

Factors affecting quality management at the Thai national institute of health

Factors
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Abstract

Purpose – The purpose of this paper is to confirm and examine organization-related factors that could affect quality management at the Thai national reference laboratory known as National Institute of Health.

Design/methodology/approach – The authors invited 340 laboratory staff members to complete a questionnaire that enquired about their skills, opinions, perceptions, leadership, work environment, organizational culture and organizational commitment in relation to quality management. Confirmatory factor analysis (CFA) and multiple linear regression were used to analyze the data.

Findings – In total, 65 percent of institute members responded to the questionnaire. CFA revealed that all factors were related to quality management. Three factors, leadership, organizational commitment and work environment, significantly affected quality management, but organizational culture did not.

Research limitations/implications – Other data types should be collected for an in-depth understanding, i.e. focus groups or in-depth interviews. A longitudinal study could also enhance quality management understanding to see how each variable changes over time.

Originality/value – Analyzing quality management through confirmatory factor and regression analysis showed that the four analyzed variables are statistically significant in relation to quality management at the laboratory. Managers could apply this information to revise the current policy.

Keywords Thailand, Quality management, Confirmatory factor analysis

Paper type Research paper

Introduction

The Thai National Institute of Health (NIH) is authorized as a national reference laboratory. The Institute managers' vision is to become a leading laboratory for solving public health issues including testing for emerging and re-emerging diseases. The functions of the Institute include carrying out clinical research and working with other institutes or organizations within the country and also with international health organizations, such as the World Health Organization, the Japanese International Cooperation Agency and the US Centers for Disease Control and Prevention and other non-governmental organizations. Providing quality-certified references to other laboratories within the country is among the Institute's primary functions. The aim is to improve accuracy, efficiency and continuous improvement of the clinical laboratory. According to the Institute's current policy, work and safety practices are distributed to staff members through a policy manual (NIH, 2013).



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At the NIH, International Organization for Standardization (ISO) certification shows that the Institute's quality is internationally accepted through ISO 9001, ISO 15189, ISO 17025 or other local laboratory standard requirements. It is, therefore, imperative to maintain its quality as a national reference laboratory (Anapattussapong, 2013). However, the four generally recognized organizational factors are studied to see how they related to quality management at the Thai National Reference Laboratory: leadership; organizational culture; work environment; and organizational commitment. This study provides important empirical evidence for managers to enhance, increase or empower their staff members regarding each factor to strengthen their quality management policy. It aimed to investigate these factors by using statistical methods to measure their quality management effects.

Literature review and hypotheses

Although there is substantial literature on quality management in Thailand, there is little or no research on the organizational factors that affect quality management at the public health institute. Additionally, the NIH may have limited resources such as inconsistent funding for projects or inadequate information technology (IT), which is essential for data analysis. Focusing on utilizing IT tools may help improve the public health service quality (Hiwotu *et al.*, 2014; Weaver *et al.*, 2016). The five factors that we examined were defined as constructs and they were latent variables.

Organizational factors related to quality management

Leadership

Leadership is an effective way to motivate staff members to perform well (Reddy, 2014). An individual can lead, persuade or motivate others to work or perform tasks on their own to meet the organization's goals and objectives. Leadership in this study means self-leadership (Stewart *et al.*, 2011), and it is defined as a staff member's ability to achieve his/her goals while working toward the organization's objectives. One individual could voluntarily mentor, coach or help another with his/her work (McNamara *et al.*, 2014). Leadership involves each staff member working on possible processes and procedures, which results in organizational development and achievement (Cable and Graham, 2018). The characteristics or qualities of various personnel who exhibit leadership attributes, whether or not they are in leadership positions, are observed.

Various leadership studies have been conducted in the private but not in the public sector (Chaijukul, 2010; Das *et al.*, 2011; Laohavichien *et al.*, 2011; Kantabutra, 2011; Andressen *et al.*, 2012). These studies found that individuals who have leadership qualities influence other staff members who subsequently improve their daily performance and achieve beyond the organization's goals. Leadership can be found at any level within the organization and can facilitate organizational learning (Yukl, 2013). Leadership studies reveal that leadership has a relationship and/or effect on quality management, especially when managers have to implement quality management programs (Chaijukul, 2010; Laohavichien *et al.*, 2011; Kafetzopoulos *et al.*, 2015; Gopee and Galloway, 2017). Individual staff members who exhibit leadership have various leadership attributes, e.g., having a good judgment, achieving significant outcomes, sustaining an intrinsic driving force, maintaining an open-mind regarding change and adaption and asserting a proactive attitude toward common goals. These leadership attributes have been studied for decades. Leadership theory has been put into practice and it focuses on the relationships and perceptions among personnel who share benefits when working in an organization (Northouse, 2018).

Latham (2014) noted that staff leadership and positive behavior helped improving the organization's quality and innovative culture. People with leadership value opinions from

others and try hard to gain trust from them by constantly building relationships. They realize that they have to carefully choose the timing and wait to find a way to make their ideas work and make a change. This is when a leader acts as a quality management change agent (Goetsch and Davis, 2014). Employees are coached and made to work as a team and to adhere to commitments made on quality goals. The empirical model of McFadden *et al.* (2015) supports our study. They found that leadership was a causal variable in continuous quality improvement.

Culture

Organizational culture is a complex and collective phenomenon for which data should be considered at group level. Organizational culture is rooted in anthropological work and is sometimes ambiguous (Scott *et al.*, 2003). It refers to norms, beliefs, attitudes, values and understandings that are shared among members. It is experience and members' expectations within such an organization. It refers to appropriate norms that personnel would use or pursue to carry out their tasks. It could affect the organization's quality management performance and productivity (Ashkanasy *et al.*, 2011). Rad (2006), Baird *et al.* (2011) found that culture had the maximum effect on quality management. Therefore, recognizing organizational culture and its effect on quality improvement is indispensable (Power *et al.*, 2010).

A Thai study revealed an organizational culture and commitment that was significantly related to the Institute's goals, including quality management policy (Anapattussapong, 2013). Haushildt and Konradt (2012) and Manz (2013) focused on self-leadership as each staff had skills. Self-leadership was defined as a process used to motivate oneself or others. It is important for organization's effectiveness (Andressen *et al.*, 2012). Organizational culture is also associated with leadership. A study involving leadership and organizational culture showed that communication was significant among the two variables (Kramer and Crespy, 2011). Kramer and Crespy's study focused on effective communication among staff members who had self-leadership and who tried to persuade other staff members to believe that they could achieve their goals. Collaborative work in leading and decision making was practiced by individuals through leadership and culture. Self-leadership resulted from the efforts of staff members to survive within the organization. Senior staff members working in a problem-solving culture helped solving the organizational problems. Hartnell *et al.* (2016), therefore, defined culture as the unconscious ways by which people do things and make things work. Staff members in other organizations may be indifferent toward leadership or may see it as a negative consequence from strong bureaucracy or professional ideology, which could create barriers between employees in an organization and could make cooperative tasks difficult. Therefore, understanding leadership may be complicated in different organizational cultures (Alvesson and Spicer, 2011). Leadership could create various organizational patterns depending on human nature, power, hierarchies, social relations and beliefs, which could be called as a leader-driven organizational culture wherein leadership could play a part in establishing values and ideas (Bryman *et al.*, 2011). Alvesson and Spicer (2011) noted that leadership and organizational culture influenced each other within organizations. Individual leadership can use organizational practices to change quality practice in organization (Valmohammadi and Roshanzamir, 2015).

Work environment

Work environment is a wide-ranging definition with various implications. It could refer to facilities or any factors that help to facilitate tasks within an organization and affect organization quality management, i.e. workplace setting, tools or utilities, technical/personnel assistance, relationship with other organizations and resource adequacy.

However, we focused on support from supervisors, physical conditions, tools and job aids, workload and climate within the organization, which affect staff commitment, quality management and care quality (Capuano *et al.*, 2005; Aiken *et al.*, 2011; Kieft *et al.*, 2014; Zúñiga *et al.*, 2015). Calcedo *et al.* (2015) mentioned that work environment was important and was associated with quality management, safety, error prevention and normal operating conditions in the workplace. Sufficient resources in the work environment help staff members to increase productivity and also to become more committed toward quality management. However, insufficient resources challenge them to conduct or control their work. Talukder *et al.* (2018) found that supervisor support was a direct causal factor for staff or job satisfaction, providing knowledge and training opportunities, but an indirect factor for staff or organizational performance.

Duffield *et al.* (2011) researched workload and related it to patient outcome including quality management and medical errors. The study examined workload in work environments. If workload increased with the increased patient turnover, then the nurses had to work harder, i.e. the organization needed more nurses to complete the work and maintain the same work quality and safety. Melnyk *et al.* (2014) found work environment as an evidence-based factor that had an effect on patient outcomes.

Work environment generated consistent interaction between staff and managers. Physical conditions and infrastructure along with communication helped staff members to perform well. Abu Al Rub's study stated that work environment is a prerequisite factor for organizational commitment and has a significantly positive staff retention causal effect. The conclusions agreed with the previous work environment and commitment studies (Abu Al Rub *et al.*, 2016).

Organizational commitment

A force that brings each staff member together to perform relevant actions to meet an organization's criteria, targets, objectives or goals is called commitment (Sim, 2011; Choi *et al.*, 2015), which differs from motivation or other positive attitudes. Staff relationships within an organization are important for an effective and efficient workplace (Ashkanasy *et al.*, 2011). Higher commitment can have positive consequences and lower commitment can have negative consequences (Abbott *et al.*, 2005). Many studies examine employee commitment and the intention to remain loyal to organizations (Kalidass and Bahron, 2015; Tarigan and Ariani, 2015; Boamah and Laschinger, 2016; Gade, 2017). Employees are loyal when they are committed and they are unlikely to leave. Therefore, committed employees are more likely to be active and productive and achieve quality goals (Carney, 2011). Dhar (2015) found commitment to be an organizational quality service mediator.

Autthateinchai (2013) studied NIH staff commitment and provided information on staff turnover. Only one civil servant resigned in 2008 and none in 2009–2010. In 2011, five officers left owing to a voluntary early retirement program. However, each year, the institute lost a competent staff member. In the four years, between 2008 and 2011, 43, 38, 34 and 40 temporary staff members, respectively, left, and in 2014, 48 staff members resigned out of 181 temporary staff members. This exodus could delay programs or cause projects to be discontinued, especially quality management tasks. The Thai NIH managers needed to replace staff members who had left and they also had to spend time and financial resources to train new staff members. Also, once new staff members had been hired, it took time to train them to the same competency as the staff members who had left (Pati, 2012). Organizational commitment is a better indicator than job satisfaction for predicting staff turnover, even when other studies argue that both were equally important indicators (Humphreys *et al.*, 2005; Lee and Gao, 2005; Swarts, 2008). Organizational commitment was associated with quality management. Menezes's (2012) study revealed 58 percent of quality management variance can be explained

by organizational commitment. Getting commitment from employees was important for a continuous quality improvement, which is a crucial element in quality management work. Top manager commitment is also important according to Kumar's commitment paradigm (Kumar *et al.*, 2012), Kemenade's quality management key practices (Kemenade, 2014) and Weckenmann's quality paradigm (Weckenmann *et al.*, 2015).

Quality management

The quality performance and processes relevant to quality within the organization were focused, which improved workforce capability, quality management processes and performance. A Malaysian study mentioned a quality management system that involved various processes, including monitoring and continuous process and performance effectiveness (Basir *et al.*, 2017). Staff members within the organization have to identify and consider client needs in an appropriate and systematic way to satisfy clients by eliminating or decreasing errors.

Structures and processes improve service quality, internal and external client satisfaction and continuously reduce defects. Managers could use this information for their decision making to actively involve staff members and to place emphasis on a continuous quality improvement. Quality management measures the overall management functions and quality implementation through quality assurance and quality control (Weckenmann *et al.*, 2015). Success in quality management requires a specific culture within the organization and management support (Mosadeghrad, 2012). Kumar's study provided a perspective on quality management research methods, which could help organizational research and development (Kumar *et al.*, 2012). Another study (Kumar *et al.*, 2018) mentioned quality process, key practices and performance for successful quality management. Our quality management model is considered as a dependent variable (DV), whereas leadership, organizational culture, work environment, organizational commitment are independent variables (IDVs).

The Thai NIH has a quality management system in place, including quality assurance and quality control programs. Top managers and their staff members try to improve the system and make the system more effective or meaningful. To improve quality in the organization and to raise its quality up to the standard required by the organization policy, organizational development could be used to handle operations and communications among staff members (Xianting, 2010). Without considering organization's type and size, top managers and their staff members commonly encounter two main challenges as they grow: how to continuously adapt to a rapidly changing environment and how to maintain success. To overcome these challenges, they need to learn about their own situation, to deal with organizational problems, to make appropriate decisions, and learn the ways to foster trust, communication and coordination (Xianting, 2010; Weckenmann *et al.*, 2015).

Laboratory quality must meet national and international standards. Therefore, we intend to look for data and information concerning various organizational factor roles in maintaining quality management. It is important to determine and identify the various organizational factors contributing to an appropriate quality management process and performance (Singh, 2011; Nasim, 2018). There is not much evidence-based research in quality management that is reflected by organizational factors, especially in public health institutes of developing countries. An important starting point is to identify the factors constituting good quality management. Once these are known, the top managers can determine the procedure to support planning and policy implementation based on this study's findings. The team should review the management process in which their staff members are involved. Staff members could collect data and information to aid decision making (Theodorou and Giannelos, 2015). One study mentioned utilizing statistical methods to help quality management as a tool to measure several analytical techniques (Nasim, 2018). Research findings will improve understanding about organizational factors relating

to quality management, and it may be possible to make distinct progress or improve organization's effectiveness, especially in the quality management area.

The researchers proposed the following five hypotheses and investigated their relationships and effects on quality management:

H1a. Leadership has an association with organizational culture, work environment, organizational commitment and quality management.

H1b. Organizational culture has an association with leadership, work environment, organizational commitment and quality management.

H1c. Work environment has an association with organizational culture, leadership, organizational commitment and quality management.

H1d. Organizational commitment has an association with work environment, organizational culture, leadership and quality management.

H1e. All factors have an effect on quality management.

Methodology

The researchers used a cross-sectional research design. They asked staff members of the institute to respond to a 60-item questionnaire in relation to leadership, organizational culture, work environment, organizational commitment and quality management. Each question was examined using exploratory factor analysis (data are not shown here), Cronbach's α reliability test and content validity. Cronbach's α coefficient was 0.94, which is acceptable (Field, 2006). Content validity was checked by three quality management scholars.

In total, 340 questionnaires were distributed and 223 responses were collected (Table I). Confirmatory factor analysis (CFA) was used to analyze and confirm the concepts

Personal characteristic	Number (%)
<i>Gender</i>	
Male	55 (25)
Female	168 (75)
<i>Age (years)</i>	
21–30	69 (30)
31–40	89 (40)
41–50	39 (18)
51–60	26 (12)
<i>Education</i>	
Lower than bachelors	54 (14)
Bachelors or equal	127 (57)
Masters and higher	42 (19)
<i>Work experience (years)</i>	
< 1	22 (10)
1–5	71 (32)
6–10	46 (21)
> 10	84 (37)
<i>Job characteristics</i>	
Admin. and management	71 (32)
Academic and science	20 (9)
Lab services	132 (59)

Table I.
Demographic data

represented in the five variables. Multiple linear regression was later used to observe each factor's effect. Two statistical software packages were used: the Statistical Package for Social Sciences (SPSS version 18) and Analysis of a Moment Structures (AMOS version 18) for data analysis. An ethical approval was received to carry out the study from Mahidol University's ethics committee, and the study participants were informed that their responses were confidential and voluntary. The study design did not place the participants at any risk (e.g. questions were formulated so as not to make participants feel uncomfortable, which could disturb their psychological health).

Results

Before CFA, statistical assumptions were checked; the normality test showed no multicollinearity. The study sample size was acceptable (223/340 participants), with a 65.5 percent response rate (Byrne, 2016; Kline, 2016). The subject number-to-question item ratio was 223: 60 (3.7:1). Costello and Osborne (2005) noted that around 26 percent of studies had subject number-to-item ratios between 2:1 and 5:1. They also noted that if the ratio was small, more errors were likely to occur. We accounted for statistical measurement errors or residuals in the estimation analysis process using AMOS. CFA is a theory-driven approach, which allows researchers to assign question items to variables or factors, supported by previous research or theories. CFA is a legitimate method, since it is concerned with each factor's conceptual rationale as a hypothesis testing approach to data analysis (Byrne, 2016). The five measurement models had to be confirmed through CFA. CFA and goodness of fit were tested. Goodness of fit statistical indices inform if data are good enough and consistent with the CFA-hypothesized model.

The maximum likelihood estimation was used in the statistical model. Model estimation was performed through each construct variable. Goodness of fit indices (GFIs) were checked. There were some GFIs, which had values that indicated an acceptable model, whereas other values suggested that it was an unacceptable model. However, if most statistical fit indices provided sufficient fit, then it was considered that the hypothesized model was a statistically acceptable fit in the CFA model (Kline, 2016). Other statistically relevant index values are shown in Table II.

Normed χ^2 (CMIN, specific statistical term in AMOS) is a parsimonious measure using the ratio between normed χ^2 and df. Normed χ^2 divided by degrees of freedom (CMIN/df) is called a relative χ^2 . If the value is less than 1, then this indicates that it is overfitted, which is good for the model. A value between 1 and 2 typifies good fit. If the value is between 2 and 5, then the model is not good and requires adjustment. Root mean square residual (RMR) is also used to assess model fit, with a smaller number translating to a better value. The RMR standardized value is usually required (SRMR) and a value less than 0.08 is ideal (Tabachnick and Fidell, 2007; Byrne, 2016).

Root mean square error of approximation (RMSEA) values between 0.05 and 0.08 are acceptable (Kaplan, 2009). The ideal value would be less than 0.05, especially after model modification or adjustment. Normed fit index (NFI) and comparative fit index (CFI) are both baseline comparisons that are used to indicate good fit (Hair *et al.*, 2010; Kline, 2016). If both values are greater than 0.95, then this means the model has good fit. The other two important (GFIs) are GFI and the adjusted value called adjusted goodness of fit index (AGFI). Both GFI and AGFI values should be more than 0.95 (Byrne, 2016). The GFIs output from the first-order CFA is shown in Table II.

	χ^2	df	<i>p</i> -value	CMIN/df	GFIT	AGIF	CFI	RMR	RMSEA
CFA model	190	105	0.06	1.81	0.93	0.91	0.96	0.03	0.05

Table II.
CFA goodness of fit indices

The CFA-hypothesized model revealed that four variables/factors were associated with quality management. Leadership, organizational culture, work environment and organizational commitment had standardized regression weights of 0.37, 0.55, 0.61 and 0.54 respectively. The standardized regression estimate weights between variables are shown in Table III. After CFA was tested and confirmed, the relationships between observed or measured factors, multiple linear regression was performed to ascertain if these factors affected quality management in the model. The regression result is shown in Table IV.

Discussion

The *R*-squared value for Quality Management was 36 percent (Table IV). The unstandardized coefficients' column (*B* value) corresponds to the three latent variables (organizational culture was statistically insignificant, Table IV), which were IDVs when analyzed by multiple regression analysis. The IDVs indicated the extent to which DV would change if the IDV changes by one unit (Ho, 2006; Sarantakos, 2007). The *B* values in Table IV were interpreted accordingly: if organizational commitment is increased by one unit, then quality management (both performance and process) will improve by 0.24 units; and if work environment is increased by one unit, then quality management (both performance and process) will improve by 0.28 units; and if leadership is increased by one unit, then quality management (both performance and process) will improve by 0.14 units.

Organizational culture plays a statistically insignificant role in quality management at the institute. This may be explained by the questionnaires being too subjective or invalid, but all organizational culture questionnaire items had Cronbach's α values more than 0.90. Perhaps organizational culture does not play a key role at the NIH because 70 percent of staff members are aged between 21 and 40 years (Table II) and they can be considered as a younger generation who feel indifferent toward quality management or they believe that their voice or opinion may not be heard. Furthermore, top managers might not pay attention to what young staff members think, so their norms and beliefs do not affect quality management.

Table III.
CFA output correlations from AMOS

	Estimates
Leadership ↔ Org. culture	0.65
Org. culture ↔ Work environment	0.95
Work environment ↔ Org. commitment	0.76
Org. culture ↔ Org. commitment	0.66
Leadership ↔ Work environment	0.46
Leadership ↔ Org. commitment	0.45
Org. commitment ↔ Quality management	0.54
Work environment ↔ Quality management	0.61
Org. culture ↔ Quality management	0.55
Leadership ↔ Quality management	0.37

Table IV.
The output from the quality management model by multiple linear regression

Model	Variable	<i>R</i> ²	Unstandardized coefficients		Standardized coefficients	
			<i>B</i>	SE	β	<i>p</i> -value
3	Commitment	0.36	0.24	0.05	0.32	< 0.001
	Work environment		0.28	0.06	0.28	0.009
	Leadership		0.14	0.05	0.15	< 0.001
	Org. culture		0.09	0.08	0.08	0.244
	Constant		1.50	0.26		< 0.001

A hypothesized model was used and it was observed from academic and statistical perspectives. When looking at the regression analysis, a strategic plan could be modeled wherein organizational commitment could be the first factor that top managers would attend to, since it had the highest prediction value ($\beta = 0.32$, Table IV). Laboratory staff members could try to increase organizational commitment to obtain better results in quality management work. The regression equation showed:

$$\begin{aligned} \text{Quality Management} = & 1.50 + 0.24 \text{ Organizational Commitment} \\ & + 0.14 \text{ Leadership} + 0.28 \text{ Work Environment.} \end{aligned}$$

The study hypotheses, *H1a*, *H1b*, *H1c* and *H1d*, indicate that all variables or factors were associated or related to quality management. All variables or factors statistically affected quality management except organizational culture. The regression model proved that the three factors, organizational commitment, work environment and leadership, can explain about 36 percent of quality management variation. The regression model provided standardized coefficient β value as a measure affecting each variable or factor, and organizational commitment had the highest statistical effect on quality management.

Conclusions and limitations

All latent variables were evaluated according to the CFA model. Moreover, four hypotheses were accepted, *H1a*, *H1b*, *H1c* and *H1d*, i.e. not all factors affected quality management (*H1e*). Multiple linear regression was used to analyze the data. Three factors, organizational commitment, work environment and leadership, explain about 36 percent of variation in quality management. Organizational commitment had the strongest effect on quality management. New research could be undertaken to explain the remaining 64 percent of the variance.

Our findings indicate that three factors affect quality management. Data from staff members statistically supported the hypothesized model. Various statistical techniques were used to ensure that assumptions had not been violated for more sophisticated and comprehensive statistical methods, i.e. CFA and multiple linear regression.

One limitation was a short data collection time (two months), i.e. more time allows the researchers to reach more respondents to maximize data accuracy. The second limitation was that organizational-wide data were collected at a discrete point (rather than over a few months) to review how related factors change in a longitudinal study. Third, respondent-to-parameter ratio was 3.7:1 (a 65 percent response rate), which is less than the researchers' anticipated ratio (5:1 or 88 percent). A higher response rate decreases questionnaire item misclassification into wrong factors (Costello and Osborne, 2005). Nevertheless, the results could be generalized to other populations.

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