

# Virtual Organizations in Croatia: The Case of Bjelovar-Bilogora County

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**Abstract.** *Virtual organization represents a modern way of organizing business processes and organizational structures, with mission of establishing an effective organization. In developed countries, virtual organizations are common due to the large availability of information-communication technology (ICT), possession of adequate knowledge as well as the existence of large corporations. In our research, we examined the practice of virtual organizations and virtual teams in a Croatian Bjelovar-Bilogora County, which belongs to the middle to lower developed areas. The results were analyzed considering the previous researches done in Croatia. Furthermore, the results are subjected to testing by Kruskal-Wallis method, in order to determine whether there are differences in the orientation of the virtual practice within the industries: Processing, Trade and Construction. We also tested the differences between groups formed according to company size. This generated useful findings regarding the characteristics of virtual organization in one Croatian county that is not leading by the level of economic development.*

**Keywords.** Bjelovar-Bilogora County, ICT, industries, Kruskal-Wallis test, virtual organizations, virtual teams.

## 1 Introduction

The famous theorist Drucker [9] analyzed the shift in the type of organizational design from the "command-and-control" performed toward the organizations based on knowledge and information. The first kind is centralized firms, with resources available at a single physical location, which often ignoring the possibilities of outsourcing. Instead of a centralized structuring organization, for many actual situations, one can propose a shift toward a simple, decentralized organization, focusing on its key competencies.

Online technology enables centralized control and decentralized decision-making process in modern organizations. During the rise of virtual phenomena in the context of network organization, one basic concept later evolved into a virtual organization concept. Over the years various authors have attempted to determine the "specific combination of characteristics" and the notion "virtual" in virtual organization (VO).

Kraut et al. [15], point out that the more you exceed the limits of traditional organizational structures, the higher is the degree of its virtuality. This result is increasing of ICT usage for communication and interaction with external partners. According to [3] virtual organization is a temporary network of companies that quickly formed connections with aim of taking advantage of external opportunities that are rapidly changing. Companies are interrelated by means of the information- communication technologies (ICTs) to share costs, skills and access into global markets, while each partner contributing with its best practice.

The concept of virtual organization with a leader company is quite convenient way of organizing processes and structures and is believed to be the foundation of entrepreneurship in the near future.

Croatian economy is relatively small with low GDP per capita, compared to developed countries such as Germany, France and the United States. Therefore, the phenomenon of virtual organization, which is characterized by the use of ICT and the creation of internationally competitive products, is the relatively less present [5] in Croatian economy. It is interesting to determine, for a low-developed Croatian county such as the Bjelovar- Bilogora County (BB County), whether there is a lag in virtual organizing compared to the sample of most

prominent companies in Croatia studied in [5], [14].

## 2 Virtual organizations and virtual teams

According to leading IT Internet Encyclopedia [22] a virtual organization is an organization whose members are geographically separated, which usually work on computers via e-mail and act towards others as a single, unified organization with the real physical location. A virtual organization has no physical presence, but virtually exists on the Internet; is not limited to a legal definition of, and occurs in an informal way like an alliance of independent legal entities [2].

A virtual organization allows sharing of resources, capacities, risk, infrastructure, costs, as well as the high speed of going into businesses. In today's turbulent times, the company can't performed everything alone, and in this way has the ability to focus on the core strategy, improving it, as well as combining it with the core strategies of other firms [16]. The companies which are including in the virtual organization perform outsourcing of those activities in which are not excellent. Lifetime of a virtual organization is not defined, but it depends on the needs and interests of participants.

Virtual organization assumes structure without firm boundaries, vertical integration and a strict hierarchy. Virtual organizations are often formed as a complex network of suppliers and customers, where each of them contributes only by its own core competencies.

The concept of virtual team overlaps with notions of virtual organizations, virtual communities, electronic commerce and telework. Teleworkers are defined as individuals working at home. Virtual team, according to [11] consists of at least two or more people that interactively cooperate to achieve common goals, while at least one member of a team works on a different location, organization, or at a different time, so that communication and coordination is mainly based on electronic communication media (e-mail, fax, videoconferencing, VoIP, etc.). The team members have complementary skills, committed to a common purpose and share access to the job for which are jointly responsible. They communicate electronically so they might never actually meet face to face. However, most teams will meet over time. Many virtual teams in today's organizations consist of

employees who work at home and in small groups at the office, but in different geographic locations [7]. A task influences how to manage a virtual team. In accordance with the understanding of authors [10], there are seven basic types of virtual teams, which are: networked teams, parallel teams, project or product-development teams, work or production teams, service teams, management teams and action teams.

Seven factors that influence the probability of success of virtual teams are as follows [10], [20]:

- Human Resources Policies,
- Training and on-the-job education and development;
- Standard organizational and team processes,
- Use of electronic collaboration and communication technology,
- Organizational culture,
- Leadership support for virtual teams,
- Team leader and team member competencies.

## 3 Supportive technologies

The importance of ICT in supporting virtual-organization and possibilities regards the advances in transportation, communication, working together was considered by [3], [8], and [17].

Virtual organizations [21] are complex systems where organizational and technological aspects are playing, more than ever, a critical role, and the same should reach a higher level of flexibility in responding to the challenges and opportunities in the turbulent market. They are completely different from the traditional organizations and they must be established and function through the ICT, while ICT must be simple to use and accessible to all participants in business activities. It should support the work of virtual actors, communication, collaboration and coordination within virtual teams and must provide process management capabilities in virtual work.

Collaboration technologies include one or more of the following seven key skills [12]: document management, threaded discussion, group idea generation and evaluation, group calendar, group contacts, real-time chat, real-time application sharing and screen sharing.

According to [21] groupware (GW) is a collection of ICT that enables people to work

together more effectively through communication, collaboration and coordination. GW systems support collaboration between people by providing functions such as: e-mail, voice mail, discussion forums, brainstorming, voting, audio conference, videoconference, shared whiteboard, group planning etc.

The technology of virtual private networks (VPN) is one of the technologies that are most suitable, from the IT point of view, to support the functioning of virtual partnerships and alliances [5]. Computers connected to the VPN are giving the impression that they are in the same computer network, and at the same location, but are actually connected to the VPN, dislocated and in different organizations. The Internet is the infrastructure used to transport and VPN technology provides secure and easy communication.

Regarding the rapid development of various software (SW) tools designed to support virtual organizations and virtual teams in recent years one can find many free open source and commercial software on the market and in recent times a variety of services in the cloud.

Important concepts for a virtual organizing are XML, relating data formats, and so-called service-oriented architectures.

## 4 Economy of Bjelovar-Bilogora County

Bjelovar-Bilogora County is located in the eastern part of Central Croatia. It is one of the medium-sized Croatian county with an area of 2.636,67 km<sup>2</sup> (4.7% of Croatia) and 133.084 inhabitants [19]. BB County covers five cities (Bjelovar, Čazma, Daruvar, Garešnica and Grubišno Polje) and 18 municipalities. According to the National Competitiveness Council research [18], which was conducted in cooperation with the United Nations Development Programme in Croatia, BB County is ranked at the 15th place of competitiveness for 2010, within 20 counties and the city of Zagreb. GDP of BB County amounts €8.832 per capita [19] and it is below the national average, which is €8.448 per capita. In 2010, the county average net salary was 3.439 HRK (app 600 US\$) and it is lower 35.6% compared to the average salary of the Croatia, which is 5.343 HRK.

Considering that they constitute the largest part in total county income, County's major industries are process industries (37.8%), trade

(29.3%) and construction (9.9%). The largest part of total income in the process industries generates manufacture of food products, furniture manufacture, as well as manufacture of wood and products of wood and cork [6].

One of the main goals in the Development Strategy of BB County [19] is to increase the competitiveness of the County economy. Significantly weaknesses of the County are: insufficient number of skilled workers in all economic sectors, mismatching of educational structure with the economy needs, inadequate technological equipment in industrial sectors, etc. According to the Population Census from 2001, BB County even has 55.6% inhabitants without schooling, incomplete or with only primary school education, while only 6.4% has higher education. Even a 52% population is work inactive. Priorities of the goal "Increasing the competitiveness of the County economy" are focused on rural development, tourism development, development of process industries and SMEs, as well as strengthening human resources. Through extracted activities from these priorities, in several places is emphasized the importance of ICT.

## 5 Research in economy of Bjelovar-Bilogora County

The methods of surveys and interviews have been used for researching the frequency of using the concept of Virtual organizations and ICT at companies in BB County. Since the outsourcing is one of the main characteristics of virtual organizations, the survey was also focused on this area to make insight how many companies outsource business activities in which they are not the most competent.

### 5.1 Survey sample

Within the research on the frequency of application of virtual organization concept and ICT, survey was conducted on a sample of 68 companies from BB County, where some were contacted even further for additional explanations in existing ambiguities. It can be concluded that the surveyed companies from the BB County are mostly small businesses, which is not surprising, considering that the Croatian economy is based on small and medium-sized companies, which claims approximately 98%.

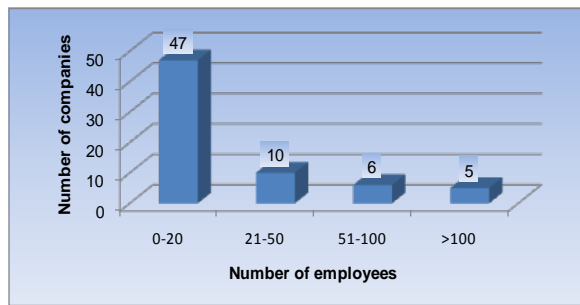


Figure 1: Distribution of companies by number of employees

From 68 companies surveyed, 69% of them employs up to 20 employees, while there are least of those that employ over 100 employees, only 7% (Fig. 1). Process industries, trade and construction industry are leading activities per total income and make the most of companies in the BB County, therefore it is no wonder that the majority of responses came from companies in these activities (Fig. 2).

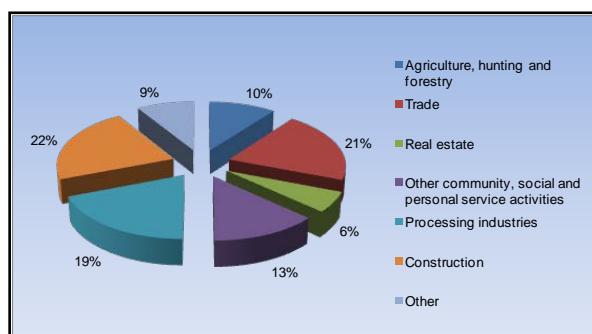


Figure 2: Sample of companies from BB County.

Most companies are part of the construction (22% of them), 21% of companies has trade as main activity, while 19% is in process industries, the most profitable and most promising branches of BB County.

## 5.2 Survey questions

The questionnaire contained 18 closed type questions, regarding the practice of virtual organizations and teams. In 59% the participants were managers or owners, while the remaining part was competent employees.

We consider that the set of questions which had been selected for the Kruskal-Wallis analysis best illustrates the state of the virtual organization and predisposition for realization of virtual links. These are questions regarding the use of

technology (P1)<sup>1</sup>, the existence of outsourcing practices (P2)<sup>2</sup>, participation in business associations (P3), connecting employees in virtual teams (P4), and familiarity with the theoretical concept of virtual organizations (P5).

Since we could consider that the process of finishing necessary work, out of the company's boundary, is actually the essence of the virtual organization, outsourcing is therefore given as an element of the test.

## 6 Results of empirical research

From the sample of 68 companies surveyed, 90% of them responded that in whole or in part is left to carry out certain non-core business activities to the other companies or professionals. Most of these companies have outsourcing in computer services, followed by accounting.

As for the previous business connections and networking of companies from the area of Bjelovar- Bilogora, for the purpose of realization of certain projects, the vast majority of companies (74%) had never participated in any kind of business alliances. Only 26% of companies already were involved in some type of business association in order to achieve a clear common goal.

As one of the major potential problems related to virtual organizing is data that 27% of respondents allocated insufficient knowledge and skills about the technology. Approximately 19% of respondents stated that they consider possible problem of inflexibility and resistance within the company, regarding the virtual organizing. The same percentage of respondents believes that a key factor for actual type of linking technology is price. However, considering all the recent trends in ICT and the emergence of *cloud computing*, the conclusion is that among the companies most likely there is insufficient awareness about modern ICT trends.

For the answers to the question about linking employees in virtual teams, it can be said that only 32% of firms connected in some way in such formations. Compared with previous research e.g. [14], it may be noted that the respondents in both surveys have recognized the importance of using outsourcing, and the

<sup>1</sup> Technologies for business connecting/networking and communication: software for Instant Messaging, VoIP, Videoconferencing, VPN

<sup>2</sup> Not considering the cases that are exclusively based on the accounting and bookkeeping services

percentage of using this concept is always similar.

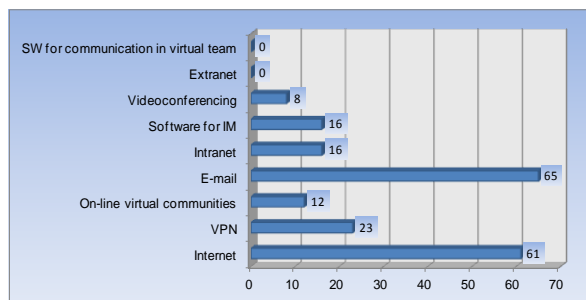


Figure 3: ICT usage for networking and communication.

Compared with research of BB County, where 26% firms participating or has participated in some kind of business associations, in the study [14] about half of the respondents have participated in some form of business association. Another previous research [5] also found significantly higher percentage of respondents that have experience in virtual business connecting (more than 50%).

### 6.1 The application of Kruskal-Wallis method

In the next part of research data processing, we wanted to determine and compare the characteristics of virtuality in different industries. Numerous studies of virtual organizing in different industries are made, such as [23] in the chemical industry, and case-studies related to service-industry, electronics and so on as described in [4].

We assume that while comparing industry sectors and also companies' size, these should be independent samples. Therefore is suitable statistical method of Kruskal-Wallis (K-W) test for the verification of our assumptions. The goal is to determine whether these sets are different regarding the "virtuality" characteristics as defined by the issues/questions P1-P5.

The total number of companies of construction sector is 15, while 13 are from the processing sector and the 14 is from trade industry. We believe that these samples are sufficiently uniform in size. Number of companies if looking at the size is 47 for microenterprises (employs fewer than 20 persons), 10 for small (up to 50 persons) and 11 for medium. For the reasons of discrepancies of these groups we have apply recalculation of frequencies in percentages. Table 1 shows the

numbers/frequencies of positive answers from firms classified in different groups. Questions are about characteristics of practice *relevant to the virtual organizations* (Pi; usage of VO technology- P1, existence of outsourcing practices- P2, participation in business associations- P3, connecting employees in virtual teams- P4, and familiarity with the theoretical concept of virtual organizations- P5).

Table 1: Groups and frequencies of occurrence (for selected virtual characteristics).

Group	QUESTIONS					Total
	P1	P2	P3	P4	P5	
<b>INDUSTRY</b>	<b>FREQUENCY (number)</b>					
<b>Construction</b>	7	13	4	5	4	15
<b>Process Ind.</b>	5	12	2	2	3	13
<b>Trade</b>	9	9	4	4	3	14
<b>SIZE</b>	<b>FREQUENCY (percentage, %)</b>					
<b>Micro</b>	20	30	14	17	19	47
<b>Small</b>	6	9	2	2	3	10
<b>Medium</b>	3	10	2	3	3	11
<b>SIZE</b>	<b>FREQUENCY (percentage, %)</b>					
<b>Micro</b>	43	64	30	36	40	100
<b>Small</b>	60	90	20	20	30	100
<b>Medium</b>	27	91	18	27	27	100

Because of unequal sizes of groups *micro*, *small* and *medium*, and due to the claims of applied K-W test, below we consider data concerning the percentages as relevant for the topic of comparing these groups (populations).

Therefore, *our approximation is in comprehension of the percentage values like that is frequencies* (of occurrence). The selected values from Table 1 is converted into ranks, according the principle that the smallest number is represent by the rank one (1) and so on, as explained in [13, 503]. Then we apply statistical H-test. For  $k$  independent samples from the same population we calculate the H-test according to the formula:

$$H = \left[ \frac{12}{n(n+1)} \sum_{j=1}^k \frac{R_j^2}{n_j} \right] - 3(n+1) \quad (1)$$

Herein, the  $n$  is total number of cases (for 5 questions and 3 groups it is 15);  $R_j$  is the sum of ranks for the case of *group j*, while  $n_j$  is the number of cases in the *j-th sample*.

Hypotheses to be tested by this method are as follows:  $H_0$ - distributions of all sets (groups,

populations) are equal; and  $H_1$ - at least one population has a tendency to take on higher values comparing to at least one other representative of the population.

If the resulting value for  $H$  is less than critical, then that it is confirmed of  $H_0$ . Otherwise valid is  $H_1$ .

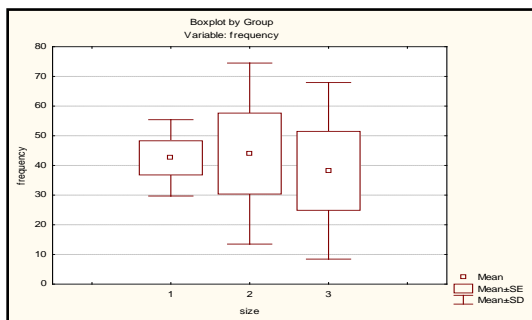


Figure 4: Mean and SD (Size of Enterprises).

In Fig. 4 shows the mean and variance for the results of groups defined by size (Box& Whisker Plot). Results are shown for information about percentages. Below we used the K-W test that applies to the ranks. We used the *Statistica* software tool. It is obvious that the obtained amount of  $H = 1.836$  is smaller than the threshold  $H = 5.780$ , and for the case with  $\alpha = 0.05$  and the pattern (5, 5, 5).

Table 2: The result of Kruskal-Wallis test (Size of Enterprises).

Kruskal-Wallis ANOVA by Ranks; frequency (za obradu 6)			
Independent (grouping) variable: size			
Kruskal-Wallis test: H ( 2, N= 15) =1,836396 p =,3992			
Depend.: frequency	Code	Valid N	Sum of Ranks
1	1	5	50,00000
2	2	5	39,00000
3	3	5	31,00000

Therefore we remain by the hypothesis  $H_0$ , so that independent groups of firms of different sizes do not vary in the tested characteristics.

Results of Kruskal-Wallis test for independent groups of companies belonging to the different industrial branches (construction, process industries, trade), are given in Fig. 5 and Tab. 3.

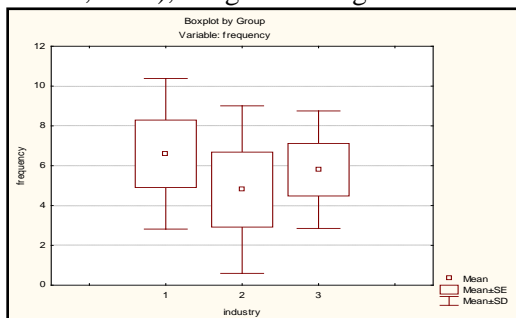


Figure 5: Mean and SD (Industries).

Amount obtained for  $H = 1.790$  is less than the threshold  $H = 5.780$ , and for the case with  $\alpha = 0.05$  and sample (5, 5, 5).

Table 3: The result of Kruskal-Wallis test (Industries).

Kruskal-Wallis ANOVA by Ranks; frequency (za obradu 6)			
Independent (grouping) variable: industry			
Kruskal-Wallis test: H ( 2, N= 15) =1,789744 p =,4087			
Depend.: frequency	Code	Valid N	Sum of Ranks
1	1	5	48,50000
2	2	5	30,00000
3	3	5	41,50000

Therefore, for different industries, we stay with the hypothesis  $H_0$ .

## 7 Conclusions

Members companies of virtual organizations are dislocated and associated by information-communication technologies in order to share costs, skills and access to global markets. A virtual organization provides great possibility to companies- very rapid adjustments to turbulent markets.

Virtual organizations are characteristic of modern economies that have spread of new ICT technologies and practice of contemporary business processes management. Research of the presence of virtual organizations in Croatian BB County gave the results to be viewed in the context of the degree of development of the County. From the total number of surveyed companies, as many as 76% did not participate in networking with other businesses, but 90% of the companies have some experience with *outsourcing*. Experience in working with virtual teams is modest. The presence of virtual teams' communication software is not found in either case. Previous researches conducted on a sample of prominent Croatian companies [14], [5], gave better specific indicators related to virtual organizations. These earlier researches involved larger and more advanced economic entities that are largely concentrated in and around Zagreb.

In our research we examined differences in virtuality between the industry sectors and among groups of enterprises of different size categories. We conducted a Kruskal-Wallis test for independent samples. It turned out that among the tested groups of companies there are no significant differences in the selected characteristics of virtuality.

Future research efforts can be directed towards the analysis of changes in business practices and organizing according to the virtual

forms- whether such changes occur in conditions of economic recession and due to needs of achieving competitive advantage.

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