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## IMPACT OF INVESTMENT IN QUALITY AND ENVIRONMENTAL PROTECTION ON REGIONAL SUSTAINABILITY

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**Abstract:** *Considering that quality is one of foundation of harmonized regional development, in this paper, overall view of identified need for level of product quality, improvement of environmental protection, improvement of competitiveness and improvement of quality of tourism services has been analysed. In the next phase requests of stakeholders are presented. Author has also analysed feasibility of investing in quality improvement and environmental protection in Sumadija and Pomoravlje and identified the most significant types of economic benefits and economic costs that may result from the introduction of ISO 9001, ISO 14001, HACCP and obtaining the CE mark for products and diagrammatic unveiled in the assumed maximum, realistic and minimum value applying cost/benefit analysis. On these bases, mathematical functions and calculations are applied to determine if there are different variants of total economic benefits and total economic costs. Goal was to determine if the investment in quality improvement and environmental protection in SMEs in Sumadija and Pomoravlje is largely justified and profitable.*

**Keywords:** *quality, lifecycle quality, environmental protection, investment, regional sustainability*

### 1. Introduction<sup>1</sup>

The term refers to quality of the product process or organization. If we start from definition of regions in the country as “territorial rounded part of the state with characteristics which links it and the other to whole country, makes it specific”, it could be seen that same include all entities-organisations, local and federal government, banks, universities, health department, school department), more than that connection with environment no connection of entities within the region. That is one of

the reasons why is so hard to make definition of quality on regional level (Zimon, 2015).

This academic assignment is scientifically less important than practical one. Recognition of region like a carrier of development and acknowledgement that on the very beginning, uneven development exists, for example within Serbia and EU.

Considering that quality is one of foundation of harmonized regional development (through quality infrastructure) and outcome of regional development (through competitiveness and impact of quality of life), regional aspect of quality must be a significant segment of regional development policy.

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Regional policy was treading by many studies from area of regional policy and development strategies, but quality part is not represented in appropriate way. One of the reason is because creators of regional development policy, did not recognize quality like a main factor and outcome of same.

A regional sustainability is prerequisite for harmonized development of each state. It has very complex structure with many interrelated factors on organizational, regional and state level. Investment for improvement of regional sustainability because it is very complex and risked. The first phase for it is precise analyse of the present level of regional sustainability, benchmarking with other regions and find the key factors for improvement of regional sustainability. In the paper authors analysed quality and environmental protection as crucial factors of regional sustainability. Besides analysis of quality and environmental protection in one region in Serbia, analysed its impact on regional development. In paper are presented results of cost / benefit analyse and effects of investments on regional sustainability. In dealing with the first chapter 2 analyses the needs of the region of Central Serbia and identified stakeholder requirements in terms of quality improvement and environmental protection. The third chapter points to the model of regional sustainability, while in the fourth chapter of applying cost / benefit method analysed the effects of investment in quality improvement and environmental protection to regional sustainability

## **2. Identification of needs**

### **2.1. Increasing the quality of products and services and improving the quality of organizations**

Business climate considers all codex of commercial and administrative requirements in business management. Business requirements, taxes and good business

environment, advanced human recourses and developed financial department, has the greatest impact on regional business.

Business environment in Serbia does not provide necessary requirements for correct functioning of market economy. So, one of the most important priorities is establishment of a competitive environment for god's flow, capital and labour.

Sumadija and Pomoravlje region has tradition of industrial production with main characteristics of existence of huge industrial complexes (Zastava, Filip Kljajic, 21 October, Fabrika Kblova Jagodina, Cementara and staklara Parcin). These companies were leaders in regional economic development and employed majority of workers. Most of these companies were truck by erosion of capital and property, by poor management and slow privatization process, comparing number of employees in 1989 from 50000 to 30000 in whole region. Currently 42% employed from all the region are in industrial sector, which makes 25% of national income.

In the last 15 years there have been significant technological lagging in the region of Sumadija and Pomoravlje. under the technological lag means that the obsolescence of equipment and obsolescence in terms of using new knowledge and technology skills. As a result of this phenomenon is the decline in the quality of products, foreign markets have been lost and the level of The Innovation in the economy is very low. The sector of services for small and medium enterprises is also underdeveloped. The problems are on the both sides supply and demand. This clearly indicates the need to support the growth of SME sector through training and education, consultation, marketing research 'of the market, raising quality.

Assessment of the quality level of the organization in the region is based on the evaluation of the organizations that participate in the chain of value creation in the region

Related to:

- suppliers
- customers-
- the barriers of entry, and
- substitute

Four determinants of competitiveness could be identified at regional level.

If we start from the real situation, that realized regional products are sold in other regions, it is obvious that by defining the regional development policy (and quality within it), in addition to suppliers (who perform the primary and support activities), customers must be analysed (within the region and outside), and the barriers of entry to the market and the emergence of substitute with good prices and performance too.

## 2.2. Environmental protection improvement

SWOT analysis whose purpose was to point out the strengths and weaknesses as well as the external opportunities and threats when it comes to infrastructure development of environmental protection in Sumadija and Pomoravlje, has contributed to a better understanding of future courses of action.

Region strengths would be classified as follows:

- existence of a system for processing wastewater,
- fund for environmental protection,
- public health institute,
- preserved natural resources, and
- educated personnel.

The weakness of the region in terms of environmental protection are:

- low level of environmental awareness,
- insufficient funding for the process of wastewater treatment,
- lack of systematic measurements of exhaust gases and industrial pollution of air and water,
- lack of water and air filters,

- lack of concern and carelessness of radioactivity, and
- ecology "illiterate" population.
- unregulated issue of jurisdiction of certain institutions

When we analyse the external opportunities in the region, we can say that they are:

- improvement of legislation with EU standards and laws (ISO 14000),
- recycling businesses,
- sanitary landfill,
- education in ecology field,
- municipal waste management system,
- creating of maps of environmental hot spots in Sumadija and Pomoravlje,
- composting- landfill gas, and
- selective waste collection.

At the end, external danger when it comes to environmental protection in Sumadija i Pomoravlje are:

- centralism in decision-making,
- existing, unregulated, landfill,
- illegal dumping, and
- radioactive lightning rods.

## 2.3. Improvement of competitiveness

Creativity, specialization and versatility are key to maintain a competitive position in the market. Practice shows that today perhaps the most important change in the strategy of any organization clearly emphasized orientation to invest in research and development of technology, managerial and entrepreneurial skills, business organization, market development and software applications. Competitive export-oriented economy is based on innovation and developed brands. The strategic goal of regional development in the direction of improving competitiveness would be realized achievement of specific priorities within the framework of the implementation of these appropriate measures (Porter, 1996).

- 1) improving the economic base and the development of the SME sector

- 2) create conditions for economic development
- 3) functional and advanced linking economic and social subjects
- 4) brand development and sustainability of competitive advantage

#### 2.4. Improving the quality of tourism services

Tourism is one of certainly underused potential in Sumadija and Pomoravlje. The socio-economic analysis indicates on underdevelopment of this sector. This analysis shows that tourism in national income in the region, accounts for less than 3%. With its topographical features, as well as the rich cultural and historical past, this area could be a significant tourist destination for both domestic and foreign visitors. In the development of tourism in Sumadija and Pomoravlje, so far, primacy had a spa tourism. Beside spa, natural and climatic characteristics Sumadija and Pomoravlje have reach preconditions for the development of sports / recreation and hunting tourism.

Total number of companies in this sector is less than 2%, while the sector employs about 1% of the total number of employees in the Sumadija and Pomoravlje.

Due to the large number of employment opportunities for people and increase the company's and population income, tourism is one of the priorities in the development of Sumadija and Pomoravlje.

Key problems in this area are:

- Infrastructure: all types of accommodation facilities, access roads, tourist signs, hygiene problem/ illegal dumps, lack of public toilets, lack of parking and poor maintenance same ones, the poor state of monuments of cultural and historical heritage
- human resources: education and training of employees in the tourism

industry, a low level of services, behavioural culture

- Promotion: the lack of regional tourist offers, poor network within tourism organizations, the lack of a regional centre, the low level of available information

Strategic goal of tourism development in the region is the creation and promotion of tourist products in accordance with international quality standards and the principles of sustainable development (Stranjancevic and Bulatovic, 2015).

Raising the quality of the tourism product in the region has a significant foothold in available natural resources, partially in constructed material basis. The impact of tourism on the environment can be positive (maintaining the welfare of the population and social progress, job creation, preservation of natural and cultural values), or negative (pollution of nature, consumption of natural resources, construction, violation of local customs and public structures). An integrated approach to tourism planning, based on quality, contributes to a high level of compliance of tourism and environmental protection (Evans, 2011).

#### 2.5. The development of innovation and entrepreneurship

Under the innovation activity is the activity that is undertaken in order to create new products, technologies, processes and services or significant changes to existing ones, in line with market needs.

Innovation is considered as a new product, process, technology or services with unique characteristics, created by applying our own or others' results of scientific research, discovery and knowledge, through their own concept, idea or methods for its creation, which is, with the appropriate value placed on the market.

Holders of innovation activity are: production and development centres,

research and development centres, innovation centres, business incubators, technological, scientific and technological parks, Universities, institutes, companies and entrepreneurs.

Apart from the fact that the region in the past was an industrial centre and to further development based on the development of the economy, especially small and medium enterprises, it is necessary to encourage the establishment of institutions in different domains that will be able to offer different types of help to relevant industries in the region.

Support entrepreneurs in the field of development of innovation and increased competitiveness, is achieved through the following activities:

- a) In high-technology sectors and regions that are national priorities:
  - promotion of the participation of companies in the field of high technology in the international transfer of technology, research, technological development and demonstration activities,
  - innovations in support to create financial instruments to assist innovation projects, which would be economically viable and developed with help of scientific teams or organization, and
  - support creation of new units for innovation transfer in agricultural sector and creating foods, to support creation of high quality products that might be cost and technologically competitive on the world market in sectors that are the base of economic structure

It is necessary to develop a separate set of measures to promote entrepreneurship in specific sectors that have been defined as the most important from the point of impact on the overall economic development (Agriculture and Manufacture of food, ecotourism, phytosanitary products, etc.)

Thus, for example, increasing qualifications

of those employed in tourism should include investment in vocational training, including rehabilitation and gaining world-recognized qualifications and participation in international programs of knowledge transfer.

Success of entrepreneurial organization is based on: innovation, strategy, business culture, management style and organization.

Entrepreneurial business, which means increasing sales by introducing new products and services is very difficult because it requires new managerial knowledge and skills, and highly educated teams that are not easy to find in today's enterprises (Hingley and Nicolas, 2006).

### 3. Background

Literature regarding quality and environmental protection is very complex, it is influenced by a large number of interrelated factors at the organizational level, the analysed region and country. These factors are related to aspects of:

- 1) quality,
- 2) environment,
- 3) regional development,
- 4) the impact of new technology levels,
- 5) resilience
- 6) economic developments, etc.

Therefore, the available literature very numerous. The author has analysed the dominant literature in the very last 10 years because of better understanding of the important changes in the countries in transition and predict the feasibility of investing in quality and environmental protection.

Quality, as one of "supporting" the paradigm of the 21st century is studied from various aspects. For this work are important aspects of quality objectives, simulation and optimization of working processes in terms of quality (Tadic *et al.*, 2013; Arsovski *et al.*, 2009; Nestic *et al.*, 2015; Arsovski *et al.*, 2012; Kanjevac, 2011; Arsovski *et al.*, 2008;

Stefanovic *et al.*, 2015; Tadic *et al.*, 2015; Tadic *et al.*, 2014; Kucinar *et al.*, 2012; Arsovski *et al.*, 2011; Pavlovic *et al.*, 2011; Pavlović *et al.*, 2010; Pavlovic *et al.*, 2009). The economics of quality is based on the concept of the cost of the process (A1; A2; A3; Curcic *et al.*, 2011; Pavlovic *et al.*, 2009).

Environmental protection is a prerequisite for sustainable development. Thus, it was seen as a process that in addition to its cost, it can be a generator of profits, especially through the recycling process. This is analysed in the works (Pavlovic *et al.*, 2011; Curcic *et al.*, 2011; Djordjevic *et al.*, 2011). Economics of Environmental Protection, a special cost / benefit method was analysed on the basis of papers (Deichmann *et al.*, 2004; Escribano *et al.*, 2004; Iimi 2008; Francois and Manchin, 2006; Naor *et al.*, 2008).

Regional development, particularly in terms of sustainability is analysed on the basis of papers (F, G, H, I, J, Arsovski *et al.*, 2015; Rankovic *et al.*, 2012; Arsovski *et al.*, 2012; Rankovic *et al.*, 2012; Stefanovic *et al.*, 2012; Arsovski *et al.*, 2012; Pavlovic *et al.*, 2012).

The impact of the technological level was viewed in terms of production technology (ICT) (Djapic *et al.*, 2009; Slavkovic *et al.*, 2012; Curcic *et al.*, 2011; Pavlovic *et al.*, 2009), information and communication technology (Arsovski *et al.*, 2009; Arsovski *et al.*, 2011; Arsovski *et al.*, 2008; Stefanovic *et al.*, 2012; Pavlovic *et al.*, 2011), ICT aided design and process improvement (Nestic *et al.*, 2015; Arsovski *et al.*, 2012; Tadic *et al.*, 2014; Gvozdenovic *et al.*, 2012), ICT supported education (Kalinic *et al.*, 2011; Kalinic *et al.*, 2014; Stefanovic *et al.*, 2010), and so on. Impact resilience analysed on the basis of papers (Aleksic *et al.*, 2013a; Tadić *et al.*, 2014; Aleksic *et al.*, 2014; Arsovski *et al.*, 2015; Aleksic *et al.*, 2013b) Economic development is separately analysed from the perspective of sustainable development

(Goetz *et al.*, 2009; Stimson *et al.*, 2006; Eurostat, 2013; Catarino *et al.*, 2011; Arsovski *et al.*, 2009).

## 4. Analysis of the feasibility of investing in quality and environmental protection

### 4.1. Economic benefits

Economic benefits from the introduction of quality and environmental protection are:

Economic benefits arising from the introduction of QMS:

- reducing operating costs ( $K_{Q1}$ )
- increase in sales based of quality  $K_{Q2}$
- profit increase  $K_{Q3}$
- reduction of the cost of products and services that will be achieved through cost reductions for quality  $K_{Q4}$
- increasing (enable) export  $K_{Q5}$
- reduce of cost of claims  $K_{Q6}$
- reducing the cost of waste  $K_{Q7}$
- increasing the price of the business system's with change of ownership  $K_{Q8}$

Economic benefits arising from the introduction of EMS:

- reducing the cost of deposits and destruction of waste  $K_{E1}$
- profit increase  $K_{E2}$
- minimize damage from environmental incidents  $K_{E3}$
- reduce insurance cost  $K_{E4}$
- reduction of losses due to forced interruption of production  $K_{E5}$
- reducing the cost of paying fines  $K_{E6}$

Economic benefits arising from the introduction of HACCP:

- reducing operating costs  $K_{H1}$
- increase of profit  $K_{H2}$
- increase of export  $K_{H3}$
- reducing the cost of complaints  $K_{H4}$

- reducing the cost of food control  $K_{H5}$
- reduce costs arising from health defects  $K_{H6}$
- increase in the price of the business system by ownership change  $K_{H7}$
- reducing the cost of paying fines  $K_{H8}$

Economic benefits arising from obtaining the CE mark:

- increase of profit  $K_{C1}$
- increase of export  $K_{C2}$
- reducing the cost of complaints  $K_{C3}$
- reducing the cost of treatment incurred due to injuries at work  $K_{C4}$
- reducing the cost of treatment due to the use of unsafe products  $K_{C5}$
- reducing the cost of paying fees  $K_{C6}$

To determine the total economic benefit ( $UK_Q$ ) of introduction of QMS, first-processing weights whose value depends on the evaluation of the importance of individual factors whose results depend from the introduction of QMS.

Model valuation is carried out by the method of expert assessment.

$$\begin{aligned}
 P_{KQ1} &= 0.15; P_{KQ2} = 0.10; P_{KQ3} = 0.15; \\
 P_{KQ4} &= 0.12; P_{KQ5} = 0.10; P_{KQ6} = 0.15; \\
 P_{KQ7} &= 0.18; P_{KQ8} = 0.05.
 \end{aligned}$$

The total economic benefit of introduction of QMS, is equal to sum of multiplication of the product of individual factors of economic benefits and their weights:

$$\begin{aligned}
 UK_Q &= K_{Q1} * P_{KQ1} + K_{Q2} * P_{KQ2} + K_{Q3} \\
 &\quad * P_{KQ3} + \dots + K_{Q8} \\
 &\quad * P_{KQ8}
 \end{aligned}$$

The values of factors that determine the economic benefits from their charts so we have three variants:

- Optimistic-maximum decrease of costs and increase of profit
- Average-realistically reduce costs and increase of profit

- Pessimistic-minimal reduction of costs and increase of profit

If we consider that we observe a five-year period in which there is a presumption that economic benefits come from the introduction of QMS, then the value factors of economic benefits are determined by use of exponential functions.

$$y = a_1 * b_1^x \tag{2}$$

and the degree of the quadratic function:

$$y = a_2 * x^2 \tag{3}$$

Function (2) is used to determine the factors of economic benefits related to cost reduction, a function (3) to the factors of economic benefits related to an increase in profits, sales and exports. Mean values of factors gives approximately, by the sum of the factors of economic benefits for each year divided by the number of years. Their values will be presented like a reduction in percentage of cost, increase of profit. The values of the constants ( $a_1$ ), ( $a_2$ ) and ( $b_1$ ) for each of the factors of economic benefit is determined so as we know the value of these factors at the beginning and at the end of the five-year period.

The total economic benefit of introduction of EMS, is equal to sum of multiplication of the product of individual factors of economic benefits and their weights:

$$\begin{aligned}
 UK_E &= K_{E1} * P_{KE1} + K_{E2} * P_{KE2} + K_{E3} \\
 &\quad * P_{KE3} + \dots + K_{E6} \\
 &\quad * P_{KE6}
 \end{aligned}$$

The values of factors that determine the economic benefits from their charts so we have three variants (same like previous case).

The monetary value of total economic benefits arising from the introduction of the ESM would be obtained if the percentage value, replace the monetary currency on the charts of factors of economic value.

The total economic benefit of introduction of HCCP is:

$$UK_H = K_{H1} * P_{KH1} + K_{H2} * P_{KH2} + K_{H3} * P_{KH3} + \dots + K_{H8} * P_{KH8}$$

The total economic benefit of introduction of CE mark, is equal to sum of multiplication of the product of individual factors of economic benefits and their weights.

$$UK_C = K_{C1} * P_{KC1} + K_{C2} * P_{KC2} + K_{C3} * P_{KC3} + \dots + K_{C6} * P_{KC6}$$

It analyses the five-year period in which there is a presumption economic benefits of receiving the CE mark, they will start to value the factors of economic benefits determined by use of exponential and power function.

$$y = a_1 * b_1^x \text{ for decrease of costs}$$

$$y = a_2 * x^2 \text{ for increase of benefit and export}$$

#### 4.2. Economic costs

Economic costs include:

##### Economic costs arising from the introduction of QMS:

- consultant fees,
- certification costs,
- costs of proving the quality,
- costs of demonstration tests,
- training costs for quality,
- cost of replacement, renovation and repairs,
- costs of waste, and
- costs of complaints.

##### Economic costs arising from the introduction of EMS:

- consultant fees,
- employee training costs,

- costs of warehousing and transport of waste,
- planning costs of environmental protection,
- costs of procurement and installation of equipment for environmental protection, and
- costs of recycling.

##### Economic costs arising from the introduction of HCCP:

- consultant fees,
- certification costs,
- employee training costs,
- purchase costs of equipment and reconstruction,
- costs of construction and reconstruction works,
- costs of complaints,
- costs of withdrawal products from production, and
- the cost of laboratory tests.

##### Economic costs arising from obtaining the CE mark:

- consultant fees,
- certification costs,
- employee training costs,
- the cost of laboratory tests, and
- waste cost, and
- costs of complaints.

To determine the total economic costs, first determine the weights of which depends on the assessment of the significance of individual factors of the economic costs resulting from the introduction of QMS.

$$P_{TQ1}=0.18, P_{TQ2}=0.12, P_{TQ3}=0.09,$$

$$P_{TQ4}=0.12, P_{TQ5}=0.15, P_{TQ6}=0.10,$$

$$P_{TQ7}=0.12, P_{TQ8}=0.12$$

These weights were determined using the method of expert assessment

The total economic costs of introduction of QMS, is equal to sum of multiplication of the product of individual factors of economic



benefits and their weights

$$UT_Q = T_{Q1} * P_{TQ1} + T_{Q2} * P_{TQ2} + T_{Q3} * P_{TQ3} + \dots + T_{Q8} * P_{TQ8}$$

The values of factors that determine the economic costs from their charts so we have three variants:

- Optimistic-maximum decrease of costs and increase of profit
- Average-realistically reduce costs and increase of profit
- Pessimistic-minimal reduction of costs and increase of profit

Analysing the previous period in which there is a presumption of creating economic costs for the implementation of QMS, we will determine the value factors of economic cost to the end of the period. Their values will be presented reduction in percentage of cost.

Costs of consulting services ( $T_{q1}$ ) and the cost of certification ( $T_{Q2}$ ) will assume to be implemented in the first year of the period, so in calculation will be taken only a fifth part of their value.

In calculating the value of other factors, the economic costs for the implementation of QMS following functions are used:

exponential functions.

$$y = a_1 * b_1^x$$

and the degree of the quadratic function:

$$y = a_2 * x^2$$

To determine the total economic costs of introducing the EMS.

Apply the same methodology as for the determination of  $UT_Q$ , which arise during implementation of QMS, so first determine weights whose value depends on the evaluation of the importance of individual factors of the economic costs resulting from the introduction of EMS

$$P_{TE1}=0.20; P_{TE2}=0.10; P_{TE3}=0.20; P_{TE4}=0.25; P_{TE5}=0.10; P_{TE6}=0.15$$

The total economic costs of introduction of EMS, is equal to sum of multiplication of the product of individual factors of economic benefits and their weights:

$$UT_E = T_{E1} * P_{TE1} + T_{E2} * P_{TE2} + T_{E3} * P_{TE3} + \dots + T_{E6} * P_{TE6} \tag{8}$$

Determination of the total economic costs incurred by the introduction of HACCP. First, we determine the weights whose value depends on the assessment of the significance of individual factors of the economic costs resulting from the introduction of HACCP.

$$P_{TH1}=0.15; P_{TH2}=0.09; P_{TH3}=0.10; P_{TH4}=0.15; P_{TH5}=0.15; P_{TH6}=0.12; P_{TH7}=0.12; P_{TH8}=0.12$$

The total economic costs of introduction of EMS, is equal to sum of multiplication of the product of individual factors of economic benefit and their weights:

$$UT_H = T_{H1} * P_{TH1} + T_{H2} * P_{TH2} + T_{H3} * P_{TH3} + \dots + T_{H8} * P_{TH8} \tag{9}$$

Determination of the total economic costs ( $UT_C$ ) incurred by obtaining the CE mark. First, we determine the weights whose value depends on the assessment of the significance of individual factors of the economic costs resulting of getting CE mark:

$$P_{TC1}=0.20; P_{TC2}=0.15; P_{TC3}=0.20; P_{TC4}=0.15; P_{TC5}=0.12; P_{TC6}=0.18$$

$$UT_C = T_{C1} * P_{TC1} + T_{C2} * P_{TC2} + T_{C3} * P_{TC3} + \dots + T_{C6} * P_{TC6} \tag{10}$$

The values of economic factors determine the cost of their plot by exponential and quadratic functions.

### 5. The effects of investment in quality improvement and environmental sustainability of the region

#### 5.1. Sustainability region

Sustainability region is closely linked to the development of regional economies. It connects external sources of regional and organizational well-being. At the regional level are recognized:

- 1) strategic infrastructure,
- 2) institutions for planning and financing,

3) and the ability to operate power At the organizational level to the (Stimson *et al.*, 2006) are recognized:

- 1) capital
- 2) Innovation
- 3) catalysts operations

Based on these sources of prosperity and drivers of regional growth (investment, productivity, utilization of resources, added value, etc..) is possible to achieve the objectives of regional development (employment, GDP / employee etc.).

Additionally, Sustainable Development considered aspects of the environment, business continuity, etc. It is therefore essential that the effects of investment in quality improvement and environment in terms of the impact on sustainable regional development (Figure 1).

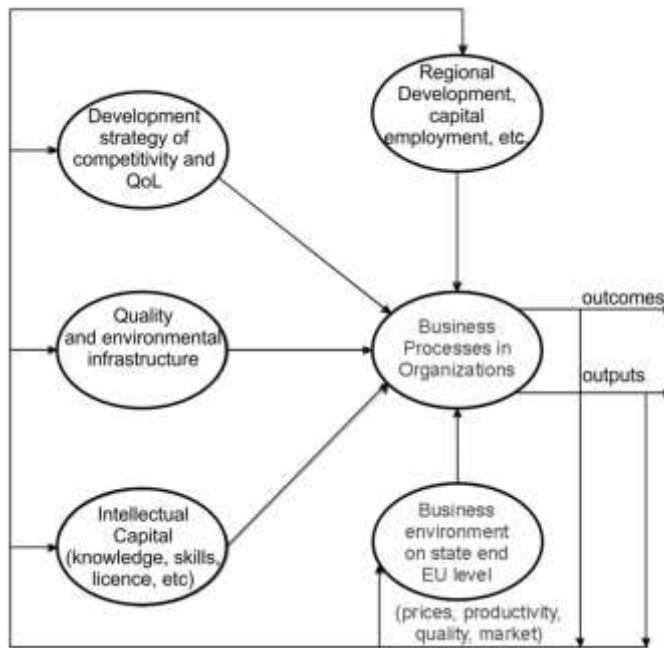


Figure 1. Outputs and outcomes of improvement actions on regional level

One part of the exit from the organization is visible and refers to the results of the impact on companies (outputs). The second part of the output refers to the "intangible" results (outcomes), such as: awareness, level of

motivation, the level of knowledge and skills, emotional intelligence, and so on. Outputs and outcomes of return affect the level of sustainability of the region.

## 5.2. Analysis of the effects of investment in quality and environmental protection in the region of Šumadija and Pomoravlje

The basis of this method is to determine to interrelate all costs and benefits arising from the implementation of specific process

Analysis of cost / benefit assessment is a method of financing policies and basis for decision-making in the field of finance.

Most often the cost / Benefit analysis (CBA) is using the net benefit to society (NSB), which is:

NSB=SB-SC  
SB -social benefits  
SC -social costs

### The ratio of total economic benefits and economic costs resulting from the introduction of QMS

#### Overall economic benefits ( $UK_Q$ )

$(UK_Q)_o$  = 49.1% optimistic value  
 $(UK_Q)_m$  = 40.3% mean value or real value  
 $(UK_Q)_p$  = 24.3% pessimistic value

#### Overall economic costs $UT_Q$

$(UT_Q)_o$  = 24.8% optimistic value  
 $(UT_Q)_m$  = 31.4% mean value or real value  
 $(UT_Q)_p$  = 44.4% pessimistic value

### The ratio of total economic benefits and economic costs resulting from the introduction of EMS

#### Overall economic benefits ( $UK_E$ )

$(UK_E)_o$  = 41.5% optimistic value  
 $(UK_E)_m$  = 29.9% mean value or real value  
 $(UK_E)_p$  = 16.6% pessimistic value

#### Overall economic cost ( $UT_E$ )

$(UT_E)_o$  = 9.4% optimistic value  
 $(UT_E)_m$  = 14.0% mean value or real value

$(UT_e)_p$  = 19.1% pessimistic value

### The ratio of total economic benefits and economic costs resulting from the introduction of HCCP

#### Overall economic benefits ( $UK_H$ )

$(UK_H)_o$  = 47.7% optimistic value  
 $(UK_H)_m$  = 38.0% mean value or real value  
 $(UK)_p$  = 25.4% pessimistic value

#### Overall economic cost ( $UK_H$ )

$(UT_H)_o$  = 23.9% optimistic value  
 $(UT_H)_m$  = 31.3% mean value or real value  
 $(UT_H)_p$  = 39.4% pessimistic value

### The ratio of total economic benefits and economic costs arising from obtaining the CE mark

#### Overall economic benefits ( $UK_C$ )

$(UK_C)_o$  = 45.9% optimistic value  
 $(UK_C)_m$  = 36.2% mean value or real value  
 $(UK_C)_p$  = 21.1% pessimistic value

#### Overall economic cost ( $UK_H$ )

$(UT_C)_o$  = 26% optimistic value  
 $(UT_C)_m$  = 32.8% mean value or real value  
 $(UT_C)_p$  = 39.8 % pessimistic value

## 6. Conclusions

First part of this gives an overall view of identifying the need for: increasing the level of product quality, improving environmental protection, improving competitiveness and improving the quality of tourism services.

The next steps discussed are requests of stakeholders.

In the third part of the study author analysed feasibility of investing in quality improvement and environmental protection in Sumadija and They identified the most significant types of economic benefits and

economic costs that may result from the introduction of ISO 9001, ISO 14001, HACCP and obtaining the CE mark for products and diagrammatic unveiled in the assumed maximum, realistic and minimum value Pomoravlje applying cost / benefit analysis.

By applying mathematical functions approximately calculated and presented their percentage values, and then multiplied by the actual budgeted investments relating to consultancy services, certification and investments. So there was a different variant of total economic benefits (UK) and total economic costs (UT). Their comparative analysis confirmed the justification of investment in quality improvement and environmental protection in SMEs in Sumadija and Pomoravlje.

Analysing the data in Table 7 it can be concluded that the real value of overall  $UK_S$  economic benefits greater than the real value of economic costs  $UT_S$ , how in individual observation (especially for ISO9001, ISO 14001, HACCP and CE mark) and in aggregate value.

Thus, in the table can be seen that the cumulative maximum of total economic

benefits greater than the total sum of maximum economic costs of 15.9%. This statement also applies to an individual maximum value of total economic benefits and costs but in different percentage amounts.

One of the conclusions was that the aggregate value of the minimum overall economic benefit is slightly greater than the sum of minimum total economic costs by 0.2%, however this is not the case when we have individual analyses of total economic benefits and costs.

The worst case scenario would be if they had a minimum or a reasonable overall economic benefit (UK)<sub>p</sub>, and the maximum total economic costs (UK)<sub>s</sub>. In this case we had adverse indicators of feasibility of investing in quality improvement and environmental protection, which is unlikely getting experience from EU countries.

From above analysis it can be concluded that investment in quality improvement and environmental protection in SMEs in Sumadija and Pomoravlje is largely justified and profitable. In other words, it is a realistic assumption that, in the analysed period of five years, the total economic benefit will be greater than total economic costs.

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