institute for Research in Training & Development, Pennsylvania State
University, was contracted by the Pennsylvania Department of Education to formatively evaluate
four of these schools in terms of their implementation of the standards. The first stage in the
evaluation process was to conduct a benchmark survey to measure progress and provide
feedback. The second stage called for the conduct of in-depth focus groups at each of the schools. This paper reports selected results of the survey stage of this study.

3.1 Subjects

A 100% sample of the population was drawn from the 389 administrators, faculty and staff employed at the Lehigh Career & Technical Institute, Steel Center AVTS, SUN Area Career & Technology Center, and the Altoona vocational-technical school. Each member of the population was included in the sampling frame and allowed an opportunity to participate in this survey, thereby reducing the sampling error to zero (McMillan, 1996).

The Lehigh, Steel Center and SUN vocational-technical school employees were selected to participate in this survey, as all three schools began their ISO 9000 certification process in September 1999, and achieved registration to the standards by the conclusion of this survey. Altoona began implementing ISO 9000 during October 2000, was still in process at the time of this survey, and included for comparison purposes.

A total of 224 employees completed the May 2001 survey questionnaire for a 57.6% response rate. This return exceeded the minimum 50 percent response rate suggested by Babbie (1998) to be “adequate for analysis and reporting” (p. 262). Furthermore, the size of the response exceeded the needed sample size of 194 participants to be statistically representative of the population at the 95 percent confidence level, with a confidence interval of plus or minus 5 percent (Isaac & Michael, 1997).

3.2 Procedure

A survey questionnaire that measured the independent, dependent and mediating variables was developed, expert panelled and pre-tested. Items were constructed with reference to the ISO 9000 standards and related literature. A reliability coefficient was computed for the ordinal level, 5-point scale items that measured quality policy knowledge, quality procedural knowledge, problem solving and decision-making. The Cronbach alpha value obtained was .8025 for 216 cases, which met or surpassed the expected reliability measures for internal consistency of scales specified by McMillan (1996) to be “generally around .75” (p. 148), or Klimczak and Wedman (1997) to be “around .70” as falling “in the acceptable range” (p. 79). This result suggested that the differences between survey respondents would more than likely be due to different opinions, and not because the survey items were confusing or had multiple interpretations; i.e., that the items were internally consistent (SPSS, 1999).
The chief administrative officer was responsible for administering the survey to the employees at the four vocational-technical schools. Confidentiality was ensured through the use of a blind, ballot box method, where employees would voluntarily insert their survey instrument through a slot in a secured box. There were no identifying names or numbers recorded or questions asked that would reveal the specific identity of the respondents.

4. Results

The 224 completed survey instruments were first electronically scanned into a database, then imported into a SPSS, Version 10.0, spreadsheet statistical software package for data analysis. Nonparametric statistics were used to analyze the relationships between variables. This method was subject to less error than product-moment correlations when measurement had only the power of ordinal level (Walsh, 1990).

4.1 Correlations

Spearman rho rank-order correlation statistics were computed and measured the relationships between the variables in this study. The findings revealed that there were positive correlations between the independent variables and the dependent variables that were statistically significant at the p<.001 level for the total sample. ISO 9000 quality policy knowledge was related to problem solving (rho = .386, n = 218) and decision-making (rho = .368, n = 217), and ISO 9000 quality system procedural knowledge related to problem solving (rho = .479, n = 217) and decision making (rho = .443, n = 216).

4.2 Length of Experience

Length of vocational-technical education experience was controlled to measure its mediating effects on the outcomes of this study. The mid-point in the sample distribution for length of experience allowed for the creation of two comparison groups: (1) employees with less than 10 years experience (n = 107); and (2) employees with 10 or more years experience (n = 116). Once again findings revealed that there were statistically significant relationships obtained between the independent and dependent variables at the p<.001 level uniformly for both groups.

Upon closer scrutiny, there appeared to be substantially larger correlations for the group with longer service when compared with their less experienced peers. ISO 9000 quality policy knowledge was related to problem solving (rho = .303, n = 105) and decision-making (rho = .315, n = 104) for the less-than-10 year group, whereas, the 10-year-plus group obtained higher...
values for dependent problem solving (rho = .483, n = 112) and decision-making (rho = .461, n = 112).

There appeared to be even greater differences in the correlations associated with ISO 9000 quality system procedural knowledge and the dependent variables. The group with lesser experience obtained significant, but lower correlations with dependent problem solving (rho = .314, n = 104) and decision-making (rho = .356, n = 103), when compared to the results of the more experienced group. For the 10-year-plus group, procedural knowledge was positively associated with problem solving (rho = .596, n = 112) and decision-making (rho = .516, n = 112).

4.3 Exposure to ISO 9000

The length of time that vocational-technical school employees had experienced the implementation of ISO 9000 was measured to assess what mediating effects may exist on the outcomes of this study. Towards this purpose, the school employees who initiated ISO 9000 implementation in October 2000 or 8 months ago were compared with the school employees who initiated their implementation September 1999 or 21 months ago and achieved registration to the ISO 9000 standards in December 2000.

All correlational values obtained were statistically significant, although the significance levels were better for the 21-month school (ranged from p<.008 to p<.001) when compared with that of the 8-month school (ranged from p<.050 to p<.018). This appeared consistent with the strength of the correlations between the two schools. ISO 9000 quality policy knowledge was related to problem solving (rho = .372, n = 42) and decision-making (rho = .488, n = 41) for the 21-month school, whereas, the 8-month school obtained lower values for problem solving (rho = .186, n = 79) and decision-making (rho = .208, n = 79).

These differences persisted and appeared greater for the association between ISO 9000 quality system procedural knowledge and the dependent variables. The 21-month school obtained markedly higher correlations with dependent problem solving (rho = .532, n = 41) and decision-making (rho = .479, n = 40), when compared to the 8-month school results for problem solving (rho = .209, n = 79) and decision-making (rho = .238, n = 79).

5. Conclusions and Limitations

The results from this study suggest that there were statistically significant correlations between ISO 9000 quality policy knowledge, ISO 9000 quality system procedural knowledge, problem solving and decision-making for a representative sample of the employees at four vocational-technical schools.
vocational-technical schools in the State of Pennsylvania, USA. Within this sample, subgroups of employees obtained higher or lower correlations between these variables. Employees with 10 or more years of experience demonstrated stronger correlations than less experienced peers. Employees who had more months of implementing the ISO 9000 quality system evidenced stronger correlations than those employees from a school with less exposure to ISO 9000.

As mediated by the length of vocational-technical employment and the length of exposure to ISO 9000 implementation, the results obtained in this research may be summarized by the following research hypotheses:

a. There is a positive association between employee knowledge of ISO 9000 quality policies and the perceived ability to problem solve and make decisions.

b. There is a positive association between employee knowledge of ISO 9000 system procedures and the perceived ability to problem solve and make decisions.

The limitations were typical to survey research. The standardized survey questionnaire items were approximate indicators of the variables used in this research, potentially simplifying complex phenomena for measurement purposes. Added to this limitation are those typically associated with cross-sectional surveys, lack of experimental controls, ordinal level data and the use of nonparametric statistics.

Correlation is not causation (McMillan, 1996). The statistically significant correlations reported in this research represent necessary but insufficient conditions to establish cause-and-effect relationships between the knowledge of ISO 9000 quality system policies and procedures, and problem solving or decision-making.

Although statistically significant and representative of the population at the p<.05 level (Isaac & Michael, 1997), the 57.6 percent return rate may possess sources of bias resulting from respondents self-selecting themselves for participation in this survey. Babbie (1998) has noted this potential for bias, while at the same time having concluded that a response rate of 50 percent is “adequate for analysis and reporting” (p. 262).

References


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