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RESEARCHES OF THE IMPACT QUALITY MANAGEMENT PRINCIPLES ON INTEGRATED MANAGEMENT SYSTEM PRACTICES IN SERBIA

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ABSTRACT: The business is experiencing intense development of standardization in the first decade of the 21st century. So far developed dozens of standards / models and recommendations for management systems, which are now applied separately or integrated with one or more standardized management system. The basis for the development of standardization of business was a series of ISO 9000, which has now reached that stage IV of development. The basis for their development from the year 2000 are pripcipi quality management, their eighth We can also say that they are - the principles of quality management have always been the basis for the development of other models and standardized management system, which in this work and investigated. Namely, to determine what is the relationship between them and the practice of IMS applications in the Serbian economy, which in this paper and in detail and illustrated.
KEYWORDS: QM principles, IMS, Practices, Improvement

INTRODUCTION

Today in world we have more 1 million of QMS certificate and about 25% of them are related on IMS (two or more integrated standardize management systems). If we look history, we can divide the evolution of the quality movement into five distinct eras: (i) inspections, (ii) quality control (QC), (iii) quality assurance (QA), (iv) quality management (QMS), and (v) strategic quality management, which includes TQM / BE and IMS. ISO 9000 standards dominate the world scene of quality practice in the last two decades. Today, the 4th version of ISO 9000 series (ISO 9001:2008) is actual as a model for certification. At the other hand, the quality awards (international, company's, national – there are over 150 different models today in the world) have suffered an intensive changes as well (TQM, BE, E). The whole set of techniques and a tool used for quality improvement and QMS & TQM models integration is also established. For instance the ISO 9004:2009 and other models (up to date analyses shows that over 120 different models are used today). Eight quality management principles on which the quality management system standards of the ISO 9000:2005, ISO 9001:2008 and ISO 9004:2009 series are based. Also, IMS are based on QMS and others standardize management systems, such as ISO 14001, OHSAS 18001, ISO 22001, etc are introduce. Those principles can be used by senior management as a framework to guide their organizations towards improved performance and also building and applied of IMS. This paper show to QM principles / QMS (IMS) analyses and synthesis of theory and QM/IMS practice (of specified modifications of well known models) in the world and in Serbia [31, 43-46].

WORLD'S QM THEORY AND PRACTICE – THE ADVANCED APPROACHES

If we look world's QM/IMS theory and practice today, we can see following thinks: (i) The evolution of QM/IMS model development in praxis, (ii) The new QM/IMS model dimension and it's praxis, (iii) Tools for improvement of QM/IMS praxis, (iv) Modeling and improvement of QM/IMS processes and (v) Measuring and improvement of QM/IMS praxis (benefits).

At the beginning of this paper covers the analyses of following approaches: general approach to the QMS application - against the TQM in EU, analyzed by longitudinal approach and empiric data (continual development and application of QM praxis based on integration and development of QMS and TQM) [6], generic benchmarking as a framework for BE model application in SMEs (BE model for SMEs) [9,35], development of QM models based on benchmarking analysis and organizational learning, by application of many criteria's (QM model based on learning) [10], integrated quality data model (IQDM) for support of all processes, sub processes and quality activities in the life cycle of product [11], quality of product defined as "kind of durability", through the QM process [12], the future TQM model defined based on the "body of knowledge" [35].

The conclusion can be made that the evolution of QM/IMS concept development in praxis (QM/IMS praxis in the world) is based on the new expanded approach for quality knowledge modeling (QMS, TQM / BE, IQDM, body of knowledge for QM/IMS). These approaches and advanced QM models can be used as a paradigm for improvement of good QM praxis in the Serbian economy.

The second part of the paper analyzes the new dimension of QM/IMS model and it's praxis in the world; especially the questions like: how can QMS certification benefit the organization? (production increment, market expansion, better QM model, quality problems decrement, customer satisfaction - global competitiveness) [14], integration of sustainable development as a lever of a business system, application of integrated management system (IMS) which integrates QMS, EMS, OHSAS and CSR [15], QMS certification and it's contribution to improvement of educational and training activities - education for quality (training and development for quality initiatives) [17], the application of Step by Step Programme (SSP) for the quality improvement (QI) in low innovative industries (heavy industry) - QM improvement [21], contingent approach of QM concept development in different structured organizations - contingent QM [23], QMS and TQM, can they be complementary, or not? The analyses show that the simultaneous implementation is the best approach, when organization reaches bigger and better benefits, then in separated implementation - QMS/TQM simultaneous implementation [28], the adoption to changes brought by the new versions of standards and business condition changes, that define the scope of business - gap between organizational changes and QMS models [29], the QM role and it's implication on strategic planning in organization, as a part of the global business - QM as new global competitive strategy [32], T(QM)`s influence on business results from it's competencies angle (customer orientation, continual improvement, focus on employees and the global vision of the organization) - (T)QM as a competitive factor [34] and positive and dominant influence of TQM on product quality and innovation performance - The relationship between TQM practices, quality performance, and innovation performance [36].

The conclusions based on fulfilled analyses can be recapitulated as: (i) The good QM/IMS practice positively influences on different aspects of business performances of an organization (starting with sustainable development and finishing with innovations) and inverse, (ii) the following paradigm of the research has been confirmed - The good QM/IMS practice in Serbia positively influences on overall business performances of an organization.

Quality improvement and effective implementation of good QM practice is based on the use of different engineer techniques of quality (seven old and new QM management tools) and the large number of others.

The short analyses of specific examples, based on overall research results, is given in this paper: audit as an added value of quality and powerful tool for

continual improvement, with formed Fuzzy quality teams - ''fuzzy'' auditing [7], audit and self-assessment as a method and tools for QM/IMS model improvement [8], the use of QM tools and techniques in SMEs [26], and causal TQM model and it's influence to the conformity with quality requirements and customer satisfaction [33]. These analyses confirms: (i) Different tools and techniques are developed and implemented in QM improvement process, especially those important for SMEs, and (ii) our paradigm stands - QM tools and techniques are the base for QM praxis improvement in Serbia.

QMS practice is based on process modeling for all quality activities, which was the reason of our detailed analyze in the first place. It shows that different models are used for these purposes: model for analyses (performance measurement) and process re-engineering on the bases of IDEF 3 methodology [37], integrated multidimensional for process improvement methodology (IMPIM) which enables analyses of costs, as well as re-engineering (improvement) of processes [38], statistical engineering method based on variation method and analyze of it`s effects (VMEA), which enables management / improvement of QM processes [39], simulation model for value analyses (VA) by SPC and FMEA methods [40], modeling technique referred as IDEF9000 aimed for analyses and improvement of process – oriented QM systems, published as a methodology for dynamic enterprise process performance evaluation [30], Activity-Based Costing and Activity-Based Management (ABC/ABM) [41] and a Process Oriented Approach to Automated Quality Control [42]. This analyze shows us that progressive tools and techniques are used for modeling of QM processes, and the paradigm stands – There are no, or very few, tools and techniques for processes modeling used in Serbia.

At last, the final part of our analyses is concerned about improvement measurement of QM/IMS practice (benefits). It shows that different approaches are used in this area: examination of the QMS certification effects, by in-depth analyses of different influences, such as: (i) relation between QMS and TQM – Does QMS contribute to TQM improvements, and how much, (ii) QMS benefits perception – Do they overwhelm implementation costs, (iii) relation between QMS and organizational improvements – Does QMS contribute to organizational improvements, (iv) QMS implementation in all kinds and sizes of organization – It's universality for all types and situations, (v) long-term effects of QMS – Does it's application means long-term improvements, and (vi) motivation for QMS application – customer's demands and/or legal requirements are the most important for quality improvement? [1].

This approach shows that QMS certification effects can be analyzed from specific angles: QM/IMS praxis improvement, costs, organizational improvements, universality of application, long-term positive effects and motivation for certification.

The following analyses considers specific relations and effects of QS (ISO 9001/2/3):1994 and QMS certification [2], where interesting indicators were gained: 18 indicators have been analyzed (from supplier relation improvement to employees satisfaction), just 3 QS certificate indicators were better than QMS: time of investment get-back, occupational health and safety, and employee motivation. Comparison of QMS effects with TQM improvements in the same industrial branch (construction) in two countries (USA and Hong Kong) is shown in [3]. Interesting indicators were gained: Hong Kong construction companies prefer QMS certification (with the Government help), while the USA companies use TQM improvements. The same or similar quality engineering techniques for good QM praxis improvement are used. China is the world lieder in QMS certification (around 200.000 certificates for China, and just over 1 million for the entire world). The research shown in [4], analyses this phenomenon, as well as the QM praxis improvement in China by MBNQA criteria's. Interesting indicators were gained: large number of China`s companies fully understands the strategic importance of QMS, and many of them treys to apply TQM concept. The future of quality movement, managers and quality professionals is their lieder role in QM promoting as a strategic concept, as well as the best practice in this scope. Relative effectiveness of QM praxis in Thai (native, American and Japanese companies) was researched by DEA (Data Envelope Analysis) technique [5]. The following results were gained: Relative effectiveness comparison – average effectiveness of Japanese companies is better than Thai`s, or American`s. Return index comparison (of investments, capital, ...) – Thai companies are especially focused on effective and efficient QM activities, Japanese companies have high effectiveness (high level of QM praxis maturity), American companies strive for QM activities implementation with regard to costs. Costs causes – the causes of QM activities costs in American and Japanese companies are the same, but Thai companies cover their costs with lower prices and larger sale.

One interesting analyses is shown in [13], where the influence of QM practice on production system performances is given. The gained results show that the approximate analytic method for assessment of production system performances can be used, which is followed by SPC methods (QM praxis and it`s influence on productivity performances). The research shown in [16], analyses the effects of QMS certification in an interesting way, by inter-relation between five factors and their parameters: the production process improvement (7 parameters – the largest is increment of internal delivery performances (0,76)), company results improvement (4 parameters – the largest is increment of overall sale (0,84)), customer satisfaction (3 parameters – the largest is customer satisfaction index improvement (0,78)), investments (3 parameters – the largest is increment of investment index (0,89)) and personal motivation (3 parameters – the largest is increment of personal qualification index (0,60)). Gained parameters speak for themselves. The new model for prediction of QMS certificates diffusion in EU countries (Italy, UK, Netherlands, Germany, Spain and France) is given in [18]. It shows that benchmarking model of prediction is based on „logistic model", which shows that phenomenon (QMS certification) limes to saturation. Also, the certificates diffusion depends on specific business macro-structure, and the prediction shows further enlargement of certificate number. Model for measurement of TQM purchase performances [19], integrates following factors: top management responsibility, quality measurement and benchmarking, process management, product design, employees training, purchase management and involvement and satisfactions of customers. There are 45 parameters defined for all factors and they all together gain the „overall TQM level" of the organization.

Model for QM/IMS system performance measurement in praxis, based on defined indicators is given in [20]. The general definition of indicators define it`s metrics, which provides three functions: management, communication and improvement, and also defines it`s mathematical structure. Next example is related to QM practice success analyses (TQM model) in SMEs [22], by the parameter mark, related to: results related to customers, employees and society, as well as the quality performances. This research was done for 85 SMEs organizations, and correlation parameters were gained (for 16 characteristics) and after that „on site" check for 10 randomly picked organizations was done. The conclusion made out of the research was that specialist quality education can strongly influence on output quality of product. Evaluation of QM praxis in large organizations was done on the basis of 10 years long surveillance. [24]. It was aimed to determine the influence of internal factors on sustainable development and QM in long-term period. By longitudinal approach in research, QM strategies and activities were evaluated by analyzed relevant QM documentation. All factors with long-term influence on QM were exposed, such as influences of: CEO, executive directors, quality foundations and their

creation of new quality initiatives, as a motor force for quality improvement on national level, QM model expansion and its integration with other systems (IMS). Other factors encompass audit role and evaluation, customer relation, informational system and creation of solid relation between business plan and QM activities.

One of the key elements of QM/IMS praxis is monitoring and measurement of its performances. The approach given in [25] is the study that evaluates QM praxis in Irish industry, on the bases of its performances. The key element of this research is linear relation with correlation coefficient of 0,694 between QM praxis and industry performances. The research was done by specially designed questionnaire, which was used to gain all relevant information about QM praxis and business results. The Study shown in [27] analyses nine factors of QMS (6 – internal characteristics of QMS and 3 – external characteristics of QMS), HK for metal industry. It shows that quality is the most important factor for sales and marketing performances improvement in an organization. This research also pointed out that good QM practice in organizations builds the basis for decrement of production costs and improvement of organizational effectiveness and efficiency. Foretoken analyses enables us to define following conclusions: (i) different approaches and methodologies are used for QM praxis evaluation. These approaches and methodologies represent annex of ISO 19011 standard, or are complementary with a part of it, and (ii) QM praxis in high developed countries is defined as „the best".

QM PRAXIS IN SERBIA – SOME RESEARCHES RESULTS

QM/IMS praxis in Serbia can be observed from two different views: (i) quality improvement in business, based on QMS certification, and (ii) development and application of good QM praxis. The first approach can be defined by following facts (May 2011): about 1950 QMS certificates, 8 ISO 16949 certificates, about 190 EMS certificates, about 430 (QMS + EMS) certificates, 270 (QMS + EMS + OHSAS) certificates, 318 HACCP certificates, 44 ISO 22001 certificates, 9 ISO 13485:2003 and 9 ISO 27001 certificates. If we have on mind the fact that there is over 1 million of QMS certificates at this moment on the world, Serbia participates about 2 promiles of overall certificates number. That is extremely small number, because there is 205 countries today in the world, and Serbia holds 104th place in the world by the number of certificates. Considering the level of economic development (BND) and level of technical and technological development, Serbia is on 76th place, it is clear that our country deserves larger number of QMS certificates. In the region of West Balkans, all significant countries have

larger number of QMS certificates (some of them, like Hungary have more 17000 QMS certificates, Romania more of 11000, etc). Why is that so?

Here are some reasons: (i) commerce transition process with owner structure change lasts for very long period (almost two decades), so that we have about 100 organizations that lost their certificates – they did not go for recertification, (ii) no consistent Government policy in the scope of macro-economics which are supposed to encourage commercial subjects for QMS certification (there were some palliative measures till now), and (iii) lack of national strategy for long-term quality development in Serbia. Because of all this, YUSQ, as a National Organization for Quality started national programme named: Quality improvement study in Serbia, in cooperation with EOQ and EC. This study is based on following paradigms: (i) good QM praxis has positive influence on business performances and development on organizations (Pharmaceutical industry, „Metalac" – Gornji Milanovac, Carlsberg – Serbia, Celarevo, „Tigar" – Pirot, Elektro-Vojvodina, Novi Sad, etc.), (ii) Quality engineering tools and techniques for QM praxis improvement in Serbia (iii) New national strategy for quality improvement based on good QM praxis in EU (UASQ, EOQ and EC Study), (iv) Continual education for quality (UASQ permanent education system for quality) and (v) Education and lieder role of management in good QM praxis in Serbia.

Next part is related on researches of the impact Quality Management Principles on Quality Management Practices in Serbia. We are used questionnaire and Lickert scale model (five level – from 1/low to 5/high). We are formulate companies data base – more 300 (about 30% without (QMS) IMS certificate and about 70% with IMS (QMS) certificate). The organizations were divided into groups according to size and industry type, and each group was divided into IMS (QMS) and non-IMS (QMS) certified organizations. We are received 338 responses (about 62% have such type of IMS) to the 720 survey instruments that were distributed, by e-mail. 16 responses were excluded from the study because they were incomplete. The survey instruments were mailed directly to top and middle managers who were responsible for quality management practices. Table 1 represents the sample by industry type (we are used UN classification system), showing that it comprised 237 manufacturing and service industries. As indicated in the table, most participants in this study were manufacturing companies, representing 66 % of the total sample. These participants were classified into ten categories: (1) oil & gas, (2) basic materials, (3) industrials, (4) consumer goods, (5) health care, (6) consumer services, (7) telecommunications, (8)

utilities, (9) financials and (10) technology. Detailed classification of industrials is given on table 2.

Table 1. The sample by industry type

Industry	Non-IMS(QMS)	IMS(QMS)	Total
Oil & Gas	2	5	7
Basic Materials	11	35	46
Industrials	15	49	64
Consumer Goods	12	39	51
Health Care	6	1	7
Consumer Services	2	4	6
Telecommunications	1	3	4
Utilities	1	4	5
Financials	5	11	16
Technology	8	28	36
	64	174	238

Table 2. Industrials – detailed classification

Industry	Supersector	Sector
	Construction & Materials	Construction & Materials
	Industrial Goods & Services	Aerospace & Defense
		General Industrials
Industrials		Electronic & Electrical Equipment
		Industrial Engineering
		Industrial Transportation
		Support Services

Table 3 shows the companies grouped in terms of number of employees. Most of the samples were taken from small organizations. The IMS registered organizations in the study tended to have more employees than the non-IMS(QMS) registered organizations.

Table 3. Review analyzing organizations according number of employs

Size	Employees	Non-IMS(QMS)	IMS(QMS)	Total
Small	< 50	26	133	159
Medium	50 - 249	24	43	67
Large	>250	13	9	22
	Total	63	185	**238**

Tables 4 and 5 show the results of descriptive statistics and ANOVA. There were significant differences in all seven QM principles: (1) Customer focused organization, (2) leadership, (3) Involvement of people, (4) Process approach, (5) System approach to management, (6) Continual improvement, (7) Factual approach to decision making, and (8) Mutually beneficial supplier relationships, between non-IMS(QMS) and IMS(QMS) organizations. In addition, the IMS (QMS) organizations had higher mean results in all of the quality management principles. The mean values for QM/IMS principles were the highest for IMS(QMS) organizations had higher mean values than non-IMS(QMS) registered companies. Table 5 show that QM principles (system approach to management)

for non-IMS(QMS) organization not have significant level in relation of IMS(QMS) certified organization.

Table 4. Basic statistics

QM Principles	Non-IMS(QMS)	IMS(QMS)	Average
Customer focused organisation	3.87	4.12	4.02
Leadership	3.53	3.81	3.66
Involvement of people	3.67	3.96	3.84
Process approach	3.31	3.72	3.51
System approach to management	3.53	3.80	3.66
Continual improvement	3.40	3.85	3.65
Factual approach to decision making	3.61	4.13	3.87
Mutually beneficial supplier relationships	3.56	3.97	3.79
Average	3.55	3.92	3.73

* Significant at 0.05 level.

Table 5. ANOVA analysis results

QM Principles	Non-IMS(QMS)	F-Value	IMS(QMS)
Customer focused organization	3.89	8.05*	4.15
Leadership	3.51	3.27*	3.82
Involvement of people	3.69	7.95*	3.99
Process approach	3.30	15.71*	3.71
System approach to management	3.51	0.24**	3.81
Continual improvement	3.43	12.61*	3.89
Factual approach to decision making	3.63	7.11*	4.11
Mutually beneficial supplier relationships	3.58	7.26*	3.99

* Significant at 0.05 level.
** Not Significant at 0.05 level.

Table 6. Results of Multiple Comparisons between Non-QMS and QMS

QM Principles	Non-IMS (QMS)/ Mean	Mean / Difference	IMS (QMS)	HSD Test	LSD Test
Customer focused organization	3.89	- 0.26	4.15	*	*
Leadership	3.51	- 0.31	3.82	*	*
Involvement of people	3.69	- 0.33	3.99	*	*
Process approach	3.30	- 0.39	3.71	*	*
System approach to management	3.51	- 0.30	3.81	*	*
Continual improvement	3.43	- 0.45	3.89	*	*
Factual approach to decision making	3.63	- 0.38	4.11	*	*
Mutually beneficial supplier relationships	3.58	- 0.41	3.99	*	*

* Significant at 0.05 level.

As shown in Tables 6 a comparison of the group means for each of the QM principles shows that there are significant differences for all principles between IMS(QMS) and non-IMS(QMS) organizations. To test these differences statistically, a multiple comparison test (HSD and LSD test) was carried out between those organizations.

It could be concluded that the requirements of ISO 9001:2008 standardization made a particular impact on QM principles.

QM/IMS RESEARCH IN SERBIA

Basic research centers in Serbia for quality development and technology are: (i) Mechanical Faculty in Belgrade, Laboratory for production metrology and TQM: (a) research, development and application of good QM/IMS praxis – BE model (business organizations, educational organizations), (b) intelligent and digital quality model for new technology systems generations, and (c) six sigma and Taguchi method for production without waste - research, development and application, (ii) Vinca institutes, Belgrade - development and application of EU directives in Serbia, (iii) Faculty of technical sciences – IIS – ITC, Novi Sad: (a) development and application of good QM and IMS praxis in commerce of Serbia, and (b) education for quality, and (iv) CIM College, Nis: (a) research, development and application of software models for quality engineering techniques, (b) development and application of software model for process modeling in QM and IMS commerce praxis, and (iii) development and application of good QM and IMS praxis in Serbia.

If we compare scope of research mentioned above, with research themes shown in chapter 2 of this paper, the conclusion can be made that Serbia does not lag behind in this area, as it was stated in paragraph 3. This can assure us that the paradigms defined in paragraph above, were defined correctly.

CONCLUSION REMARKS

Talking about QM theory and praxis in the world and in Serbia today, we can make a conclusion that: (i) quality and sustainable development are basic paradigms of commerce in high developed countries, in the first decade of 21st century, and (ii) Serbia has all necessary prerequisites for high achievements in this area, but necessary steps needed for this accomplishment are intensive state changing activities, defined as paradigms in paragraph 3. UASQ with it`s activities has a leading role in those processes, and accomplishes that in some long-term period. This work represents a part of research done in projects (QM/IMS praxis and implementation of EU directives) which is supported by Serbian Ministry of Science and Technology.

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