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STUDYING THE INTERRELATIONSHIP BETWEEN QUALITY MANAGEMENT SYSTEM AND INTELLECTUAL CAPITAL

Abstract: *The aim of this study is to analyse the relationship between the quality management system (QMS) and the intellectual capital (IC) of a company. The importance of IC results from its potential to generate value, especially in the knowledge-based economy. It reflects unique organizational resources which are hard to acquire, imitate and replace. Such resources are most often grouped using trichotomous categorization into human, structural, and relational capital. As there is scarce literature examining the interrelationship between QMS and IC, this study aims to explore the way QMS enhances IC, but also how IC impacts QMS. The role of motivation for implementing a formal QMS is examined in light of IC efficiency and value-added based on IC. The results indicate a mutually reinforcing role of QMS and IC, leading to superior company performance.*

Keywords: *intellectual capital, quality management system, knowledge, performance*

1. Introduction

Quality management system (QMS) is oriented towards improvement of business performance through reducing customer complaints, costs and errors, increasing efficiency and employee motivation, as well as through exceeding customer expectations.

Research has shown that QMS can improve business performance, while the focus was on measuring the past performance. Given that the current business environment is very dynamic, looking at the rearview mirror while driving forward is not the best option. Thus, it is necessary to analyse whether QMS helps companies to create value in the future. Intellectual capital (IC) represents a set of a company's immaterial resources, which are rather hard and time-consuming to be acquired, but as such they are hard to be replased or imitated by competition, thus providing the base for competitive advantage. According to the Resource Based View (RBV), companies gain competitive advantage if they possess resources which are rare, valuable, unsupstituable, and imperfectly imitable. Unlike material assets which can be easily acquired, immaterial assets need development within the company. Consequently, such assets are context-dependent and create value only in that specific environment. IC represents a company's unique capabilities and an invisible infrastructure for value creation. It is dynamic by its nature, enabling a company to evolve in a changing context.

Ruiz et al. (2018) studied the influence of total quality management (TQM) on firms' intellectual capital, finding a strong positive causal effect. Milovanović et al. (2021)

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assert that "IC provides key support to the QM process", while, at the same time "through the QM process, companies exploit and increase the value of its IC". The authors proposed further examination of IC contribution to improving the QM process.

In order to examine the contribution of QMS adjusted to the requirements of ISO 9001:2015 to the company's ability to create value in the future, this study employs the concept of IC. Moreover, it examines the two-way relationship between QMS and IC, following the suggestions of the previous research. The results support a mutual reinforcing effect of QM and IC, leading to improved business performance on the sustainable basis. Additionally, it is found that motives for employing a formal QMS, such as ISO 9001, impact IC efficiency and value-added based on IC.

2. Quality management system

Oakland (2004, p. 270) defines quality management system (QMS) "as an assembly of components, such as the management structure, responsibilities, processes and resources for implementing quality management". The author asserts that interations between components of QMS are as important as the components themselves, and that it is important to understand the functioning of the system, instead of analyzing the individual components. QMS begins with identification of customer needs, and finishes with their satisfaction, involving all activities grouped in four major areas: management responsibility, resource management, product realization, and measurement, analysis and improvement.

According to Purushothama (2010), the concept of QMS originated from the Second World War but was kept as a military secret until 1976, when the British Standards Institution published BS 5750. It was accepted by the International Organization for Standardization (ISO) in Geneva as a series of ISO 9000 standards, published in 1987 amended in 1994, 2000, 2008 and 2015. The amendments are a consequence of the mechanism of reviewing the adaptability of the management system to the changing business environment. The number of companies that align their management system with the requirements of the ISO 9001 standard is growing. As of December 31, 2021 the total number of valid ISO 9001:2015 certificates was 1,077,884. The reasons for the great popularity of the ISO 9001 certificate are numerous. Unlike regional or national quality awards that can be used as a framework for achieving business excellence, these standards are much more widespread. The formation of free trade zones such as EC, EFTA, NAFTA and others, imposes the need for certification according to the ISO 9001 standard. Certification can help companies to build a system that will minimize the risk of injuries and harmful effects of products, which can result in high fines for the company. Companies use ISO 9001 certificates as a basis for choosing business partners, and public tenders in many countries today are difficult to win without an ISO 9001 certificate.

ISO 9000:2015 describes contemporary business environment as profoundly different from recent decades. The family of standards for quality management recognises the role of knowledge as a principal resource in a changing environment where stakeholders are becoming more demanding. For the first time this amendment presents quality management as a strategic process, and includes risk-based thinking. The idea is to drive companies towards sustainable development, instead of concentrating on customer satisfaction and efficiency only. In earlier editions of the ISO 9001 standard, the concept of risk-based thinking was implicit and expressed through guidelines for preventive action. QMS is defined by ISO 9000:2015 as a dynamic system that evolves through improvements. It is a set of activities

by which the organization identifies its goals and determines the processes and resources required to achieve the desired results. A QMS is supposed to be "flexible and adaptible within the complexities of the organizational context" (ISO 9000:2015). It is highlighted that each organisation's QMS is unique, and it has to be compliant to the organisational needs. The standards specify seven quality management principles as the basis for QMS: customer focus, leadership, engagement of people, process approach, improvement, evidence-based decision making, and relationship management. A cohesive QMS is a formal program of managing quality activities in order to improve business performance. Some of the benefits are reflected in customer loyalty, market share, operational efficiency, flexibility, use of resources, cost reduction, competitive advantage, employee motivation, reputation and control of all processes (Purushothama, 2010).

Besides ISO 9000 standards, there are several alternatives that can serve as guidelines for building an effective QMS, such as quality awards (Deming Prize, Malcolm Baldrige National Quality Award, European Quality Award etc.) and the European Foundation for Quality Management Excellence Model – EFQM. The awards promote performance excellence and guide businesses towards improvement of competitiveness through criteria used to evaluate organizations. Fernández Pérez and Gutiérrez Gutiérrez (2013) find that different alternatives have a different impact on the network of relationships that management achieves with the external environment, through which it accesses information and knowledge, and which has a positive impact on the company's strategic flexibility and organizational learning. Companies that do not adhere to quality management guidelines face a negative impact of the diversity of external relations networks on strategic flexibility and organizational learning, while the aforementioned negative impact is absent if companies have implemented ISO standards.

3. Intellectual capital

According to Janošević (2019), IC reresents a set of different types of intangible resources, which significantly contributes to the creation of value and improvement of the company's competitive position in today's knowledge-based economy or information era. The reason is that intangible resources have a greater potential for value creation because, compared to tangible resources, they are harder to imitate and unsuitable for substitution. According to this author, the key characteristics of IC are: (1) IC generates future benefits, (2) IC potency is based on intangible resources, (3) IC can be input and output of the value creation process, (4) value created by using IC is indirect, (5) IC components are connected to each other and to tangible assets (physical and financial), (6) IC is directly related to knowledge management process, (7) IC is difficult to imitate and substitute, (8) certain elements of IC can determine the competitive environment of the branch and sources of sustainable competitive advantage, (9) unlike material assets whose value decreases with use, the value of IC increases with use, and (10) IC changes the rules of competing, the process of strategy formulation and implementation, and the ways of measuring success.

The literature offers numerous definitions of IC. Stewart (1998) defines IC as the collective brain power that encompasses knowledge, information, intellectual property and experience that can be harnessed to create wealth. According to Rastogi (2003), IC can be seen as the holistic ability of a company to coordinate, manage and deploy its knowledge resources with the aim of creating value in the future. Similar to conceptual determination of IC, there are also diferences regarding its constituent elements. It has been perceived as a set of

competencies of employees, internal structure and external structure (Sveiby, 1997); marketable assets, human capital, intellectual property and infrastructure (Brooking, 1997); human capital and organisational (structural) capital (Roos & Roos, 1997); human capital, organizational (structural) capital and customer capital (Stewart, 1998); research and development, advertising (brand support), capital expenditure, information systems and technology appropriation (Gu & Lev, 2001); human capital, customer capital, structural capital, social capital, technological capital and spiritual capital (Khalique et al., 2015); human capital, structural capital and relational capital (MERITUM, 2002).

The rising importance of IC can be best observed by looking at the components of market value of the S&P 500 in the USA over the years provided by Ocean Tomo (2020). Figure 1 ilustrates this phenomenon, showing that participation of IC in total assets has grown enormously (73% for the period of 45 years). The most impressive fact is that the portion of IC is approaching the value of total assets.

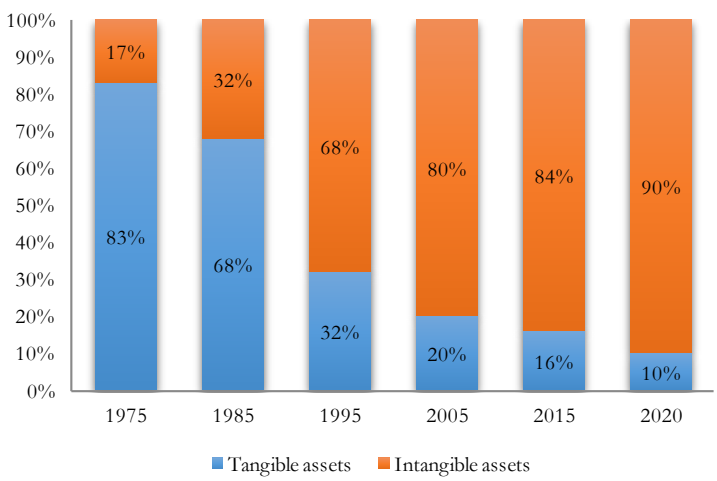

Figure 1. Components of S&P 500 market value in the USA

Source: Ocean Tomo (2020). Study of Intangible Asset Market Value. Available at: *http://www.oceantomo.com/intangible-asset-market-value-study/* , Retrieved 13.04.2023

4. Relationship between QMS and IC

Quality management by its definition is a broader concept than IC. It is a process aiming to assure a company's competitiveness, while IC is perceived as the main resource that can be used for achieving competitive advantage. Nevertheless, it is assumed that QMS can help in developing IC, and that IC supports QMS, leading to superior business performance. Several researchers have recognized connection between the two concepts. For example, Kim et al. (2009) proposed a framework for managing IC based on ISO 9001 QMS. Ruiz et al. (2018) examined the influence of total quality management (TQM) on IC and found

a strong positive effect. By studing the impact of IC on the firm's performance, Yousaf (2022) found that EFQM model also enhances the firm's performance. Claver-Cortes et al. (2018) found that international quality standards lead to competitiveness, as they demand adaptations to infrastructure and processes, while trainings enabled transformation of tacit into explicit knowledge. Further, organizational culture was strengthened, headed by the management's commitment and followed by employees' involvement in decision-making and teamwork. Majority of companies experienced opening of new markets and establishing alliances. Therefore, quality standards led to improvement of human, structural and relational dimensions of IC in examined companies, which observed improved innovativeness and operational and market performance.

However, to date and according to the authors' knowledge, there are no studies examining the relationship between ISO 9001 QMS and IC. This study therefore attempts to fill this research gap by proposing a model for examination of such relationship. Figure 2 ilustrates assumed relationship between QMS and IC. QMS is presented through its principles defined by ISO 9001, while IC is composed of human, structural and relational capital. Elements of each IC component are systematized based on previous research (Janošević, 2019; Janošević & Dženopoljac, 2015, Martin-de-Castro et al., 2011). When having a strong focus on customers, the organization is learning about their requirements, needs and expectations, thus generating a knowledge that will be used for improving products, services and processes in order to increase customers' satisfaction, market share and improve reputation. It is thus supposed that customer focus positively impacts human capital (relationship a).

Leadership plays a pivotal role in the QM process through goals setting, strategy formulation, resources allocation, communication and leading by example, which is essential for employee motivation and enthusiasm (relationship b). Leaders are responsible for organizational structure and culture, business strategy and management process (relationship c).

Engagement of people is concerned with their involvement, training and empowerment, contributing to improving employees' knowledge, skills and motivation (relationship d). Procedures are created to direct employees and standardize their performance and are especially beneficial for the newly employed (relationship e).

The idea of process approach is to manage interrelated processes in order to improve effectiveness and efficiency of the system, and to exploit synergy as a source of competitive advantage. This principle leads to improved awareness of the customers' needs across the organization and to improved motivation and enthusiasm of employees, as they become aware of their role in the system, but also of the importance of other positions and interdependences (relationship f). This is very effective in breaking down inter-functional barriers.

Improvement demands continuous quest for possibilities to create value, either regarding customer satisfaction or lowering costs, increasing speed, efficiency, productivity and so on. This principle is extremely important in a high competitive environment, and it may determine survival of the company. A pursuit for improvement opportunities enhances creativity of employees (relationship g), while novelties may be protected by patent, license or trademark (relationship h).

Evidence-based decision-making demands data gathering, storage and analysis in order to produce valuable facts upon which decisions will be made. For the purpose of this principle databases are created and software developed or acquired to help managing the data (relationship i).

Relationship management aims to establish good cooperative connections with suppliers,

distributors, customers and community. This principle is supposed to lead to good reputation, formation of business networks and sales channels, as well as to a higher level of corporate social responsibility. Moreover, having ISO 9001 certificate is positively reflected on the company's image (relationship j). All QM principles together are supposed to lead to increased organizational learning capability, employee commitment and market position (relationship k). On the other hand, IC is very important for the QM process:

1) Having skilled, motivated and creative personnel enhances their involvement in quality improvement (relationship l);
2) Procedures limit errors (relationship m);
3) Databases and software enable analysis, finding room for improvement, but also an effective decision-making process (relationship n) and
4) Organisational structure and culture, and management process play an important role in enabling all of QM principles (relationship o).

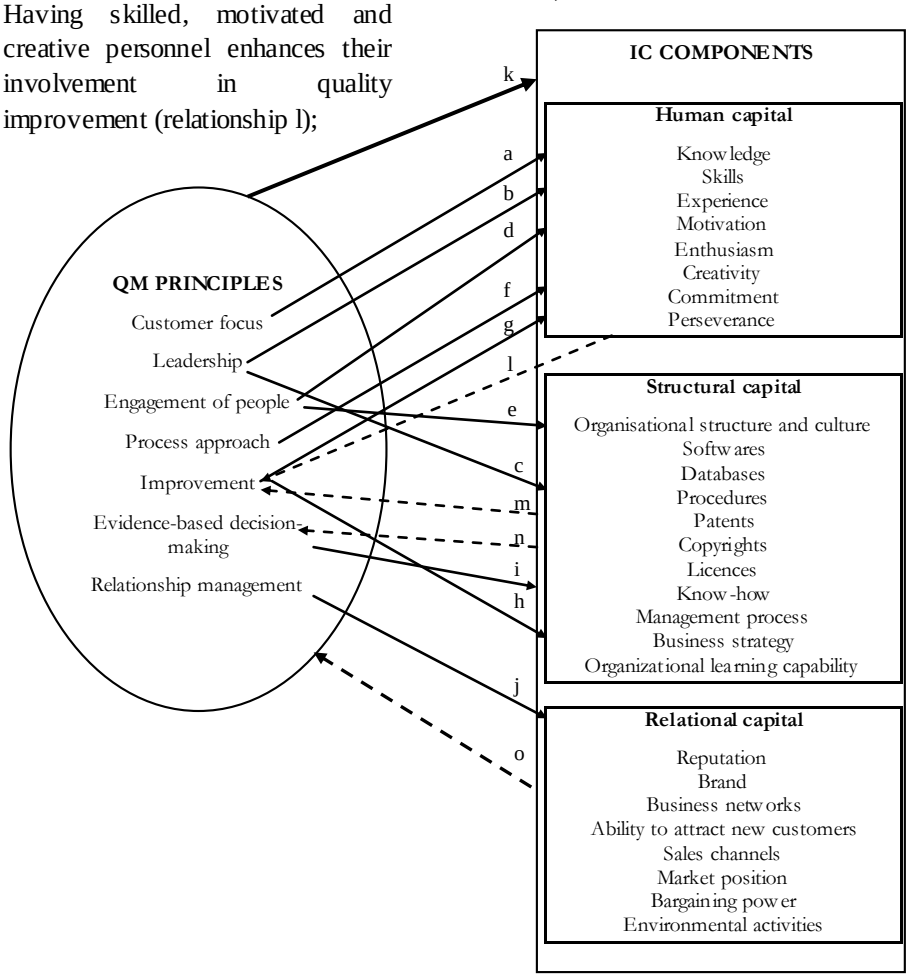

Figure 2. The interrelationship between quality management and intellectual capital
Source: Authors

5. Motivation for ISO 9001 certificate and IC performance

There are two types of motives to certify QMS to ISO 9001 known as internal and external motives (Bravi et al., 2019). Internal certification motives refer to aspiration to improve the quality of business in order to achieve superior performance. External motives concern the pressure from customers or regulation, following the trend or using the certificate for accessing government funds, participate in bidding, as well as for marketing purposes. Certificate is useful for international cooperation to eliminate information asymmetry (Heras-Saizarbitoria & Boiral, 2013) and achieve confidence of stakeholders (Zhang et al., 2019), while it is supposed to help building QMS that will lead to improved operational efficiency, quality and productivity (Nair & Prajogo, 2009; Dias & Heras-Saizarbitoria, 2016). Chountalas et al. (2020) assert that the level of fidelity to ISO 9001 requirements vary among companies, leading to different outcomes in terms of improved performance. Some authors find that certification may not lead to improved performance if the management and employees are not committed to following the requirements in everyday operations (Oliveira et al. 2019, and others). Thus, the research documents that internal motives for ISO 9001 certification produce a greater impact on a company's performance than external ones (Chountalas et al. 2020, and others). On the other hand, Chountalas et al. (2020) find that even superficial implementation of ISO 9001 can to a certain extent initiate beneficial changes throughout the organizations and, consequently, lead to improved performance.

In order to investigate the impact of motives for ISO 9001 certification on the company's efficiency in using the specific components of IC and its performance in terms of value added based on IC, the current research involves 44 ISO 9001 certified companies in Serbia, divided into two groups, 22 companies with internal certification motives and 22 of those with external certification motives. The groups are homogenous concerning the size of companies (micro, small, medium and large) and sector (manufacturing, service and trade). The used method is Value-Added Intellectual Coefficient (VAIC), and data are gathered from the annual financial statements of ISO 9001 certified companies for the year 2021, and by interviewing quality managers from the companies that participated in the survey regarding the nature of motives for certification.

VAIC method includes two components of IC, human and structural capital, and demands calculation of human capital efficiency (HCE) and structural capital efficiency (SCE). The sum of these values is known as intellectual capital efficiency (ICE), and it shows how well a company uses these components of IC. Unfortunately, the method does not include relational capital as the third component of IC. The method also requires the calculation of capital employed efficiency (CEE) in order to finally show the value added based on IC.

Table 1 presents descriptive statistics for VAIC and its components along with the Shapiro-Wilk test of normality. The Shapiro-Wilk test is significant ($p<0.01$) for most of the subsamples, indicating that the data is not normally distributed. Since the assumption of normality is necessary for parametric tests, the Mann-Whitney non-parametric test is used to establish whether there are significant differences in intellectual capital between internally and externally motivated companies. Table 2 shows the results of the Mann-Whitney test for VAIC and its components. The grouping variable is certification incentive: external vs. external.

The results indicate that there is a significant ($p<0.01$) difference in VAIC between internally and externally motivated

companies. Internally motivated companies (Mdn=2.98) have higher VAIC than externally motivated companies (Mdn=2.46), demonstrating that interest in improving the quality of processes compared to the pressure from the environment for certifying to ISO 9001, helps companies create higher value-added based on IC. The differences are also significant ($p<0.10$) for VAIC components such as HCE, SCE, and, consequently, ICE (as the sum of HCE and SCE). Internally motivated companies (Mdn=1.74) have a higher HCE than externally motivated companies (Mdn=1.39). SCE is also higher for internally motivated companies (Mdn=0.42) than for externally motivated companies (Mdn=0.28). This means that internally motivated companies use IC more efficiently than externally motivated ones. On the other hand, CEE did not differ significantly ($p>0.10$) between internally and externally motivated companies.

Table 1: Descriptive statistics with the test of normality

Incentive		M	SD	Mdn	Shapiro-Wilk		
					Statistic	df	Sig.
HCE	Internal	2.01	1.30	1.74	0.72	22	0.00***
	External	1.49	0.42	1.39	0.95	21	0.39
SCE	Internal	0.23	0.94	0.42	0.41	22	0.00***
	External	0.28	0.18	0.28	0.95	21	0.41
CEE	Internal	0.80	0.72	0.58	0.73	22	0.00***
	External	1.67	3.99	0.49	0.39	21	0.00***
ICE	Internal	2.24	1.93	2.16	0.78	22	0.00***
	External	1.78	0.59	1.67	0.96	21	0.57
VAIC	Internal	3.04	1.99	2.98	0.74	22	0.00***
	External	3.37	3.79	2.46	0.40	21	0.00***

* Results significant at the 10% level
Source: Author's research

Table 2: Mann-Whitney Test

Intellectual capital	HCE	SCE	CEE	ICE	VAIC
Mann-Whitney U	162.00	162.00	214.00	162.00	124.00
Wilcoxon W	415.00	415.00	445.00	415.00	355.00
Z	-1.88	-1.88	-0.41	-1.88	-2.60
Asymp. Sig. (2-tailed)	0.06*	0.06*	0.68	0.06*	0.01***

* Results significant at the 10% level
*** Results significant at the 1% level
Grouping Variable: Incentive
Source: Author's research

6. Conclusion

The current study is an attempt to analyse the impact of QMS on a company's ability to create value in the future, measured by IC. Previous research has scrutinised the effects of QMS on past performance without providing insights into a company's potential to operate successfully in the long run. By indicating connections between QMS and IC, this study asserts that QMS strengthens IC as a dynamic system enabling a company to adjust to the changing environment and sustain competitive advantage. IC is company-specific, difficult to acquire, and imitate, which is why it is valuable for business success. Moreover, the study uncovers that motives for implementing a formal QMS, such as ISO 9001, have an impact on the company's efficiency in using IC, specifically human and structural capital. Namely, internally motivated companies for ISO 9001 certification, those that strive to improve the quality of processes in order to reduce errors, customer complaints and waste, to increase efficiency, employee motivation and customer satisfaction, show a higher efficiency of IC than externally motivated ones, who try to follow the trend, to have more effective marketing, or are pressured by customers or regulation for certification to ISO 9001. Also, internally motivated companies show higher value-added based on IC, meaning that they produce superior performance by their IC compared to companies that are externally motivated for ISO 9001 certification.

Although QMS seems to contribute to IC and its efficiency, IC, on the other hand, supports the establishment of an effective QMS. It facilitates employee involvement, organizational learning, and improvement, as well as relationship management. Thus, these two concepts are mutually reinforcing, leading to a company's continuous evolution.

It is suggested for future research to empirically examine the nature and strength of relationships between specific components of QMS and IC, based on the model proposed in this study. Such examination should aim to determine the strongest predictors of yield created by the resources invested.

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