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Thematic unit: QUALITY AS A STRATEGY

da značajnija promocija kvalitete kao strategije u svim organizacijama i sektorima može znatnije doprinijeti razvoju konkurentnosti gospodarstva na globalnoj razini.

Ovaj smo put, nakon više godina, ponovno u Vodicama, prekrasnom turističkom mjestu hrvatskoga Jadrana. Očekujemo vas, sudionike simpozija iz petnaestak zemalja svijeta, koji ćete svojim sudjelovanjem dati doprinos razvoju koncepta kvalitete kao strategije i dati nam brojne primjere o tome iz vlastitih sredina.

I hvala vam na tome.

Dr. sc. Miroslav Drljača
Predsjednik HDMK i Urednik

Dear colleagues, ladies and gentlemen, it is my pleasure to invite you to participate in the 18th International Symposium on Quality, under the title QUALITY AS A STRATEGY.

We are starting the preparations for the Symposium in the period of economic growth in Croatia. GDP growth rates are around 2 and more percent. All elements of GDP are increasing is encouraging. Unemployment rate is decreasing, meaning that the number of employed population rises. In 2016 tourism records the best results since the beginning of Croatian independence.

EU member states also record a growth of GDP. The price of oil in the world markets is still relatively low. However, the EU, as well as some European countries, still not formal EU members, on the so called Balkan route, are preparing for a new wave of migrants from North African and Middle East countries, but also from Central Africa and the Far East countries.

Globally, there are significant risks for stability of European and world economy: Brexit and its consequences, still unknown, frequent terrorist attacks in European countries, war in Syria and in the Middle East, deceleration of economic growth in China and many others.

New solutions and possibilities of growth and development are looked for. We believe that one of possible solutions is quality embedded as a strategy in the management system of every organization and every state. And this is where the working title of this symposium comes from: QUALITY AS A STRATEGY.

Conflict is a constant on a global scale. Thousands of scientists and professionals all over the world, in gatherings equal or similar to this one, as well as daily in their work places, try to find solutions by applying quality as a strategy.

CQMS is on the standpoint that quality is a good development strategy, it gives possibility to develop competitive ability of the economy, ensure material wellbeing of citizens and develop democracy. Practical examples substantiating this are around us.

By studying the socio-economic reality, its causes and consequences, it may be concluded with great certainty that bad quality is the cause of all imbalances, meaning crises, conflicts, wars and other manifestations of destruction.

Our duty as scientists and professionals is to make our contribution to the idea of quality as a strategy. To this purpose we started organizing the 18th international symposium on quality and invited all of you to exchange experiences and ideas, with the aim to find acceptable solutions leading to prosperity.

Through presentation of scientific and expert papers from the scope of management systems by scientists and professionals from the country and from abroad, we want to point out that a more significant promotion of quality as a strategy in all organizations and sectors may considerably contribute to development of competitiveness of economy at the global level.

This time, after many years, we are again in Vodice, a beautiful tourist place of the Croatian Adriatic. We look forward to seeing you, participants from some fifteen countries of the world, who would, with your partaking, make a contribution to development of the concept of quality as a strategy and give us numerous examples of this in your own surroundings.

And thank you for that.

Miroslav Drljača, Ph.D.
CQMS President and Editor

Tematska cjelina/*Thematic unit*
KVALITETA KAO STRATEGIJA
QUALITY AS A STRATEGY

Vodice, Hrvatska/*Croatia*
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March 22nd – 24th, 2017

MEASURABILITY OF TECHNOLOGICAL COMPETENCE IN TERMS OF ACHIEVING QUALITY AND STRATEGIC POSITIONING OF ORGANIZATION

MJERLJIVOST TEHNOLOŠKE KOMPETENTNOSTI U CILJU POSTIZANJA KVALITETE I STRATEŠKOG POZICIONIRANJA ORGANIZACIJE

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ABSTRACT

In modern business conditions, competent organization is the one that succeeds to realize technological competence, along with other key elements of competence. Organizations which accumulate technological competence are the ones that are continuously learning and growing. Technological competence is an organization ability to use optimally a relevant technology and thereby provide a strategic positioning in the market. The paper gives literature review about different perspectives of competence with the emphasis on technological competence accumulation that enables organization achieve a leading position in the market. Paper also describes the RPA index, a known methodology, which can be used to determine a level of accumulated technological competence in the organization. Based on determined level of techno-

logical competence a strategy of organization behavior is selected with the goal of achieving strategic positioning in the market.

Key words: *organization, competitive advantage, technological competence.*

1. INTRODUCTION

During product and services realization, organizations use specific technologies that represent accumulated and materialized knowledge of previous generations. By organization it is meant company, organization or firm. Protection of intellectual property has encouraged technology development because the owner started to materialize and reward their efforts that was invested in product or service development. Technological changes have led us into today's technological age with lot of sophisticated products and services. Those available products and service increase our standard and make life easier. This benefits have also pitfalls visible in privacy and individuality loss. The paper represents a research about the impact of technological competence on organization competitiveness and its strategic positioning.

2. ORGANIZATION AND TECHNOLOGY

The word „organization" comes from the Greek word „organon" which means tool, instrument, device or leverage. From the Greek word organon to Latin word organum, the word organization entered into all world languages as internationally accepted term organization.[1] It operates within external and internal environment that affects organization. Business system consists of further components: inputs (natural resources, human capital, and information), transformation (processing resources), output (goods and services) and management (planning, organizing, influencing, and control). They manage transformation process and respond to challenges of internal and external environment.[2] The organization is a dynamic system with all key elements and can be expressed as:

$$S = \{E,a,r\} \tag{1}$$

- S – system,
- E – sum of elements from E1 to En where $E \geq 2$,

[1] Pere Sikavica, *Organizacija*, Školska knjiga, Zagreb, 2011.

[2] Judith R. Gordon, R. Wayne Mondy, Arthur Sharplin and Shane Premeaux, *Management and organizational behavior*, Allyn and Bacon, Boston, 1990.

- a – attributes, system capacity,
- r – relations, links between elements of the system.[3]

Organizational systems integrate natural and technical systems as subsystems. Accordingly organization, as a business system, has great internal complexity of relations and a complex relation with environment dynamics. The main purpose is to satisfy all stakeholders through realization of economic benefits. Organizational system must achieve set goals which are basis for setting up the necessary organizational structure and defining required system elements (E) (resources in term of manpower, capital, resources, materials, etc.), their interdependence and association as a whole which interacts with environment.[4]

Technology is one of the most important organizational factor and since technologies are different then organizational structures must differ. Technology represents a way organization transforms inputs into outputs, it is the core of transformation process, and it includes equipment, workflow and methods. Those are transformation production processes that require specific work distribution and internal organization.[5] Technology is a knowledge base about procedures and processes that are being applied in treatment, processing and manufacturing assembly and in other areas of human activity. It is a set of those procedures and processes. Technology in the narrow sense (which relates to work subject) may be called non-materialized technology and it is a set of procedures and processes in various fields of activities. Together with technological knowledge it presents technology in a broader sense.[6] Technique, meaning working asset, can be called materialized technology because they have objectified knowledge being developed in the past. Technique represents materialized accumulated knowledge and skills that human and society are using in manufacturing and other business areas.[7]

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[3] Krešimir Buntak, Zdenko Adelsberger i Dejan Adelsberger, "Kompetentnost - ključna karakteristika organizacije upravljane na načelima kvalitete", Kvalitet (7-8), 2011, str. 33-35.

[4] Krešimir Buntak, "Utjecaj organizacijske kompetentnosti na održivost poslovanja organizacije temeljene na konceptu upravljanja kvalitetom", Zbornik radova 13. međunarodnog simpozija o kvaliteti *Kvaliteta i društvena odgovornost*, Hrvatsko društvo menadžera kvalitete, Zagreb, Solin, 2012, str. 399-415.

[5] Slobodan Kotlica, *Osnovi tehnološkog menadžmenta*, Megatrend univerzitet primenjenih nauka, Beograd, 2005.

[6] Ibid.

[7] Ibid.

2.1. Technology and knowledge

Technology is specific for individual products and processes, while knowledge is more general. Technology can be materialized in people and materials, in physical processes, in cognitive processes, in equipment, tools and factories. It is the output of development activities and practical application of inventions and innovations. Basic technological elements can be implicit so their imitation is very difficult.[8] Knowledge has the status of public good. Public goods are neither excludable nor possess consumption rivalry. People cannot be prevented to use a public good and individual use cannot reduce the amount and possibility to use it by other stakeholders.[9] This is especially true regarding scientific knowledge. Another qualification of knowledge is that by using knowledge you can't spend it moreover it increases over a time through a system of learning by using. However, economic value of knowledge decreases when more subjects are using it, especially in the process of imitation and supply increase, which reduces market price. Accordingly, no matter the fact it doesn't spend like material assets, knowledge, especially technological, can be radically devaluated when new technological breakthrough comes (new technological knowledge). In that case new technology decreases the value of existing technology in use, to zero or very close to zero.[10]

3. ORGANIZATIONAL COMPETENCE

The word competence comes from the Latin word „competere". It implies competence, scope, authority, and areas in which a person has knowledge and experience. The word means capable, informed, who knows, a skilled, trained, authorized, authoritative. This means a qualified person who with its knowledge or authority has the right to do, solve and judge about something.[11] Many authors wrote about the concept of organizational and technological competence, especially after Prahalad and Hamel (1990) published their article "The Core Competence of the Corporation.".[12] Authors identified components and framework. Analyzing organizational competence literature, Edgar and Lockwood classified four categories, showing different perspectives

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[8] Ibid.

[9] Gregory N. Mankiw, *Osnove ekonomije*, MATE, Zagreb, 2006.

[10] Slobodan Kotlica, *Osnovi tehnološkog menadžmenta*, Megatrend univerzitet primenjenih nauka, Beograd, 2005.

[11] Ibid.

[12] Coimbatore Krishnarao Prahalad and Gary Hamel, "The core competence of the corporation", Harvard Business Review, Vol. 68, No 3, 1990, p. 79-92.

of organizational competence and developed a detailed review of referent literature shown in the table (Table 1).

Table 1. Literature review regarding different competence perspectives

Perspective 1: Phenomena and Related Disciplines		
Bakkeret. al. 1994 Banerjee 2003 Chaston & Mangles 1997 DeCarois 2003 Gallon et. al. 1995 Goddard 1997	Grandstrand et. al. 1997 Guimaraes et. al. 2001 Hafeez et. al. 2002 Henderson & Cockburn 1994 Leonard-Barton 1992 Lorenzoni & Lipparini 1999	Meschi & Cremer 1999 Miyazakil 1999 Onyeiwu 2003 Petroni 1998 Prahalad & Hamel 1990 Walsh &Linton, 2001
Perspective 2: Technology and Related Products		
Bakkeret. al. 1994 Bogner & Thomas 1994 Daneels 2002 Day 1994 Drejer2001 Drejer & Sorenson, 2002	Duysters & Hagedoom 2000 Gorman & Thomas 1997 Grandstand et. al. 1997 Hafeez et. al. 2002 Hamel & Prahalad, 1994 Klein& Hiscocks 1994	Leonard-Barton 1992 Onyeiwu 2003 Petts 1997 Torkkeli & Tuominen 2002 Walsh &Linton 2001 Wang et. al. 2004
Perspective 3: Skills		
Bogner & Thomas 1994 Bove et. al. 2000 Davies & Brady 2000 De Carolis 2003 Gallon, et.al. 1995 Goddard 1997 Hafeez et. al. 2002 Harmsen et. al. 2000	Hitt& Ireland 1985 Javidan 1998 King &Zeithaml 2001 Klein & Hiscocks 1994 Leonard-Barton 1992 Meyer &Utterback 1992 Moorman & Slotegraaf, 1999	Onyeiwu 2003 Petts 1997 Stuart et. al. 1995 Thomas & Pollock, 1999 Torkkeli & Tuominen, 2002 Walsh and Linton, 2001 Wang et. al. 2004
Perspective 4: Integration of Technology and Skills		
Collis & Montgomery 1995 Gallon et. al 1995 Gorman & Thomas 1997 Grant 1996	Hafeez et. al. 2002 Hamel & Prahalad, 1994 Henderson & Cockbum 1994 Petts 1997	Prahalad & Hamel 1990 Sanchez et. al 1996 Torkelli & Tuominen, 2002

Source: William B. Edgar and Chris A. Lockwood, "Organizational Competencies: Clarifying the Construct", Journal of Business Inquiry, 2008, p. 21-32. https://www.uvu.edu/woodbury/docs/jbi_v7_organizational_competencies.pdf [25.12.2016.]

Organizational competence is an integration of individual competence (corporate employees), technical, technological and organizational competence that must respond adequately and on time to a complex challenges coming from dynamic environment. In particular it should be noted the impact of intellectual (invisible) capital which largely covers employees competence,

and technological and organizational capability.[13] Intellectual capital is created, developed and maintained by knowledge management. Intellectual means that its source lies in human knowledge. It has the potential to create extra value and its realization depends on success of performance management. Intellectual capital is divided into:[14]

- Human capital;
- The structural (organizational) capital;
- Relational (consumer) capital;
- Intellectual property.

Today's organizations base their survival and development on intellectual capital. They are turning to branding, image and good reputation. A good reputation requires socially responsible organizational behavior which will ensure sustainable development of environment in which the organization operates.[15] Employees competences are set of knowledge, skills, attitudes, behaviors, personalities, experiences and other personal attributes that affect one's work. They are close to efficiency and can be measured using generally accepted standards. Those skills include successfully completing a specific task, activity or function. Through job systematization, organization needs to appoint necessary competences for a specific job such as required education, acquired knowledge, abilities, skills and personality characteristics.[16] Organizational competence forms together individual competence, as a proven ability to apply knowledge and skills, and organizational ability in terms of process, system and organization possibility to realize the product or service according to requirements given to a specific product or a service. Organization competence can be expressed as a set of human factor competences and the sum of key capabilities:

$$Ko = \{Kljk,S,a,r\} \quad (2)$$

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[13] Krešimir Buntak, "Utjecaj organizacijske kompetentnosti na održivost poslovanja organizacije temeljene na konceptu upravljanja kvalitetom", Zbornik radova 13. međunarodnog simpozija o kvaliteti *Kvaliteta i društvena odgovornost*, Hrvatsko društvo menadžera kvalitete, Zagreb, Solin, 2012, p. 399.-415.

[14] Ibid.

[15] Thomas H. Byers, Richard C. Dorf and Andrew J. Nelson, "Tehnološko poduzetništvo, od ideje do tvrtke", Tehničko veleučilište u Zagrebu, Zagreb, 2015.

[16] Krešimir Buntak, "Utjecaj organizacijske kompetentnosti na održivost poslovanja organizacije temeljene na konceptu upravljanja kvalitetom", Zbornik radova 13. međunarodnog simpozija o kvaliteti, *Kvaliteta i društvena odgovornost*, Hrvatsko društvo menadžera kvalitete, Zagreb, Solin, 2012, p. 399.-415.

- Ko – competence of the organization,
- Kljk – competence of human capital,
- S – the sum of key skills (organizational, technical and technological) from S1 to Sn, provided that $S \geq 2$,
- a- attributes, properties of the system,
- r- relations, links between elements of the system.

In dynamic environment, organizational competence decreases uncertainty in management process. Organizational competence together with documentary and manageability has become one of three key management characteristics in achieving sustainable success according to the concept of quality management system.[17]

4. TECHNOLOGICAL COMPETENCE

Technological competence includes internal organizational ability to understand, use and utilize relevant technology. The technological competence of the organization as part of a larger system play a key role in explaining the different phenomena such as globalization, technological discontinuity and industrial dynamics.[18] Malerba and Marengo were exploring the Italian manufacturing sector and found a positive relationship between technological competence and business profitability in the sector of high technologies and consider that technological competency is the most relevant for achieving long-term organizational competitiveness.[19] Those competences enable organization to become a market pioneer with new product development or with the use of new manufacturing processes. Competencies can be measured in two ways:

- in degree of tasks fulfillment and qualifications - as an internal view or
- in relation to competitors, for example: if organizational competence in particular area is higher or lower than competitors competence. [20]

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[17] Krešimir Buntak, Zdenko Adelsberger i Dejan Adelsberger, "Kompetentnost - ključna karakteristika organizacije upravljane na načelima kvalitete", Kvalitet (7-8), 2011, str. 33-35.

[18] B. Carlson, *Technological System and Economic Performance*, Kluwer Academic Publisher, Boston, 1997.

[19] Franco Malerba and Luigi Marengo, "Competence, innovative activities and economic performance in Italian high–technology firms", International Journal of Technology Management, Vol. 10, No. 4-6, 1995, p. 461-477.

20 Thomas Ritter, Hans Georg Gemünden, "The impact of a company's business strategy on its technological competence, network competence and innovation success", Journal of Business Research, 57, 548 – 556, 2004.

4.1. Technology strategy and competitive advantage

The technological competence plays a key role in maintaining a competitive advantage in a turbulent industry. Technology is, as a concept of evolutionary organizational learning, the basis for strategy development. Construction, maintenance and improvement of competitive advantage is a strategic goal for every organization. Competitive advantages are associated with ability to manage technological resources and management of different types of visible and invisible assets such as technological knowledge. With strategy development it comes to an interaction between technological skills and competences, and also between strategies itself and experience that is collected using the strategy. Experience serves as a feedback that corrects skills, competencies and technological strategy itself in terms of creating and improving competitive advantage. [21]

4.2. Accumulation of technological competencies

Achieving sustainable competitive advantage depends on internal organizational competence and on accumulated competitor's competencies from closer and wider environment. Current organization position reflects technological competence that organization possesses and change (path) that led to its current position. There are continual and big pressures on organizational current position coming from environment. On impacts and environment volatility, organizations can respond by strengthening its own technological competence and maintain its competitive advantage in the same field or develop new competencies in new areas. Accordingly, distinguishing itself from its competitors by building new competitive advantages. That mutual influence between organization and environment on development and sustained change in technological competence can be explained by the "evolution of the Red Queen". According to this theory, competition between organizations is a trigger for internal processes of technological competence accumulation. That process generates further competitors pressure on the environment which then becomes a self-sustained process of continuous competence accumulation.[22]

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[21] Slobodan Kotlica, *Osnovi tehnološkog menadžmenta*, Megatrend univerzitet primenjenih nauka, Beograd, 2005.

[22] Mette Praest Knudsen, "Patterns of technological competence accumulation: a proposition for empirical measurement", Industrial & Corporate Change, Vol. 14, No. 6, 2005, 1075-1108.

4.3. Patterns of technological competence accumulation

Technological competence can be measured by using patent base as an indicator of technological competence. Patent base, as indicators of technological accumulation in the given technological field can, to some extent, represent accumulation of technological competence. Knowledge that is stored in the patent includes both visible and hidden knowledge, but it is not known to what extent. Measuring of technological competence is performed by RPA (Relative Patent Advantage) index that was developed for the purpose of comparing organizations directly. It indicates an established competence level and difference between competence levels in a given period.[23] RPA index is calculated on the basis of RTA (Revealed Technological Advantage) index (originally developed by Soete and Wyatt in 1983) according to the equation:

$$RPA = 100\ln(RTA) \tag{3}$$

$$RTA = \frac{Pit / \sum_t Pi}{\sum_t Pt / \sum_{i,t} P} \tag{4}$$

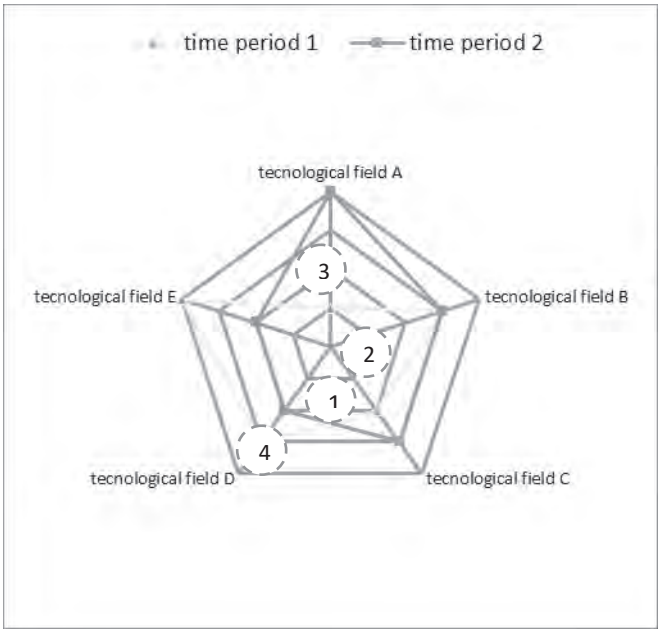
P represents the number of patents, i indicates organization, and t represents technological area. RPA index has interval range between (-100:100) where 0 is a neutral value. Value of RPA index can be directly compared, meaning that specialization level for value 10 is two times bigger than level value 5. Knudsen has defined four position conditions of technological competence accumulation in organization: competence building, competence leveraging, competence erosion and no competence.[24] Competence building means that the change of competence according to competition is above average and is increasing. Upgrading competence enables organization to achieve its goals by creating new opportunities for future achievements. It expands the space for knowledge diversification and is proactive in creating new competencies as a response to internal needs for sustainable growth. Also, it is a reaction to external threats that have devastating effects on current technological competencies by turning them, with innovation process, into outdated and unnecessary. This level of accumulation is common for organizations that already have a certain history in certain technological field.[25] Competence leveraging means

[23] Ibid.
[24] Ibid.
[25] Ibid.

unchanged competence level according to competition. Maintaining competence at the same level demands constant organization action, considering that overall technological competency is constantly growing. But increase of organizational technological competence in a certain technological field increases with same dynamics as increase of competitor's competence, so there is no advancement nor laggards in technological competence accumulation. Maintaining competence requires from organization minor investment in research and development and bigger security because researches are conducted on a well-known field. This deepens organizational knowledge and in the short run gives more security in maintaining foundations for organizational survival.[26] By depreciating competence level, concerning competition, competence erosion appears. Erosion is defined as decreasing level of competence in relation to initial position. It can happen if technological competences are not developing anymore, so competition takes the leadership. This can happen because of two reasons. One reason is disinvestment strategy, where organization leaves strategically unperceptive technological field and reallocates resources to other fields. Another reason is when an organization loses its technological competencies simply by not using them and then forgets them. So, erosion can be deliberate and undeliberate. Level with no competence have small or highly specialized organizations that do not enter into some technological fields or access them with minor activities that actually do not have any technological competence in these fields. To a no competence level organization can come after complete competence erosion related to strategic orientation or with competitors technological move.[27] Accumulation of technological competence can be depicted by using radar diagrams. In diagram each axis represents organizational technological competence in a particular technology field. Overall area demonstrates organizational technological competence. Axes are graded in four levels. Number 1 indicates level of no competence, number 2 is level of competency erosion, number 3 is competence leveraging and number 4 is the level of competence building. Different colors in radar diagram represent different time periods of accumulated technological competence.

[26] Ibid.
[27] Ibid.

Figure 1. Radar diagram of organizational technological competence



Source: Mette Praest Knudsen, "Patterns of technological competence accumulation: a proposition for empirical measurement", Industrial & Corporate Change, Vol. 14, No. 6, 2005, 1075-1108.

Level shifts of accumulated technological competence have following meanings:

- shift from competence building level to competence leveraging level is called consolidation;
- shift from competency leveraging to erosion or to no competency level is called decrease in dynamics;
- shifting from no competency level or competency erosion level to leveraging level or competency building level it is called an increase in dynamics;
- if organizational technological competence accumulation levels remain on the same level then this is called no change.[28]

4.4. Organizational behavior strategies

Organizations choose different strategies in order to meet their strategic objectives. Knudsen has identified in his research four groups of different

[28] Ibid.

behavior strategies of organization regarding technological competence accumulation during different time periods. Those are: reorganization of competence configuration, loss of momentum, strategic re-orientation and no change or consolidation.[29] Reorganization of competence configuration is a strategy where over the time organization changes its technological fields of accumulated competencies and then makes a change in more than two technological fields either by increasing or decreasing accumulation of technological competence toward another type of competence accumulation. Organizations that are blocked in difficult positions seek a way out by exploring new technological opportunities in new fields. Also, when companies in marginal positions move forward or when well-positioned organizations seek for new opportunities, both do it through strategic maneuver that results in reorganization. This strategy is very risky and uncertain. This strategy requires significant investment in research and development and can led organization into awkward position. On the other hand, there are many examples of strategy success, which is the only path, for organizations being on margins, to climb up to the top and become market leader.[30] Loss of momentum is defined as a consolidation or erosion, at least in two technological fields. This group is characterized by overall business contraction with dynamics loss. Contraction does not have to lead to a loss of competitiveness, but will eventually lead to erosion of competence base. First reason is when organizations have hard time maintaining high level of technological competence accumulation, over a time. After a period of intense investments into unexplored areas that have not yet brought economic benefits, organizations must stop for a while and analyze what results are generated from those innovations and align objective and future innovation strategy. Second, if investments in maintaining competence level is insufficient for maintain previous level of accumulation, then "Red Queen" increases contraction and can extrude some organizations who are beyond competition. Starting point for strategic re-orientation is consolidation or no-change in two or more fields and focus on stability and incremental change rather than change. This strategy represents a focused actions in several technological fields, with greater specialization, resulting in lower costs and risk with higher profits. No change or consolidation is strategy of static organizations or shift toward consolidation. This strategy applies to those who maintain pattern of competence accumulation of previous periods and choose strategy "keeping up to well-known" rather than try something they don't understand. These are organizations that use harvest strategy by using current technological competencies to gain competitive advantage. This group includes organi-

[29] Ibid.
[30] Ibid.

zations that do not have any competencies in specific technological area and never had before.[31]

5. CONCLUSION

The organization must be competent to deliver added value to the customer. It also needs to act actively and reactively on environmental influences following knowledge competition and competence. The organization must be competent to deliver added value to the customer. It also needs to act actively and reactively to environmental influences accompanying competition knowledge and competence. At the same time organization needs to create its own competence base with efficient knowledge management and creation of intellectual capital in learning organization. In this way, competition will not be able to escape because organization will accumulate technological competence that enables her to create a competitive advantage. With such competitive advantage organization can achieve better results and therefore create higher profits. Technological competence is the key for survivor in todays business world. It is not something imaginary and it can be measured in several different ways. One way is to measure technological competence through patented innovations. This way organization protects its intellectual assets. Patents present a very specific indicator of innovation activities. They are favorable, measurable, transparent and objective indicator of organization technological competence. Following history of technological competence through organization's patents and at times when only constant change and innovation can guarantee survivor it is possible to define organization's position and create strategy for further action to assure long-term organization survivor.

Sažetak:

MJERLJIVOST TEHNOLOŠKE KOMPETENTNOSTIU CILJU POSTIZANJA KVALITETE I STRATEŠKOG POZICIONIRANJA ORGANIZACIJE

U suvremenim uvjetima poslovanja, kompetentna organizacija je ona organizacija koja uz ostale ključne elemente kompetentnosti uspije ostvariti i tehnološku kompetentnost. Kroz akumulaciju tehnološke kompetentnosti takva organizacija kontinuirano uči i raste. Tehnološka kompetentnost predstavlja sposobnost organizacije da optimalno upotrijebi relevantnu tehnologiju i time osigura stratešku poziciju na tržištu. Rad daje pregled literature različitih perspektiva kompetencija pri čemu je nagla-

[31] Ibid.

sak stavljen na akumulaciju tehnološke kompetentnosti koja omogućuje organizaciji postizanje vodeće pozicije na tržištu. Također opisuje RPA indeks kojim je moguće poznatom metodologijom mjerenja utvrditi razinu akumulirane tehnološke kompetentnosti. Temeljem utvrđene razine tehnološke kompetentnosti odabire se strategija ponašanja organizacije s ciljem strateškog pozicioniranja na tržištu.

Ključne riječi: *komparativna prednost, tehnološka kompetentnost.*

6. LITERATURE

1. Buntak, K., „Utjecaj organizacijske kompetentnosti na održivost poslovanja organizacije temeljene na konceptu upravljanja kvalitetom“, Zbornik radova 13. međunarodni simpozij o kvaliteti, *Kvaliteta i društvena odgovornost,* Hrvatsko društvo menadžera kvalitete, Solin, 2012.
2. Buntak, K., Adelsberger, Z. I D. Adelsberger, „Kompetentnost – ključna karakteristika organizacije upravljane na načelima kvalitete“, Kvalitet, No. 7-8, Beograd, 2011.
3. Byers, T. H., Dorf, R. C. and A. J. N. Nelson, „Tehnološko poduzetništvo, od ideje do tvrtke,“ Tehničko veleučilište u Zagrebu, Zagreb, 2015.
4. Carlson, B., „Technological System and Economic Performance“, Kluwer Academic Publisher, Boston, 1997.
5. Edgar, W. B. and C. A. Lockwood, „Organizational Competencies: Clarifying the Construct“, Journal of Business Inquiry, 2008.
6. https://www.uvu.edu/woodbury/docs/jbi_v7_organizational_competencies.pdf [25.12.2016.]
7. Gordon, R., Mondy, R., Sharplin, A. and S. Premeaux, *Management and organizational behaviour*, Allyn and Bacon. Boston, 1990.
8. Knudsen, M. P., „Patterns of technological competence accumulation: a proposition for empirical measurement“, Industrial & Corporate Change, Vol. 14, No. 6, 2005.
9. Kotlica, S., *Osnovi tehnološkog menadžmenta*, Megatrend univerzitet primenjenih nauka, Beograd, 2005.
10. Malerba, F. And L. Marengo, „Competence, innovative activities and economic performance in Italian high–technology firms“, International Journal of Technology Management, Vol. 10, No. 4-6, 1995.
11. Mankiw, G. N., *Osnove ekonomije*, MATE, Zagreb, 2006.
12. Prahalad C. K. and G. Hamel, „The core competence of the corporation“, Harvard Business Review, Vol. 68, No. 3, 1990.
13. Ritter, T. And H. G. Gemünden, „The impact of a company's business strategy on its technological competence, network competence and innovation success“, Journal of Business Research, No. 57, 2004.
14. Sikavica, P., *Organizacija*, Školska knjiga, Zagreb, 2011.

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