EJABM European Journal of Applied Business and Management

European Journal of Applied Business Management, 3(1), 2017, pp. 1-25. ISSN 2183-5594

Research paper

Measurement invariance of the Knowledge Management Questionnaire in local authorities

Submitted in 25, February 2016
Accepted in 23, March 2017
Evaluated by a double blind review system

ELISABETH BRITO[1], LEONOR PAIS[2], NUNO REBELO DOS SANTOS[3]

Abstract

Purpose: The aims of this research were to evaluate the validity and reliability of the Knowledge Management Questionnaire (KMQ), and to check in what extent the meaning of knowledge management is the same for workers in quality certified and non-certified Portuguese municipalities using measurement invariance tests.
Design/Methodology/Approach: The KMQ was applied to 972 employees providing data on four knowledge management dimensions. After Confirmatory Factor Analysis was performed, the test of configural invariance, the test of equality of factor loadings, the test of equality of indicator interceptions, the test of error invariance, the test of equivalence of factor variances, the test of invariance of covariances between factors, and the test of equivalence of error covariances were carried out. Five fit indices were used.
Findings: Taken together, the results suggest that KMQ is a valid and reliable instrument in the context of local government, and could be regarded as invariant across employees from certified and non-certified municipalities.
Research limitations/implications: We cannot assume that the invariance is generalizable to other knowledge management instruments and other samples.
Practical implications: A reliable and valid instrument to measure knowledge management in organizations is available for practitioners use.
Originality/Value: The results support the use of the KMQ to test hypotheses focused on direct comparisons of knowledge management across the two groups, and to evaluate knowledge management in local authorities in the four dimensions.

Keywords: Measurement invariance; Knowledge Management Questionnaire; Local authorities; Quality certification.

1. Introduction

The present research aims to evaluate validity and reliability of the Knowledge Management Questionnaire – Short Form (Pais, 2014) in the local government context and to check if the meaning of knowledge management (KM) is the same for employees in quality certified and non-certified Portuguese municipalities using measurement invariance tests. Preliminary evidence of invariance of this measure was presented by Brito and Cardoso (2012). In this research we deepened the empirical

[1] School of Technology and Management of Águeda (ESTGA-UA), University of Aveiro, Aveiro, Portugal, Center for Health Technology and Services Research (CINTESIS). E-mail: ebrito@ua.pt.
[2] Faculty of Psychology and Educational Sciences, University of Coimbra, Coimbra, Portugal. E-mail: leonorpais@fpce.uc.pt.
[3] Escola de Ciências Sociais, Universidade de Évora, Évora. E-mail: nrs@uevora.pt.

evidence of this invariance.

The relationship between quality certification and knowledge management has been widely discussed and researched, and findings show that quality certification has a positive effect on knowledge management practices (Lin & Wu, 2005a, 2005b) and employee learning (Rodríguez-Antón & Alonso-Almeida, 2011). For example, quality certification promotes the development of a common language (Prajogo, Huo, & Han, 2012) that fosters the transferability and usability of the organization's knowledge (Molina, Montes, & Fuentes, 2004); it increases the capacity to encode knowledge (Bénézech, Lambert, Lanoux, Lerch, & Loos-Baroin, 2001; Zetie, 2002); it facilitates the implementation of training programmes with contents related to effective improvement in the quality of work (Kuo, Chang, Hung, & Lin, 2009; Wahid, Corner, & Tan, 2011); it promotes incremental innovation through the use of documented organizational knowledge (Benner & Tushman, 2002); it impacts on non-financial performance (Islam, Karim, & Habes, 2015); and it improves process innovation (Ratnasingam, Yoon, & Ioraş, 2013).

In common with other sectors, local government has been implementing the quality certification process, raising the need for a measure of knowledge management able to respond effectively to the specificities of this sector. There is still scant research on knowledge management measurement in local government. Therefore, the measurement equivalence/invariance of knowledge management scales applied to certified and non-certified organizations is also under-researched.

The implementation of quality certification involves changes in the organizational culture (Abdullah & Ahmad, 2009; Lin & Wu, 2005a, 2005b; Prajogo et al, 2012; Spencer, 1994) that may affect employees' interpretation of knowledge management (e.g., workers in certified and non-certified organizations may construe items focused on knowledge management differently and/or with a different factor structure). If knowledge management measures are equivalent/invariant for employees in certified and non-certified organizations, we can confidently generalize the meaning of knowledge management to each context (Chen, Sousa, & West, 2005). The non-existence of measurement invariance across groups potentially implies that the instrument we are using measures different things in certified and non-certified organizations, that we are measuring knowledge management with different and not directly comparable measurement scales, and that we are collecting data where employees evaluating the same knowledge management level have different scores (Raju, Laffittee, & Byrne, 2002). Therefore, the lack of measurement invariance would likely lead to the conclusion that differences in knowledge management in certified and non-certified organizations are due to measurement non-equivalence and not to factual differences in organizational processes of knowledge management. In such a scenario, the relationship between quality certification and knowledge management would probably be artifactual (Vandenberg & Lance, 2000).

Despite the importance of knowing what measurement issues we are dealing with when testing hypotheses and to what extent scores from different groups are directly comparable, measurement invariance is usually assumed and rarely tested (Raju et al, 2002). However, it is well recognized that the collection of valid and comparable information across different cultures, genders, types of organizations and languages is only possible with evidence of measurement invariance (Vandenberg & Lance, 2000). In the present research we tested the dimensionality, the convergent and discriminant validity and the measurement invariance of the Knowledge Management Questionnaire – Short Form (KMQ-SF; Pais, 2014) in employees in ISO 9000

(International Standardization Organization) certified and non-certified municipalities.

1.1. Knowledge and knowledge management

The seminal contributions of some authors (e.g., Davenport & Prusak, 1998; Nonaka, 1991; Nonaka & Takeuchi, 1995; Sveiby, 1997) facilitated the emphasis on knowledge and its management in organizations. Knowledge can have different meanings and be classified in multiple ways (Ipe, 2003). The division into tacit and explicit knowledge is widely recognized (Nonaka, 1994; Nonaka & Takeuchi, 1995; Polanyi, 1966). Tacit knowledge is above all practical, associated with personal experience, dependent on context and personalized, while explicit knowledge is easily codified and transferred, and founded on education (McAdam, Mason, & McCrory, 2007; Polanyi, 1966). This classification frequently leads to another, in which organizations can adopt one of two orientations in implementing knowledge management: "focused on people" (mainly tacit knowledge) or "focused on technology" (mainly explicit knowledge) (McDermott, 1999; McElroy, 1999). Considering the contingent nature of the meaning of knowledge, there is some consensus today regarding the need for its management to include not only these two aspects (McElroy, 1999; Cardoso, 2007), but also a facilitating action to carry out the organizational strategy and a cultural context facilitating that strategy and promoting collective understanding which is discursively built, supported and shared.

Organizational knowledge is also an important concept and can be considered as a "product and determinant of individual behaviour and input and output of organizational functioning" (Pais & dos Santos, 2015, p. 279). Organizational knowledge comes from efficient and effective knowledge management that has been considered differently over time. For example, as a process or a set of processes (Bassi, 1997; Bhatt, 2001; White, 2004), as a set of actions essentially linked to the use of technology (Strapko, 1990) or as an organizational strategy (O'Dell, Wiig, & Odem, 1999). Despite the coexistence of different approaches to knowledge management, Alavi and Leidner (2001) emphasized that there is no single or optimal approach as this would depend on the perspective of knowledge adopted and the application context. Dalkir (2005) considers that there is some consensus to admit that knowledge management is a highly multidisciplinary field of study. In the present study we adopted Cardoso (2007)'s Knowledge Management Model, which includes six processes: creation and acquisition, sense-making, sharing and dissemination, organizational memory, measurement and retrieval of knowledge. To these six processes a seventh was added related to the use of knowledge (Cardoso & Peralta, 2011). Based on this theoretical model the Knowledge Management Questionnaire (KMQ) was developed, expanding the understanding of knowledge management processes in organizations in a tetra-dimensional structure made up of four basic components: knowledge-centred culture (KCC; Cardoso, Meireles, & Peralta, 2012; Davenport, De Long, & Beers, 1998), knowledge-competitive orientation (KCO; Cardoso & Gomes, 2011; Hitt, Bierman, Shimizu, & Kochar, 2001), formal knowledge management practices (FKMP) and informal knowledge management practices (IKMP; Cardoso et al, 2012; Dixon, McGowan, & Cravens, 2009; Lee, 2001; Yi, 2009).

A knowledge-centred culture, also called a knowledge-friendly culture (Davenport et al, 1998), is a necessary condition for the success of knowledge management (Alavi & Leidner, 2001; De Long & Fahey, 2000; McDermott & O'Dell, 2001). It reflects a set of organizational values and institutionalized rules, norms, procedures and principles

that act as a common reference for employees and that emphasize the value of knowledge in day-to-day decisions, nurturing and facilitating the creation, sharing and use of knowledge (Cardoso & Gomes, 2011; Janz & Prasarnphanich, 2003).

A knowledge-competitive orientation aims primarily for an effective adaptation to the external environment and to competitors' behaviour (Cardoso & Gomes, 2011; Kumar, Subramanian & Yauger, 1998). This knowledge management component stimulates the commitment of all organizational employees to continually analyse weaknesses and strengths in the knowledge held by the organization and by competitors (Tokarczyk, Hansen, Green, & Down, 2007). Knowing which knowledge is unique and valuable can be the basis of organizational competitive advantages, improving the capacity to surpass competitors and continually improve (Barney, 1991; Hitt et al, 2001).

Knowledge management practices can be formally instituted and/or informally developed (Cardoso et al, 2012; Lee, 2001; Pakstas, 1999). Formal knowledge management practices foster the creation, acquisition, share and use of knowledge that arises from, for example, attending conferences and training courses, solving problems in work meetings, and formal information circuits. Knowledge repositories and technological systems (e.g., databases, procedure reports, manuals, intranet) support the preservation, sharing and use of this, mainly explicit, knowledge (De Long & Fahey, 2000; Scarbrough & Swan, 1999). A dominant focus on formal knowledge management practices can, however, lead to a loss of richness associated with interactive, face-to-face and informal communication (Fahey & Prusak, 1998). Consequently, to manage knowledge properly it is also necessary to consider and promote informal knowledge management practices (Dixon et al, 2009).

Through informal conversations, employees comment on the development of their projects with each other, exchange ideas and ask for advice, reflect on the state of the organization and share stories about past events (Webber, 1993; Yi, 2009). These informal practices are not directly manageable (Cardoso et al, 2012) and are carried out mainly under the umbrella of organizational culture (Tucker, Meyer, & Westerman, 1996). They depend heavily on the informal organizational network of relationships that nurture discursive practices in creating and sharing mainly tacit knowledge, and in promoting a similar social construction of knowledge.

1.2. Quality certification in local authorities

One of the most recognized, accepted and implemented quality standards is ISO 9000, developed by the International Organization for Standardization. Organizations have sought this certification due to both internal and external motivations. In the first case, we can mention the intention to improve and simplify procedures (White, Samson, Rowland-Jones, & Thomas, 2009) and develop processes related to the human factor (Karapetrovic, Casadesús, & Heras, 2010; Magd, 2010). In the second, the pressure from customers or the market, to improve relationships with suppliers or the desire to improve the company's image (Kammoun & Aouni, 2013; Karapetrovic et al, 2010; Kaziliûnas, 2010; Magd, 2010; Martinez-Costa, Martinez-Lorente, & Choi, 2009) are illustrative examples. The ISO 9000 standards for quality management systems aim to meet the customer's quality requirements, enhancing customer satisfaction while fulfilling formal quality requirements, and achieving quality through the continuous improvement of organizational processes (Hoyle, 2009; Rumane, 2011). Implementing the standards builds quality through procedural analysis of the organizational activities that cause quality and non-quality. This type of structured approach encourages people

to work collaboratively, bringing about synergies, demanding efforts for change and involving all stakeholders.

Considering these characteristics of the ISO 9000 standard, it becomes clear that quality certification is usually adopted as a tool within a broad strategy aiming to acquire organizational competitive advantage through quality management (Anderson, Daly, & Johnson, 1999; Hoyle, 2009; Prajogo, Huo, & Han, 2012). The adoption of this broad strategy entails a cultural shift that supports and nurtures a quality management approach (Detert, Schroeder, & Mauriel, 2000; Laszlo, 2000). Indeed, quality certification implies that organizations try to introduce new organizational and management systems, and not just acquire more or better equipment (Deming, 1995), inducing fundamental changes that demand a quality culture based on shared values, strategies, beliefs, attitudes and behaviours, necessary competencies and everyday procedures while following processes, rules and regulations (Crosby, 1994; Ehlers, 2009; Grant, 1996; Spencer, 1994).

Examples of organizational changes associated with the implementation of ISO 9000 Quality Management System are the improvement of organizational communication systems (Subramaniam, 2010), the nurturing of a collaborative culture between employees (Srivastav, 2010) and a positive influence on several aspects of human resource management – reduced turnover, increased enthusiasm at work, employee satisfaction, employee participation in decision making, professional skills and knowledge development (Dragicevic & Letunic, 2011). In turn, these fundamental changes foster an organizational culture focused on quality. Indeed, "Quality culture formation occurs through integrated changes in the organizational system; an organizational quality-based vision, mission and goals, consistent formal and informal organizational structures, compatible reward systems, appropriate technology and job design, and attention to important personnel issues" (Terziovski, Power, & Sohal, 2003, p. 583). All these changes make certified and non-certified organizations very different regarding related processes, such as knowledge management.

The Portuguese local public sector relies greatly on a hierarchical model of organization (Brito, 2010). In public organizations decision-making is usually centralised, decisions are made at the higher levels of the organization (Watson, 2003), and technological resources and formal knowledge management practices play a central role (Pollitt, 1990; Haynes, 2003; Hughes, 2003). Today, many municipalities have quality certification or have already begun processes to obtain quality certification. This quality certification has changed the management of municipalities in general and of Portuguese municipalities in particular (Brito, Cardoso, & Peralta, 2010; Haynes, 2003; Hughes, 2003). Those councils certified with the standard ISO 9000 have experienced changes in their organizational culture, and in the attitudes and behaviours of their employees (Brito et al, 2010).

The population of local authority employees, therefore, operates under two different management models and organizational cultures – one in certified municipalities and another in non-certified municipalities. The quality-related culture shift (Brito et al, 2010; Lin & Wu, 2005a, 2005b), intensifies development of a common language and improvement of communication systems (Prajogo et al, 2012; Subramaniam, 2010) and may lead to differences between certified and non-certified municipalities not only in knowledge management practices (e.g., Bénézech et al, 2001; Benner & Tushman, 2002) but also in knowledge management's meaning and conceptualization. To rule out different conceptions of the relationship between quality certification and knowledge management, the meaning of knowledge management across certified and

non-certified municipalities must be invariant.

1.3. Overview of the present research

Compared with the number of studies carried out in the private sector, knowledge management has been less studied in the public sector (Salleh, Chong, Ahmad, & Ikhsan, 2012). Previous research has been primarily interested in the role of technology and of e-government services (Ling, 2002), and has analysed specific sub-sectors or sub-areas such as the police (Luen & Al-Hawamdeh, 2001), health (Dixon et al, 2009; Van Beveren, 2003) and accountancy (Salleh et al, 2012). Additionally, despite strong support for the multidimensionality of knowledge management (e.g., Cardoso & Gomes, 2011; Evans, Dalkir, & Bidian, 2014; Davenport & Prusak, 1998), in the local public sector it has been studied considering mainly technological resources and formal knowledge management practices (Haynes, 2005; Hughes, 2003).

In this study, we tested the validity, reliability and measurement invariance of a multidimensional knowledge management instrument in a sample of employees in Portuguese ISO 9000 certified and non-certified municipalities. The Knowledge Management Questionnaire-Short Form (Pais, 2014) was used to assess the knowledge management perceptions of employees in certified and non-certified municipalities. This instrument measures four dimensions of knowledge management: knowledge-centred culture, competitive orientation, formal knowledge management practices and informal knowledge management practices. In keeping with previous research on measurement invariance, our focus is on the null hypothesis, or in other words on the measurement invariance of these four dimensions of knowledge management across certified and non-certified municipalities.

2. Method

2.1. Participants and procedure

In order to fully understand the characteristics of the population of Portuguese municipalities (N = 278), we collected information from several European institutions (e.g., Local Government General Administration, National Institute of Statistics, National Association of Portuguese Municipalities). The main characteristics referred to were geographical location, size in terms of employees and of population served, and quality certification. A set of 40 local government organizations with customer service and/or departments of urban planning, certified with the ISO 9000 were contacted and agreed to participate in this study. Using an equal probability selection method, we selected a paired sample of non-certified municipalities that matched the characteristics of the population, and also of the sample of 40 quality certified organizations, regarding geographical location and size in terms of employees and population served. The population of the certified municipalities had, at least, one certified department (urban planning and/or customer services). In certified municipalities data were only collected from people who worked in the certified department(s). All the municipalities selected for the non-certified sub-sample had no department that was certified or was in the process of being certified. In these municipalities data was only collected from people who worked in the department of urban planning and/or customer services. This method ensures greater control of attributes other than quality certification that might bias the meaning of knowledge

management for employees and consequently the measurement invariance results.

Two members of the research team visited each organization to collect data from employees. Participation was voluntary and anonymous. The sample consisted of 972 employees from 80 Portuguese municipalities: 560 employees from 40 certified municipalities and 412 from 40 non-certified municipalities. Table 1 presents a summary of the socio-demographic characteristics of the sample.

Table 1 – Socio-demographic Characterization of Participants (N = 972)

Socio-demographic characteristics of participants	Certified		Non-certified	
	Frequency	Percentage	Frequency	Percentage
Tenure in the organization				
Under 1 year	27	4.8	13	3.2
Between 1 and 5 years	85	15.2	61	14.8
Between 5 and 10 years	144	25.7	106	25.7
Over 10 years	295	52.7	229	55.6
Did not answer	9	1.6	3	0.7
Function held				
Clerical	275	48.9	191	46.4
Consultant	4	0.7	2	0.5
Leadership role	30	5.4	35	8.5
Political Leader	1	0.2	1	0.2
Manual worker	9	1.6	3	0.7
Qualified manual worker	5	0.9	5	1.2
Professional position	81	14.5	76	18.4
Higher professional position	141	25.2	95	23.1
Did not answer	15	2.7	4	1.0
Area of work				
Administration - Finance	50	8.9	40	9.7
Consultancy	6	1.1	3	0.7
Social	1	0.2	6	1.5
Town planning	238	42.5	235	57.0
Customer service	159	28.4	70	17.0
Works and maintenance	35	6.3	21	5.1
Other	45	8.0	14	3.4
Did not answer	26	4.6	23	5.6
Age				
Between18 and 24	14	2.5	4	1.0
Between 25 and 34	186	33.2	130	31.6
Between 35 and 49	282	50.4	217	52.7
Between 50 and 64	60	10.7	55	13.3
Over 65	2	0.4	1	0.2
Did not answer	16	2.9	5	1.2
Gender				
Male	194	34.6	239	58.0
Female	351	62.7	167	40.5
Did not answer	15	2.7	6	1.5
Academic qualifications				
Primary education (1 to 4 years)	7	1.3	2	0.5
Primary education (5 to 6 years)	8	1.4	0	0.0
Junior secondary (7 to 9 years)	46	8.2	33	8.0
Senior secondary (10 to 12 years)	278	49.6	234	56.8
Diploma	18	3.2	12	2.9
First degree	177	31.6	113	27.4
Master/Doctorate	13	2.3	14	3.4
Did not answer	13	2.3	4	1.0
Total	**560**	**100.0**	**412**	**100.0**

Source: Authors.

2.2. Measurement

Employees' perceptions of the applicability of knowledge management dimensions were assessed with the 22-item Short Form Knowledge Management Questionnaire (KMQ-SF; Pais, 2014). This parsimonious version was developed from the KMQ

originally formed of 56 items (Cardoso, 2007). The KMQ-SF has four dimensions: Knowledge-centred culture (7 items), Knowledge-competitive orientation (4 items), Formal knowledge management practices (6 items) and Informal knowledge management practices (5 items). Answers were given on a 5-point Likert scale, ranging from 1 (Almost never applies) to 5 (Almost always applies).

2.3. Analytical strategy

Two independent confirmatory factor analyses (CFA) were carried out, one for employees in certified municipalities and another for employees in non-certified ones, followed by testing of measurement invariance through multi-group confirmatory factor analyses.

Measurement invariance assesses to what extent knowledge management dimensions have equivalent representations under different conditions, which in our case corresponds to whether or not the organizations were quality certified (Hair, Black, Babin, & Anderson, 2009). This means that measurement invariance does not require, for example, means and variances of knowledge management dimensions to be equal across groups. However, to assess these distributional proprieties in hypothesis testing research, measurement invariance must be assured.

We followed the seven tests, represented by different factor models, suggested by Brown (2006), Cheung and Rensvold (2002), and Vandenberg and Lance (2000): 1. test of configural invariance, 2. test of equality of factor loadings, 3. test of equality of indicator interceptions, 4. test of error invariance, 5. test of equivalence of factor variances, 6. test of invariance of covariances between factors, and 7. test of equivalence of error covariances. Total invariance is only required in configural invariance; partial invariance, where at least two parameters per knowledge management process are forced to equality between groups, is sufficient to guarantee test precision in hypothesis testing (Byrne, Shavelson & Muthén, 1989; Hair et al, 2009).

In order to evaluate how the measurement models fit the data, we used the following fit indices: 1. the chi-square goodness-of-fit statistic (χ^2); 2. the chi-square goodness-of-fit statistic divided by the number of degrees of freedom (χ^2/df); 3. the root-mean-square error of approximation (RMSEA); 4. the Tucker-Lewis index (TLI) and 5. the comparative fit index (CFI). Considering a model tested with a sample of more than 250 subjects and with 22 observed variables the χ^2 is expected to have significant *p*-values, the χ^2/df should range between 2 and 5, the CFI and TLI cut-off value is .92 (although .90 is sufficient) and the RMSEA upper limit of good fit is .07 (Hair et al, 2009).

To test the fit of each measurement invariance model, we turn to the values of the CFI and the RMSEA, since in general they are not influenced by the size of the sample nor by the complexity of the model and do not correlate with global adjustment measures (Chen, 2007; Cheung & Rensvold, 2002). A value equal to or less than -.005 in the CFI associated with a value equal to or greater than .010 in the RMSEA indicates non-invariance (Chen, 2007).

European Journal of Applied Business Management, 3(1), 2017, pp. 1-25. ISSN 2183-5594

3. Results

3.1. Factor structure

Confirmatory factor analyses showed that the hypothetical measurement model with four latent variables did not fit the data well, either for employees of certified or non-certified municipalities (see Table 2). Through detailed analysis of the standardized residuals and of the modification indexes in both samples, two parameters were re-specified (free estimation of the parameters related to error covariances of items FKMP1 and FKMP4, and of FKMP2 and FKMP3). After the first re-specification (i.e., free estimation of the parameter related to the error covariance of FKMP1 and FKMP4), the model fit improved: $\Delta\chi^2_{(1,\ N = 560)} = 81.04$, $p < .001$ for employees in certified municipalities; and $\Delta\chi^2_{(1,\ N = 412)} = 108.79$, $p < .001$ for employees in non-certified municipalities. The second re-specification also improved the model fit: $\Delta\chi^2_{(1,\ N = 560)} = 55.08$, $p < .001$ for employees in certified municipalities and $\Delta\chi^2_{(1,\ N = 412)} = 38.95$, $p < .001$ for employees in non-certified municipalities. After these two re-specifications, the measurement model explained the data well in both samples, as indicated in Table 2.

The following arguments further support the two re-specifications: errors are associated with items with related content, there being conceptual support for the model adjustment (items FKMP1 and FKMP4 focus on practices centred on education and training, and FKMP2 and FKMP3 on formal knowledge management practices related to the group context); these re-specifications do not make the model more complex and do not over-adjust the model to the sample under analysis; the model does not come close to saturation (still maintaining 202 degrees of freedom); introduction of free correlations between the errors does not substantially alter the values of factor loadings or correlations between factors, it being acceptable that the covariance between each pair of indicators can be explained by both the latent variable related to formal knowledge management practices and by the uniqueness of each item; and the re-specifications are supported in both samples and the size of the samples is large, minimizing the possibility of type I errors (Brown, 2006; MacCallum, 2003).

European Journal of Applied Business Management, 3(1), 2017, pp. 1-25. ISSN 2183-5594

Table 2 – Adjustment Indices for Confirmatory Factor Analyses Based on the KM Models Tested with Employees in Certified and Non-certified Municipalities

Model	χ^2	*Df*	χ^2/df	TLI	CFI	RMSEA*
Certified municipalities' employees						
Basic tetra-factor	582.83**	203	2.87	.878	.893	.059 (.053-.065), p = .005
Tetra-factor, review 1	501.39**	202	2.48	.903	.916	.052 (.047-.058), p = .233
Tetra-factor, review 2	446.01**	201	2.22	.921	.931	.048 (.042-.054), p =.740
Unifactor	1093.08**	207	5.28	.721	.750	.089 (.084-.094), p < .001
Non-certified municipalities' employees						
Basic tetra-factor	528.80**	203	2.60	.844	.863	.064 (.057-.071), p < .001
Tetra-factor, review 1	420.01**	202	2.08	.895	.908	.053 (.046-.060), p = .266
Tetra-factor, review 2	381.06**	201	1.90	.913	.924	.048 (.041-.055), p =.671
Unifactor	882.32**	207	4.26	.682	.715	.091 (.085-.098), p < .001

Notes. * Figures in brackets refer to the values of the upper and lower limits of RMSEA, with a confidence interval of 90%; ** p < .001. Source: Authors.

European Journal of Applied Business Management, 3(1), 2017, pp. 1-25. ISSN 2183-5594

3.2. Convergent and discriminant validity, and reliability

The vast majority of the 22 observed variables have loadings over .50, significant at $p < .01$ in the critical ratio test, indicating that they converge on the correspondent latent variable in employees in certified and non-certified municipalities (Table 3). Although factor loadings support convergent validity, the values of the Average Variance Explained (AVE) for each knowledge management factor are always under .50, which indicates that on average there is more error associated with the item than variance explained by the knowledge management latent variables (see Table 4). However, these values are acceptable for a first confirmatory factor analysis of KMQ in the local public sector (Fornell & Larcker, 1981).

In the measurement model with four latent variables there were no cross-loadings. This indicates discriminant validity at the item level. Loading all indicators in one latent variable, the following chi-square differences were obtained: $\Delta\chi^2_{(6,\ N\ =\ 560)} = 647.07$, $p < .001$ for employees in certified municipalities and $\Delta\chi^2_{(6,\ N\ =\ 412)} = 501.26$, $p < .001$ for employees in non-certified municipalities. This indicates discriminant validity at the construct level.

To further assess discriminant validity, we compared the AVE of each knowledge management factor with the squares of the correlations between knowledge management factors – ideally, each latent variable should explain more item variance than that which it shares with any other latent variable (Fornell & Larcker, 1981). We also calculated the confidence intervals (±1.96 standard deviations) of the correlations between the four knowledge management factors. Ideally, upper values of confidence intervals between two knowledge management factors should not come too close to 1. If this happens it is possible that, in the population, we are measuring only one knowledge management dimension and not two (Anderson & Gerbing, 1988).

Table 4 shows that for employees in certified municipalities, all the AVEs were above the corresponding squared correlations, except for the squared correlation between knowledge-centred culture and formal knowledge management practices. For employees in non-certified municipalities, the exceptions to empirical support of discriminant validity are the squared correlations between knowledge-centred culture and formal knowledge management practices, and between knowledge-competitive orientation and formal knowledge management practices. Together, the significant fit decrease in the uni-factor model, the non-existence of crossed loadings, the correlations under .85 between factors, the 95% confidence intervals well below 1, and the majority of AVE values above the squared correlations between factors, strongly support discriminant validity.

All Cronbach's alphas are above .70 (Nunnally, 1978). In addition, all items are correlated with the corresponding scale, at least at .30 and no item harms the alpha value. Nevertheless, Raykov (1997) argues that the value of Cronbach's α can overestimate or underestimate the internal consistency value of a scale, tending towards underestimation. In the sphere of structural equation models the author recommends using the Raykov rho (ρ), also designated as composite reliability. The cut-off points to adopt are the same as those suggested for Cronbach's α (i.e., .70). All the Raykov ρ indicate values over .70 (see Table 4).

European Journal of Applied Business Management, *3*(1), 2017, pp. 1-25. ISSN 2183-5594

Table 3 – Group Standardized Factor Loadings and Item Uniqueness for Certified and Non-certified Municipalities' Employees

	Certified municipalities' employees		**Non-certified municipalities' employees**	
	Factor loading	Item uniqueness	Factor loading	Item uniqueness
Knowledge-Centred Culture (KCC)				
KCC1. We look for information that can improve the quality of what we do	.725	.478	.716	.481
KCC2. We are all responsible for what we should know to work with quality	.625	.606	.558	.684
KCC3.We think of how we solved problems in the past	.597	.639	.672	.549
KCC4. Each of us has a function to perform	.571	.673	.524	.729
KCC5. We act according to the way we are organized	.632	.593	.657	.561
KCC6. What we know is seen in the way we work	.575	.669	.506	.740
KCC7. We act in accordance with certain principles	.630	.609	.460	.789
Knowledge-Competitive Orientation (CO)				
KCO1. We are aware of what other local municipalities are doing	.769	.405	.725	.472
KCO2. What we know is a fundamental "weapon" to exceed other local municipalities	.697	.512	.788	.374
KCO3. We know that other local municipalities have information about us	.530	.504	.440	.808
KCO4. What we know is seen in what we do better than other local municipalities	.565	.678	.516	.737
Formal Knowledge Management Practices (FKMP)				
FKMP1. We attend seminars/conferences, we read and we contract specialists	.518	.734	.607	.635
FKMP2. We share information in work meetings	.663	.559	.591	.651
FKMP3. We join as a group to solve some problems	.630	.606	.618	.618
FKMP4. We attend training courses or have training in the work-place	.517	.734	.440	.805
FKMP5. Those who share what they know are rewarded	.462	.786	.600	.637
FKMP6. We are encouraged to use our initiative	.635	.530	.705	.507
Informal Knowledge Management Practices(IKMP)				
IKMP1. We tell each other funny stories about what happened at work	.697	.509	.655	.569
IKMP2. We speak about our local authority	.674	.547	.602	.633
IKMP3. We speak about our duties	.679	.546	.613	.622
IKMP4. We speak about matters that we do not understand well	.664	.553	.655	.574
IKMP5. We chat about work when we meet by chance	.452	.800	.414	.825

Note. For certified municipalities employees: Correlation between the errors of items FKMP1 and FKMP4 = .35 and correlation between the errors of items FKMP2 and FKMP3 = .45; For non-certified municipalities employees: Correlation between the errors of items FKMP1 and FKMP4 = .53 and correlation between the errors of items FKMP2 and FKMP3 = .37. Source: Authors.

Table 4 – Correlations between Factors, Cronbach's Alphas, Raykov Rhos and AVEs, for the Sample of Employees from Certified Municipalities (N = 560) and for the Sample of Employees from Non-certified Municipalities (N = 412)

	Knowledge management questionnaire				α	ρ	AVE
	KCO	**KCC**	**FKMP**	**IKMP**			
Certified municipalities' employees							
KCO	__				.726	.758	.389
	.484						
KCC	(.234)	__			.814	.816	.331
	[.418-.545]						
	.532	.684					
FKMP	(.283)	(.468)	__		.774	.770	.409
	[.470-.589]	[.637-.726]					
	.468	.574	.532				
IKMP	(.219)	(.329)	(.283)	__	.767	.772	.419
	[.401-.530]	[.516-.627]	[.470-.589]				
Non-certified municipalities' employees							
KCO	__				.701	.718	.402
	.317						
KCC	(.100)	__			.785	.787	.350
	[.227-.401]						
	.628	.621					
FKMP	(.394)	(.386)	__		.795	.796	.358
	[.566-.683]	[.558-.677]					
	.328	.542	.457				
IKMP	(.108)	(.294)	(.209)	__	.721	.728	.353
	[.239-.412]	[.470-.607]	[.377-.530]				

Notes. The squares of the correlation coefficients are presented in brackets; the confidence intervals for 1.96 standard errors are presented in square brackets; AVE = Average Variance Extracted; KCO = Knowledge-Competitive Orientation; KCC = Knowledge-Centred Culture; FKMP = Formal Knowledge Management Practices; IKMP = Informal Knowledge Management Practices. Source: Authors.

European Journal of Applied Business Management, 3(1), 2017, pp. 1-25. ISSN 2183-5594

3.3. Measurement invariance

Measurement invariance/equivalence was tested by multi-group confirmatory factor analysis. Results are shown in Table 5. Configural invariance was supported, showing that employees in certified municipalities and in non-certified municipalities perceive knowledge management similarly – in both samples there are the same number of factors which, in turn, are defined by the same items (Model 1). Metric invariance was supported, meaning that each item has a comparable relationship with the correspondent knowledge management factor in employees in certified and non-certified municipalities (Model 2). The scalar invariance test revealed a significant decrease in CFI (Model 3). This maladjustment was dependent on three items (KCC7, FKMP4 and KCO2). The intercepts of these three items were freed and we reached partial scalar invariance (Model 3a). This means that, with the exception of three items, employees in certified and non-certified municipalities have the same score on an item at a given point of a knowledge management factor. The error invariance evaluation revealed equality of the items' error variance in certified and non-certified employees (Model 4). The knowledge management factor variance invariance (levels of diversity in the perceptions of knowledge management between the two groups) was similar in employees in certified and non-certified municipalities (Model 5). Regarding invariance of relationships between knowledge management factors (equivalence of covariances between factors), the model presented a suitable adjustment to the data (Model 6). Finally, the restriction to equality of the covariances between errors FKMP1 and FKMP4, and between errors FKMP2 and FKMP3 revealed that they are invariant across samples (Model 7).

European Journal of Applied Business Management, 3(1), 2017, pp. 1-25. ISSN 2183-5594

Table 5 – Indices of Adjustment for Measurement Invariance Models

CFA Model	χ^2	*df*	CFI	ΔCFI	RMSEA	ΔRMSEA
Model 1. Configural invariance	827.09	402	.928	-	.034	-
Model 2. Metric invariance	870.28	420	.924	-.004	.034	0
Model 3. Scalar invariance	1269.95	443	.860	-.064	.045	-.011
Model 3a. Partial scalar invariance	901.34	439	.923	-.001	.034	0
Model 4. Error variance invariance	917.88	461	.923	0	.034	0
Model 5. Factor variances invariance	923.95	465	.922	-.001	.034	0
Model 6. Covariances invariance	937.78	471	.921	-.001	.034	0
Model 7. Error covariances invariance	952.57	473	.919	-.002	.034	0

Note. All calculations were made in comparison to the model tested previously, except for partial scalar invariance which is tested in comparison to metric invariance. Source: Authors.

4. Discussion

As stated above, the aims of this research were to present the Knowledge Management Questionnaire – Short Form, to evaluate its validity and reliability in local authorities and to check if the meaning of knowledge management is the same in quality certified and non-certified Portuguese municipalities through measurement invariance testing.

Using a representative sample of employees in certified and non-certified municipalities we found evidence to support our research aims. The local government version of the questionnaire is valid, reliable and invariant across employees in ISO 9000 certified and non-certified municipalities. Results suggest that the 22 items fit the data adequately in each group and that the measurement model adjusted to the data suitably in all invariance tests. The instrument can be used with confidence in certified and non-certified municipalities to evaluate knowledge management and to test hypotheses regarding, for example, mean differences in knowledge management and relationships with other variables.

This study further develops knowledge management theory especially in the context of local government considering that our results support the multidimensionality of knowledge management in the local public sector, regardless of quality certification. Accordingly, knowledge management's meaning and conceptualization in local government lies in four central dimensions: knowledge-centred culture, competitive orientation, formal knowledge management practices, and informal knowledge management practices.

This tetra-dimensional conceptualization has been found in previous research (e.g., Cardoso & Gomes, 2011; Brito, 2010), and aims to structure into four basic knowledge management dimensions the myriad of previous research on knowledge management (e.g., Cardoso et al, 2012; Davenport et al, 1998; Hitt et al, 2001; Dixon et al, 2009). As an overarching measure of knowledge management, the goal of KMQ-SF is not to ignore the unique contributions of more focused measures, but rather to simplify knowledge management measurement into four factors.

Quality certification is recognized as a facilitator of knowledge management (Lin & Wu, 2005a, 2005b; Lundmark & Westelius, 2006; Molina et al, 2004; Molina, Montes, & Moreno, 2007). This article further supports the validity of this relationship since it is the first study to empirically support the idea that knowledge management tends to have the same meaning across certified and non-certified organizations. Indeed, measurement invariance requires only that the relationships between items and the latent variables they measure are equivalent across groups, not requiring the distributional properties of scores (e.g., mean values) to be equal (Vandenberg & Lance, 2000).

The results of the multi-group tests of measurement invariance, however, revealed minor variations across employees in certified and non-certified municipalities. Specifically, the intercepts of the items KCC7, FKMP4 and KCO2 varied across the two samples. This means that at a specific level of knowledge management, different observed scores are obtained on these three items, depending on ISO 9000 certification. In the realm of KMQ-SF the non-invariance of these specific items is diluted, since partial invariance was achieved (Byrne et al, 1989; Hair et al, 2009). That is, these three biased items are likely to reflect only insignificant and inconsistent differences. Still, since our sample is representative of Portuguese municipalities, future studies interested in examining differences in knowledge management due to quality certification may consider removing these three items from the computation of factor means in order to improve the validity of the mean comparisons.

The three non-invariant items focused on organizational principles that nurture an organizational culture towards knowledge, on formal training, and on the competitive value of

knowledge (see Table 3). Other instruments in which there may be several items with a wording similar to KCC7, FKMP4 and/or KCO2, may not achieve acceptable values of measurement invariance. In such cases, it is crucial to examine carefully whether mean differences are due to biased items (functioning differently with employees in certified and in non-certified organizations) or due to true differences in knowledge management. Our results also suggest that routine inspection of measurement invariance would further support the validity of studies testing mean differences in several constructs across certified and non-certified organizations.

An important topic when studying measurement invariance is the maturity of the population in terms of proximity to the analysed construct (Marsh, Hau, & Wen, 2004). The public sector tends to follow management tendencies begun in the private sector, as occurred with quality management and certification, which only after reaching some maturity in the private sector came to be adopted by the public sector (McAdam & Reid, 2000). With knowledge management having ceased to be a management fashion (Girard & McIntyre, 2010), and with strong evidence of its relationship with competitiveness (e.g., Nonaka, 1991; Nonaka & Takeuchi, 1995, Cardoso, 2007), training (e.g., Cardoso et al, 2012) and innovation (e.g., Vaz & Nijkamp, 2009; Zhang, Benedetto, & Hoenig, 2009), its development in the public sector seems opportune (Cong & Pandya, 2003) and has been implemented in strict connection with quality certification (Brito et al, 2010). Indeed, quality certification and knowledge management are recent in Portuguese municipalities. Organizations need time to implement specific actions associated with quality certification (Tang & Tong, 2007) and ISO 9000 assumes a continuous effort towards quality (Rumane, 2011). This means that the results regarding the measurement invariance of the KMQ in employees in certified and from non-certified municipalities may change with time. Future studies should incorporate the dimension of time in studying KMQ-SF measurement invariance.

4.1. Limitations and implications for future research

This study has some limitations that we must acknowledge. First, it is not possible to generalize results to countries speaking other languages, other certification standards or other sectors without further evidence. Country culture may influence the measurement invariance of knowledge management; specific quality certification standards may have different impacts on the meaning of knowledge management; and different sectors may have different levels of maturity regarding quality and knowledge management.

Secondly, we used a single instrument to assess measurement invariance. Thus, we cannot assume that the invariance is generalizable to other knowledge management instruments and we are unable to support the invariance of other related instruments across certified and non-certified organizations.

Thirdly, previous research has found that quality certification could be the first step towards total quality management or could undermine the effectiveness and continuous improvement efforts of an organization (Kuo, Chang, Hung, & Lin, 2009; Prajogo et al, 2012). For example, an excess of bureaucracy (Lundmark & Westelius, 2006) or external pressures on quality certification (van der Weile, Dale & Williams, 2000) may undermine the expected quality improvements. In this study we did not measure if employees perceived quality certification positively or negatively. Future studies could test the measurement invariance of knowledge management with employees in certified organizations who have positive or negative attitudes towards quality certification.

4.2. Practical implications

These findings represent a strong endorsement of the validity and utility of the KMQ-SF in local government practice and research. Knowledge management has a robust instrument that can be used by practitioners for the assessment and improvement of these processes. The measurement invariance confirmed here strengthens the confidence in the results obtained by managers who want to map KM processes in their local government organizations, whether for relating them to other organizational processes, or for guiding future management actions and decisions. By using the instrument studied and confirmed here managers and practitioners become more confident about the meaning of the dimensions which is shown to be the same across different organizational samples. For example, analysts interested in knowledge management's mean differences in certified and non-certified organizations have a valid, reliable and invariant instrument to measure knowledge management. Secondly, researchers and practitioners interested in studying knowledge management in local government have access to a short and reliable instrument that captures different dimensions of knowledge management. Thirdly, municipalities aiming at quality certification have available an instrument to measure levels of knowledge management before and after quality certification. Finally, it is now possible to make intra and inter-organizational comparisons at a given time or over time considering any or all the dimensions of KMQ-SF.

The set of theoretical and practical implications derived from this study form an outlet for future research and practice in local government. Incorporating simultaneously different dimensions of knowledge management in research and practice will certainty contribute to a deeper understanding of knowledge management in organizations.

5. Conclusion

Our results support the multidimensionality of knowledge management in the local public sector, regardless of quality certification. New evidence was added concerning the Knowledge Management Questionnaire – Short Form as a valid and reliable instrument that can be used by researchers who intend deepening their understanding of knowledge management phenomenon. The measurement invariance concerning that instrument was confirmed and practitioners who intend improve the knowledge management in their organizations can use it. Further studies with different samples are welcome.

References

Abdullah, H. S., & Ahmad, J. (2009). The fit between organisational structure, management orientation, knowledge orientation, and the values of ISO 9000 standard: A conceptual analysis. *International Journal of Quality & Reliability Management, 26*, 744-760.

Alavi, M., & Leidner, D. E. (2001). Review - Knowledge management and knowledge management systems: Conceptual foundations and issues. *MIS Quartely, 25*, 107-136.

Anderson, J., & Gerbing, D. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*, 411-423.

Anderson, S. W., Daly, J. D., & Johnson, M. F. (1999). Why firms seek ISO 9000 certification: Regulatory compliance or competitive advantage? *Production and operations Management, 8*, 28-43.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*, 99-120.

Bassi, L. J. (1997). Harnessing the power of intellectual capital. *Training & Development, 51* (12), 25-31.

Bénézech, D., Lambert, G., Lanoux, B., Lerch, C., & Loos-Baroin, J. (2001). Completion of knowledge codification: An illustration through the ISO 9000 standards implementation process. *Research Policy, 30*, 1395-1407.

Benner, M. J., & Tushman, M. (2002). Process management and technological innovation: A longitudinal study of the photography and paint industries. *Administrative Science Quarterly, 47*, 676-706.

Bhatt, G. D. (2001). Knowledge management in organizations: examining the interaction between technologies, techniques, and people. *Journal of Knowledge Management, 5* (1), 68-75.

Brito, E. (2010). *Gestão do conhecimento e qualidade como vectores de competitividade na administração pública local* (Doctoral Thesis). Coimbra: Universidade de Coimbra, Portugal.

Brito, E., & Cardoso, L. (2012, 6-7 September). Knowledge Management processes in the Portuguese local government sector. *Proceedings of the 13th European Conference on Knowledge Management* (pp. 135-144). ISBN: 978-1-908272-63-8.

Brito, E., Cardoso, L., & Peralta, C. F. (2010). Conditioning organizational factors in knowledge management processes. In E. Tomé (Ed.). *Proceedings of the 11th European Conference on Knowledge Management* (pp. 155-165). Vila Nova de Famalicão, Portugal: Academic Publishing Limited.

Brown, T. (2006). *Confirmatory factor analysis for applied research*. New York: The Guilford Press.

Byrne, B. M., Shavelson, R. J., & Muthén, B. (1989). Testing for the equivalence of factor covariance and mean structures: The issue of partial measurement equivalence. *Psychological Bulletin, 105*, 456-466.

Cardoso, L. (2007). *Gerir conhecimento e gerar competitividade. Estudo empírico sobre a gestão do conhecimento e seu impacto no desempenho organizacional.* Penafiel, Portugal: Editorial Novembro.

Cardoso, L., & Gomes, D. (2011). Knowledge management and innovation: Mapping the use of technology in organizations. In A. Mesquita (Ed), *Technology for creativity and innovation: Tools, technics and applications* (pp. 237-266). Hershey, PA: Hershey IGI Global.

Cardoso, L., & Peralta, C. F. (2011). Gestão do conhecimento em equipas: Desenvolvimento de um instrumento de medida multidimensional. *Psychologica, 55,* 79-93.

Cardoso, L., Meireles, A., & Peralta, C. F. (2012). Knowledge management and its critical factors in social economy organizations. *Journal of Knowledge Management, 16,* 267-284.

Chen, F. E. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 14*, 464-504.

Chen, F., E., Sousa, K. H., & West, S. G. (2005). Testing measurement invariance of second-order factor models. *Structural Equation Modeling: A Multidisciplinary Journal, 12*, 471-492.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indices for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, *9*, 233-255.

Cong, X., & Pandya, K. V. (2003). Issues of knowledge management in the public sector. *Electronic Journal of Knowledge Management, 1*(2), 181-188.

Crosby, P. H. (1994). *Completeness: Quality for the 21st century.* New York: Plume.

Dalkir, K. (2005). *Knowledge Management in Theory and Pratice.* Oxford: Elsevier.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know.* Massachusetts: Harvard Business School Press.

Davenport, T. H., De Long, D. W., & Beers, M. C. (1998). Successful knowledge management projects. *Sloan Management Review, 39*, 43-57.

De Long, D., & Fahey, L. (2000). Diagnosing cultural barriers to knowledge management. *Academy of Management Executive, 14*, 113-127.

Deming, E. (1995). *Out of the crisis.* Massachusetts: Massachusetts Institute of Technology.

Detert, J. R., Schroeder, R. G., & Mauriel, J. J. (2000). A framework for linking culture and improvement initiatives in organizations. *Academy of Management Review, 25*, 850-863.

Dixon, B. E., McGowan, J. J., & Cravens, G. D. (2009). Knowledge sharing using codification and collaboration technologies to improve health care: Lessons from the public sector. *Knowledge Management Research & Practice, 7*, 249-259.

Dragicevic, M., & Letunic, S. (2011). The influence of international standard ISO 9001 implementation on the human resource management in hotels. In Branko, K. (Ed). *Proceedings of the 22nd International DAAAM Symposium.* Vienna, Austria, EU.

Ehlers, D. (2009). Understanding quality culture. *Quality Assurance in Education, 17*, 343-363.

Evans, M. M., Dalkir, K., & Bidian, C. (2014). A Holistic View of the Knowledge Life Cycle: The Knowledge Management Cycle (KMC) Model. *The Electronic Journal of Knowledge Management, 12*(2), 85-97.

Fahey, L., & Prusak, L. (1998). The eleven deadliest sins of knowledge management. *California Management Review, 40*, 265-277.

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*, 39-50.

Girard, J. P., & McIntyre, S. (2010). Knowledge management modeling in public sector organizations: A case study. *International Journal of Public Sector Management, 23*, 71-77.

Grant, R. M. (1996). Prospering in dynamically competitive environments: Organizational capacity as knowledge integration. *Organizational Science, 7*, 375-388.

Hair, J., Black, W., Babin, B., & Anderson, R. (2009). *Multivariate data analysis*. New Jersey: Pearson Education.

Haynes, J. D. (2005). Inquiring organizations and the wisdom of tacit knowledge for a heideggerian inquiring system: The sixth sense. In J. Courtney, J. Haynes, & D. Paradice (Ed), *Inquiring organizations: Moving from knowledge management to wisdom* (pp. 195-210). London: Idea Group Publishing.

Haynes, P. (2003), *Managing complexity in the public services*, Open University Press, Maidenhead, UK.

Hitt, M. A., Bierman, L., Shimizu, K., & Kochhar, R. (2001). Direct and moderating effects of human capital on strategy and performance in professional service firms: A resource-based perspective. *Academy of Management Journal, 44*, 13-28.

Hoyle, D. (2009). *ISO 9000 quality systems handbook. Using the standards as a framework for business improvement*. Oxford, UK: Elsevier.

Hughes, O. (2003). *From public administration to public management*. London, UK: Routledge.

Ipe, M. (2003). Knowledge sharing in organizations: A conceptual framework. *Human Resource Development Review, 2*, 337-359.

Islam, M. M., Karim, M. A., & Habes, E. M. (2015). Relationship between quality certification and financial & nonfinancial performance of organizations. *Journal of Developing Areas* [Special Issue]. *49*(6), 119-132.

Janz, B. D., & Prasarnphanich, P. (2003). Understanding the antecedents of effective knowledge management: The importance of a knowledge-centered culture. *Decision Sciences, 34*, 351-384.

Kammoun, R., & Aouni, B. (2013). ISO 9000 adoption in Tunisia: Experiences of certified companies. *Total Quality Management & Business Excellence*, *24*(3), 259–274.

Karapetrovic, S., Casadesús, M., & Heras, I. (2010). What happened to the ISO 9000 lustre? An eight-year study. *Total Quality Management*, *21*(3), 245-267.

Kaziliûnas, A. (2010). Impacts of different factors on the implementation of quality management systems and performance outcomes. *Current Issues of Business and Law, 5*(1), 75-92.

Kumar, K., Subramanian, R., & Yauger, C. (1998). Examining the market orientation – performance relationship: A context-specific study. *Journal of Management, 24*, 201-220.

Kuo, T., Chang, T., Hung, K., & Lin, M. (2009). Employees' perspective on the effectiveness of ISO 9000 certification: A total quality management framework. *Total Quality Management & Business Excellence, 20*, 1321-1335.

Laszlo, G. P. (2000). ISO 9000-2000 version: Implications for applicants and examiners. *The TQM Magazine, 12*, 336-339.

Lee, J. N. (2001). The impact of knowledge sharing, organizational capability and partnership quality on IS outsourcing success. *Information & Management, 38*, 323-335.

Lin, C., & Wu, C. (2005a). A knowledge creation model for ISO 9001:2000. *Total Quality Management & Business Excellence, 16*, 657-670.

Lin, C., & Wu, C. (2005b). Managing knowledge contributed by ISO 9001:2000. *International Journal of Quality & Reliability Management, 22*, 968-985.

Ling, T. (2002). Delivering joined-up government in the UK: Dimensions, problems and issues. *Public Administration, 80*, 615-642.

Luen, T. W., & Al-Hawamdeh, S. (2001). Knowledge management in the public sector: Principles and practices in police work. *Journal of Information Science, 27*, 311-318.

Lundmark, E., & Westelius, A. (2006), Effects of quality management according to ISO 9000: A Swedish study of the transit to ISO 9000:2000. *Total Quality Management & Business Excellence, 17*, 1021-1042.

MacCallum, R. C. (2003). Working with imperfect models. *Multivariate Behavioral Research, 38*, 113-139.

Magd, H. (2010). Quality management standards (QMS) implementation in Egypt: ISO 9000 perspective. *Global Business and Management Research: An International Journal*, *2* (1), 57-68.

Marsh, H., Hau, K., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cut off values for fit indexes and dangers in overgeneralizing Hu & Bentler's (1999) findings. *Structural Equation Modeling: A Multidisciplinary Journal, 11*, 320-341.

Martinez-Costa, M., Martinez-Lorente, A. R., & Choi, T. Y. (2009). Simultaneous consideration of TQM and ISO 9000 on performance and motivation: An empirical study of Spanish companies. *International Journal of Productivity and Economy*, *113*(1), 23-39.

McAdam, R., & Reid, R. (2000). A comparison of public and private sector perceptions and use of knowledge management. *Journal of European Industrial Training, 24*, 317-329.

McAdam, R., Mason, B., & McCrory, J. (2007). Exploring the dichotomies within the tacit knowledge literature: towards a process of tacit knowing in organizations. *Journal of Knowledge Management, 11*, 43-59.

McDermott, R. (1999). Why information technology inspired but cannot deliver knowledge management. *California Management Review, 41*(4), 103-117.

McDermott, R., & O'Dell, C. (2001). Overcoming cultural barriers to sharing knowledge. *Journal of Knowledge Management, 5*, 76 - 85.

McElroy, M. (1999, June, 1-9). Second generation knowledge management. *IBM Knowledge Management Consulting Group*.

Molina, L. M., Montes, J. L., & Fuentes, M. D. M. (2004). TQM and ISO 9000 effects on knowledge transferability and knowledge transfers. *Total Quality Management & Business Excellence, 15*, 1001-1015.

Molina, L. M., Montes, J. L., & Moreno, A. R. (2007). Relationship between quality management practices and knowledge transfer. *Journal of Operations Management, 25*, 682-701.

Nonaka, I. (1991). The knowledge creating company. *Harvard Business Review, 69*, 96-104.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5*, 14-37.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-crating company: How Japanese companies create the dynamics of innovation.* New York: Oxford University Press.

Nunnally, J. (1978). *Psychometric theory*. New York: McGraw-Hill.

O'Dell, C., Wiig, K., & Odem, P. (1999). Benchmarking unveils emerging knowledge management strategies. *Benchmarking: An International Journal, 6*(3), 202-211.

Pais, L. (2014). Gestão do conhecimento. In M. Siqueira (Org.), *Medidas do comportamento organizacional. Ferramentas de diagnóstico e de gestão* (pp. 193-218). Porto Alegre, Brazil: Artemed.

Pais, L., & dos Santos, N. R. (2015). Knowledge Sharing, Cooperation and Personal Development. In K. Kraiger, J. Passmore, N. dos Santos, & Malvezzi, S. (Eds.), *The Wiley Blackwell Handbook of the Psychology of Training, Development, and Performance Improvement* (pp. 278-302). Oxford: Wiley-Blackwell.

Pakstas, A. (1999). Towards electronic commerce via science park multi-extranets. *Computer Communications, 22*, 1351-1363.

Polanyi, M. (1966). *The tacit dimension.* London: Routledge & Kegan Paul.

Pollitt, C. (1990). *Managerialism and the public services: The Anglo-American experience.* Oxford, UK: Basil Blackwell.

Prajogo, D., Huo, B., & Han, Z. (2012). The effects of different aspects of ISO 9000 implementation on key supply chain management practices and operational performance. *Supply Chain Management: An International Journal, 17*, 306-322.

Raju, N. S., Laffittee, L. J., & Byrne, B. M. (2002). Measurement equivalence: A comparison of methods based on confirmatory factor analysis and item response theory. *Journal of Applied Psychology, 87*, 517–529.

Ratnasingam, J., Yoon, C. Y., & Ioraş, F. (2013). The effects of ISO 9001 quality management system on innovation and management capacities in the Malaysian furniture sector. *Bulletin of the Transilvania University of Braşov, Series II. Forestry, Wood Industry, Agricultural Food Engineering, 6*(55), 63-70.

Raykov, T. (1997). Estimation of composite reliability for congeneric measures. *Applied Psychological Measurement, 21*, 173-184.

Rodríguez-Antón, J. M., & Alonso-Almeida, M. M. (2011). Quality certification systems and their impact on employee satisfaction in services with high levels of customer contact. *Total Quality Management, 22*(2), 145-157.

Rumane, A. R. (2011). *Quality management in construction projects*. London: CRC Press, Taylor & Francis Group.

Salleh, K., Chong, S. C., Ahmad, S. N., & Ikhsan, S. O. (2012). Learning and knowledge transfer performance among public sector accountants: An empirical survey. *Knowledge Management Research & Practice, 10*, 164-174.

Scarbrough, H., & Swan, J. (1999). *Case-studies in knowledge management.* London: Institute of Personnel and Development.

Spencer, B. A. (1994). Models of organization and total quality management: A comparison and critical evaluation. *Academy of Management Review, 19*, 446-471.

Srivastav, A. K. (2010). Impact of ISO 9000 implementation on the organisation. *International Journal of Quality & Reliability Management, 27*, 438-450.

Strapko, W. (1990). Knowledge Management. *Software Magazine, 10*(13), 63-66.

Subramaniam, I. D. (2010). Does implementation of ISO 9001:2000 enhance the communication dynamics in organizations? *European Journal of Social Sciences, 17*(4), 638-650.

Sveiby, K. E. (1997). *The new organizational wealth: Managing and measuring knowledge-based assets*. San Francisco: Berret-Koehler Publishers.

Tang, J., & Tong, J. Y. (2007). A two-phase knowledge management system for the quality standard ISO 9001. *International Journal of Management, 24*, 184-197.

Terziovski, M., Power, D., & Sohal, A. S. (2003). The longitudinal effects of the ISO 9000 certification process on business performance. *European Journal of Operational Research, 146*, 580–595.

Tokarczyk, J., Hansen, E., Green, M., & Down, J. (2007). A resource-based view and market orientation theory examination of the role of "familiness" in family business success. *Family Business Review, 20*, 17-31.

Tucker, M. L., Meyer, G. D., & Westerman, J. W. (1996). Organizational communication: Development of internal strategic competitive advantage. *The Journal of Business Communication, 33*, 51-69.

Van Beveren, J. (2003). Does health care for knowledge management? *Journal of Knowledge Management, 7*, 90-95.

van der Weile, T., Dale, B., & Williams, R. (2000). Business improvement through quality management systems. *Management Decision, 38*, 19-23.

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*, 4–70.

Vaz, T. N., & Nijkamp, P. (2009). Knowledge and innovation: The strings between global and local dimensions of sustainable growth. *Entrepreneurship and Regional Development, 21*, 441-455.

Wahid, R. A., Corner, J., & Tan, P. (2011). ISO 9000 maintenance in service organisations: tales from two companies. *International Journal of Quality & Reliability Management, 28*, 735-757.

Watson, D. (2003). The development of total quality management in the personal social service: Realities, limitations and opportunities within the modernising agenda? *Local Government Studies, 29*, 33-50.

Webber, A. M. (1993). What's so new about the new economy. *Harvard Business Review, 71* (1), 24-42.

White, G. R. T., Samson, P., Rowland-Jones, R., & Thomas, A. J. (2009). The implementation of a quality management system in the not-for-profit sector. *The TQM Magazine, 27*(3), 273-283.

White, T. (2004, August). *Knowledge management in an academic library: based on the case study KM within OULS*. Paper presented at the 70th IFLA General Conference and Council, Buenos Aires, Argentina. Retrieved from URL http://www.ifla.org/IV/ifla70/papers/089e-White.pdf.

Yi, J. (2009). A measure of knowledge sharing behavior: Scale development and validation. *Knowledge Management Research & Practice, 7*, 65-81.

Zetie, S. (2002). The quality circle approach to knowledge management. *Managerial Auditing Journal, 17*, 317-321.

Zhang, J., Benedetto, A., & Hoenig, S. (2009). Product development strategy, product innovation performance, and the mediating role of knowledge utilization: Evidence from subsidiaries in China. *Journal International Marketing, 17*, 42-58.