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OUR ECONOMY

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Correlation Between Training and Education of Human Resources and Business Performance of Small and Medium Enterprises

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ORIGINAL SCIENTIFIC PAPER

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Abstract

Human resources (HR) represent a crucial resource of enterprises. This especially applies to small and medium-sized enterprises (SMEs), in which HR can create a competitive advantage and affect survival and development. Changes in the business environment, the need for new knowledge, skills and abilities due to changes in the market and business all lead to widening the gap between existing and required competencies of employees. In the process of training and education of HR, employees acquire the necessary knowledge, refine their skills and/or acquire new skills, and experience. More to the point, they obtain the competencies they need to stay and/or become successful in their job and future jobs that they will perform in the enterprise. The principal aim of this research is to determine the correlation between training and education of HR and business performance of SMEs. The survey was conducted in SMEs in the Federation of B&H from August to September 2020. An original questionnaire was created for the research, used for collecting the views on the HR training and education of top managers as well as four business performance perspectives of companies based on the Balanced Scorecard model. Data were analysed using SPSS 20.0. The following were used from the statistical procedures: Pearson's coefficient of correlation, t-test for independent samples, Spearman's correlation of coefficient and Mann-Whitney U test (depending on the results distribution). The results of the survey showed that there is a correlation between training and education of HR and business performance in SMEs. In addition, the survey results indicated differences among the enterprises in terms of their size; i.e., between small and medium-sized enterprises. However, those differences are not statistically significant.

Keywords: Business performance, correlation, education, small and medium enterprises, training

Introduction

Small and medium enterprises (SMEs) represent the main driver for the development, competitiveness, innovation, and employment in many

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countries. Growth in Europe and thus in Bosnia and Herzegovina (B&H) is unthinkable without SMEs, because they play a crucial role in delivering innovative products, strengthening competitiveness, and creating new jobs. The European Union has placed a particular emphasis on the development of entrepreneurship and SMEs in the last decade. In a modern business environment, SMEs fight for their survival and development in the context of increasing and more globalized competition (Klepić, Klepić & Mabić, 2020, p. 263).

As economies globalize and organizational environments become increasingly complex, learning organizations and adaptive workers are becoming more important for organizational performance. Theory and research suggest that in the presence of global competition and rapid technological advancements, modern organizations must be flexible, efficient, and continually adapt to changing environments to sustain a competitive advantage and survive (Gully & Phillips, 2005, p. 2). In their effort to survive and develop, SMEs mostly rely on human resources (HR). Employees are the ones who, with their knowledge, skills, ability, motivation, loyalty, and creativity, using and managing material, financial and information resources to the greatest extent, affect the business results, development and survival of every enterprise. This is especially true for HR in small and medium-sized enterprises, which due to their size require effective use of human resources: quality, motivation, innovation, and creativity in competition on the globalized market. They are unique for any enterprise, and they represent the living factor of every organization making the highest contribution to the achievement of objectives and business performance with their know-how, abilities, motivation, loyalty, and creativity (Klepić, Mabić & Madžar, 2020, p. 12). Changes in the business environment, the need for new knowledge, skills, and abilities due to changes in the market and business all lead to widening the gap between existing and required competencies of employees. In the process of training and education of HR, employees acquire the necessary knowledge, refine their skills and/or acquire new skills and experience. More to the point, they obtain the competencies they need to stay and/or become successful in their job and future jobs that they will perform in the enterprise.

Facing large companies as competitors that procure the best employees, smaller companies must invest in the development of their employees and create unique knowledge that will make a breakthrough and strive for innovation. SMEs do not have developed systems like large enterprises and thus developed human resource management, understanding that human resources are not a cost but an investment. After hiring people, they need to identify shortcomings and the necessary competencies to know how to fix those difficulties. Most problems can be addressed through training and education, though in some cases, employees are either laid off or redeployed.

Training and education through HR are one of the main roles of human resources departments. Training is the systematic approach that affects individuals' knowledge, skills, and attitudes particular to a specific occupation, and, if it is based on the science of training and learning, it should lead to changes in cognition, behaviour, and affect (Susomrith, Coetzer & Ampofo, 2019, p. 497). On the other side, education means the expansion of the overall knowledge, skills, and abilities of a person that enable him to make independent decisions and act in different situations. It qualifies for various jobs and creates a basis for further development (Bahtijarević-Šiber, 1999, p. 721). There are numerous methods of training and development, and different authors have their differences, but mostly it comes down to on-the-job and off-the-job training, and manager and non-manager training. SMEs mostly opt for on-the-job training because it is more difficult for them to access training educations outside the company.

Robert Kaplan (Biazzo & Garengo, 2012) in his book dealing with the implementation of BSCs in SMEs points out that it is incorrect to observe that the BSCs can be applied only in large and global companies, emphasising the need for SMEs to use this approach to measuring success. Nair (2004) points out that a corporation, both big and small, can fail for several reasons. But the most significant cause of failure is not a lack of strategy, but the incapacity to execute a balanced strategy. The BSC exists to serve this incapacity (Klepić, 2019, p. 15).

The main goal of this study is to determine whether and to what extent the training and education of human resources are in correlation with the performance of small and medium enterprises.

Business performance of enterprises was observed according to the balanced scorecard model. A BSC looks at an organization from four different perspectives to measure its success: the financial perspective, the customer perspective, the internal business processes perspective, the learning and growth perspective. Each of these perspectives focuses on a different side of a company, creating a balanced view of an organization.

Theoretical Background

Training and education of human resources

In the past (and in many continental European countries possibly until the first PISA study), educational and training institutions were often seen as providers of necessary skills for national economies, but this view has changed dramatically, with education and training now being seen as a key ingredient for international competitiveness, and with institutions that provide education being a main ingredient that help secure competitive positions (Dustmann, Fitzenberger & Machin, 2007, p. 1). Any institution of higher learning or business whose goals are to survive and prosper in this present day diverse and regressed economy has found it imperative to invest in ongoing training and development to improve proficiencies in production as well as to acquire

the greatest return on investment of human capital (Truitt, 2011, p. 1). Both corporations and businesses need to grow and innovate continuously, pursue sustained development, and cope with rapid changes in their external environments as well as increasingly competitive international markets. That is the reason why organizations need to strengthen or expand the knowledge base, skills, and abilities of their employees. For this purpose, education and training must be incorporated into a systematic and formal system if the goals of employees and corporation are to be attained (Truitt, 2011, p. 1-2). Well-designed training is impactful as continuous learning and skill development are now a way of life in modern organizations. Training and development activities allow organizations to adapt, compete, excel, innovate, produce, be safe, improve service and reach goals. Organizations invest in training because they believe a skilled workforce represents a competitive advantage (Salas, Tannenbaum, Kraiger & Smith-Jentsch, 2012, p. 74). Training is the systematic approach that affects individuals' knowledge, skills, and attitudes particular to a specific occupation, and, if it is based on the science of training and learning, it should lead to changes in cognition, behaviour, and affect (Susomrith, Coetzer & Ampofo, 2019, p. 497). According to Truitt (2011, p. 2) training is planned intervention that is designed to enhance the determinants of individual job performance and it is related to the skills an employee must acquire to improve the probability of achieving the organization's overall business and academic goals and objectives. Positive training offered to employees may assist with reduction of anxiety or frustration as well as with a higher level of job satisfaction that has a positive effect on their performance. Saks, Haccoun and Belcourt (2015, p. 8) concluded that training refers to formal and planned efforts to help employees acquire knowledge, skills and abilities to improve performance in their current job, but also that it usually consists of short-term focus on acquiring skills to perform one's job.

Development, on the other hand, refers to systematic efforts aimed at affecting individuals' knowledge, skills, and attitudes for the purposes of personal growth or future jobs and/or roles (Susomrith, Coetzer & Ampofo, 2019, p. 497).

The goal of development is to prepare individuals for promotions and future jobs as well as additional job responsibilities (Saks, Haccoun, & Belcourt, 2015, p. 8).

Education means the expansion of the overall knowledge, skills and abilities of a person that enable him to make independent decisions and act in different situations. It qualifies one for various jobs and creates a basis for further development (Bahtijarević-Šiber, 1999, p. 721). The general goals of education according to Bahtijarević-Šiber (1999, p. 737) are to raise the competitiveness of the organization, improve work performance, update the knowledge and skills of employees, avoid managerial obsolescence, direct new employees, prepare for them for promotion and managerial succession and meet individual growth needs.

Training and development are a part of a larger field, known as human resource development (HRD), which involves systematic and planned activities that are designed by an organization to provide employees with opportunities to learn necessary skills to meet current and future job demands. The main functions of HRD are training and development, organization development, and career development. The core of all three functions is learning (Saks, Haccoun & Belcourt, 2015, p. 9).

Employee training is a complex process that is usually realized through four basic phases (Buble, 2000, p. 413): identification of training needs, planning of necessary training, conducting training, and evaluation of completed training. Desler (2015 p. 293) also divided the training process into four steps: needs analysis, instruction design, program implementation, and program performance evaluation.

Rowden and Conine (2005) indicate that there is limited research on HR development in SMEs and Truitt (2011, p. 1) has written that a slowly growing number of authors are currently doing more research in the areas of training and development and its effects on employees that have not been seen in past literature.

To enhance job performance, training skills and behaviours must be transferred to the workplace, maintained over time, and generalized across contexts. Consequently, specific job training is a complicated matter. More specifically, in addition to the exact nature of job training, training is seen as relevant to fostering a positive relationship between learning satisfaction and the effectiveness of applied learning. Both formal and informal training opportunities are thought to provide a forum for the development of talent. When talent is fostered and nurtured, competitive advantages in performance are untainted. Furthermore, the organizational commitment or the relative strength of an individual's identification and involvement in a particular organization depends on effective training and development programs. Also, training and education have been shown to have a significant positive effect on job involvement, job satisfaction, and organizational commitment (Truitt, 2011, p. 3).

An important factor for the success of education is the choice of an appropriate method, which depends on the educational program and its goals. The most appropriate method needs to satisfy the following: motivate students to improve their performance, clearly illustrate the desired skills and knowledge, provide participants with active participation, provide the opportunity to practice, provide feedback on performance during learning, use some means of motivation and support during learning, structure the material from simpler to more complex tasks, adapt to specific needs and enable participants to transfer what they have learned to other situations, especially to the work they do (Bahtijarević-Šiber, 1999, p. 753).

Different authors point out different methods and, in most cases, divide them into off the the-job and on the-job training methods. Off the-job training methods according to Saks, Haccoun and Belcourt (2015, p. 175) are: lecture method, discussion method, case study method, case incident method, behavior method, role play, simulations, games, action learning, and instructional media; on the-job training methods are: job instructions training, performance aids, job rotation, apprenticeships, coaching, and mentoring. Desler (2015) presented in his book a number of training methods including internship training, non-formal learning, business process learning, lectures, programmed learning, training using audiovisual materials, training near the workplace, distance training and video conferencing, electronic work efficiency support system, computer training, simulated learning, online training, virtual classroom, and online learning. According to Bahtijarević-Šiber (1999, p. 745) methods of education at work are: individual instructions, job rotation, apprenticeship or professional practice, internship, mentoring, student practice, and methods of out-of-work education are: lectures, audiovisual techniques, programmed learning, computer-assisted learning, interactive video, conferences and discussions, training in stimulated working conditions and case methods.

The literature suggests that commitment results from adequate training and development for successful job completion and an increase in job performance. In addition, the larger the gap between the skills required to perform a task and the actual skills available for performing a task, the greater the lack of job satisfaction and the greater the increase in employee turnover within the organization. Conversely, not having the skills to perform a job correctly can set up employees for failure and put the business at a less-than-competitive disadvantage. The resulting high turnover would predict the need for even more training that would then have a direct impact on the bottom line of any business. Moreover, poor performance reviews due to inadequate job training can produce employee dissatisfaction and conflict (Truitt, 2011, p. 3).

Reviews of T&D literature have identified the multiple benefits of T&D for individuals, teams, organisations, and society. Small firm employees are less likely to obtain access to formal T&D events than are employees in large firms. Studies have identified several “barriers” to the provision of firm-sponsored, formal T&D in smaller firms. Thus, small firms have a strong preference for and are highly reliant upon informal learning processes. However, in some types of jobs, informal learning activities would not be sufficient to acquire the depth of understanding necessary for complex work activities that require high level conceptual knowledge. Furthermore, opportunities for formal learning stimulate participation in informal learning activities. Medium-sized businesses tend to be more similar to large businesses than small businesses, and thus they are managed in a relatively more formalised, professionalised and structured manner compared to small businesses (Susomrith, Coetzer & Ampofo, 2019, p. 498). Both employees and the organization benefit from training and development. An individual develops his competencies and is more valuable in the labour market, has better compensation, progresses faster, and the organization increases its efficiency and effectiveness. Organizations find it easier to attract new employees and retain them and reduce unwanted departures from the organization.

There is a calculable benefit to training employees. Trained employees can do more and better work, make fewer errors, require less supervision, have more positive attitudes, have lower rates of attrition and they produce higher-quality products and services. These benefits have a positive effect on an organization’s competitiveness and performance. The link between training and an organization’s performance is strongly supported by research. A survey conducted by the American Management Association found that companies that expanded their programs showed gains in productivity and larger operating profits. In another study, a 10 percent increase in training produced a 3 percent increase in productivity over two years. A review of research on training and organizational effectiveness found that training is positively related to human resource outcomes (e.g., employee attitudes, motivation, behaviors), organizational performance outcomes (e.g., performance and productivity) and financial outcomes (e.g., profit, financial indicators) (Saks, Haccoun & Belcourt, 2015, p. 9-10).

In addition, research has found that companies that invest more in training have higher revenues, profits, and productivity growth than firms that invest less in training. Research by the Conference Board of Canada found that those companies that spend the most on training and development believe they outperform their competitors according to a number of performance indicators, such as employee satisfaction, customer satisfaction, profitability, and productivity, compared with those that spend the least on training and development. A study of companies in South Korea found that those that invest more in workplace learning achieve higher levels of learning outcomes (i.e., employee competence, labour productivity, and employee enthusiasm) and financial performance. In other words, investment in workplace training influences organizational performance through learning outcomes (Saks, Haccoun & Belcourt, 2015, p. 9-10).

Balanced Scorecard

Balanced Scorecard is a framework designed by Professor Robert Kaplan and David Norton. As the name implies, Balanced Scorecard is a methodology to solve challenges in balancing the multiple perspectives demanded of strategy with its execution. In a nutshell, BSC is a methodology for translating strategy into action. (Nair, 2004, p. 30). Smith (2007, p. 106) points out that a Balanced Scorecard is a management tool that provides senior executives with a comprehensive set of measures to assess how the organization is progressing toward meeting its strategic goals. Balanced Scorecard is a new framework for integrating measures derived from strategy (Kaplan and Norton, 1996, p. 18).

It is important to mention that BSC provides a balance between leading and lagging indicators, as well as internal and external influences. Balanced Scorecard retains traditional financial measures. But financial measures tell the story of past events, an adequate story for industrial age companies for which investments in long-term capabilities and customer relationships were not critical for success. Those measures are inadequate, however, for guiding and evaluating the journey that information age companies must take to create future value through investment in customers, suppliers, employees, processes, technology, and innovation. The BSC complements financial measures of past performance with measures of the drivers of future performance. The objectives and measures of the scorecard are derived from an organization's vision and strategy (Kaplan & Norton, 1996, p. 7-8). The framework digests strategy but also focuses it into four perspectives of objectives. These perspectives may contain more than one strategic theme, and each theme is measured using performance measures (Nair, 2004, p. 31). Each theme is also related to the others regarding cause and effect. The balanced scorecard approach helps organizations manage the implementation of their strategies. The BSC measures an organization's performance from four key perspectives: financial, customer, internal business processes, and learning and growth (Von Bergen & Benco, 2004, p. 3). The BSC is an instrument of strategic corporate management, with the help of which a strategy is translated into concrete, operational measures. For this purpose, different perspectives of strategic objectives are determined, which are stored with key figures, target values, and measures. The objectives defined in this way are checked for consistency using cause-effect chains and the links are visualized (Schäfer & Teuber, 2007, p. 39). These four perspectives provide for a more comprehensive evaluation of the organization than the traditional emphasis on tangible and financial assets of the organization (Von Bergen & Benco, 2004, p. 15).

The underpinnings of the BSC approach are as relevant to the small firm as to the large. Small firms have employees performing operational tasks and processes. If the employees are effective and efficient (i.e., sufficiently trained and motivated), then internal business processes will be efficient. Efficient operations run by effective employees should generate higher quality output, which will attract and retain satisfied customers. Repeat customers contribute marginally more to the firm's bottom line than do new customers who must be wooed. In short, the BSC can work as well for the small firm as for the large firm. The BSC's complexity may be reduced and its formality may be relaxed in the context of a small firm, but neither its importance nor its utility suffers negative consequences related to firm size (Von Bergen & Benco, 2004, p. 15).

The BSC is characterized by "…goals, measurement parameters and strategic measures are each assigned to a specific point of view, the so-called perspective." In addition to the financial perspective, "which ultimately only shows the results of the entrepreneurial activity", "she reveals the value drivers for important, long-term and competitive services" from the customer, process and potential perspective. The equal consideration of the perspectives, which can also be adapted to specific sectors and companies, leads to a balanced management system (Schäfer & Teuber, 2007, p. 40).

The financial perspective represents the financial outcome elements of the strategy. The financial goals serve as a focus for the goals and key figures of all other perspectives. From a financial perspective, it becomes clear whether the chosen strategy has a positive effect on the discounted free net cash flow and whether this increases the company's value. The financial perspective contains goals and key figures from the following elements: income growth and income mix; increase in productivity and reduction in costs; use structure of assets; investment and acquisition strategies and cost of capital (WACC18) (Schäfer & Teuber, 2007, p. 41).

The customer perspective is the second perspective of BSC. Companies are increasingly attempting to replace product-orientated strategies with customer-orientated strategies. For this reason, the quantification of customer relations within the scope of the BSC is increasingly achieving significance as an implementation instrument for strategies and as a supplement to classic product profitability analysis (Schmeisser, Clausen & Lukowsky, 2008, p. 3). The customer perspective contains goals and key figures on: market share; customer acquisition, and new customers; customer satisfaction; customer loyalty and loyalty; customer profitability and customer value (CLV) (Schäfer & Teuber, 2007, p. 42).

The internal-business-process perspective; executives identify the critical internal processes in which the organizations must excel. These processes enable the business unit to: deliver the value propositions that will attract and retain customers in targeted market segments and satisfy shareholder expectations of excellent financial returns (Kaplan & Norton, 1996, p. 26). Processes to be analysed are usually the innovation process, the order acquisition, order processing, and customer care process. In addition to classic aspects such as quality, time, and costs, the goals and key figures are derived directly from external performance requirements and factors (Schäfer & Teuber, 2007, p. 42).
Organizational learning and growth come from three principal sources: people, systems, and organizational procedures. The financial, customer, and internal business-process objectives of the BSC typically will reveal large gaps between the existing capabilities of people, systems, and procedures and what will be required to achieve breakthrough performance. To close these gaps, businesses will have to invest in enhancing employee skills, information technology, systems, and aligning organizational procedures and routines (Kaplan & Norton, 1996, p. 26).

Small and medium enterprises

Small and medium-sized enterprises (SMEs) represent more than 99% of all enterprises in the EU. They provide two-thirds of jobs in the private sector and are responsible for

more than half of the total added value realized by companies in the EU. Growth in Europe is unthinkable without SMEs, and they play a crucial role in delivering innovative products, strengthening competitiveness, and creating new jobs. In the last decade, the European Union has placed a particular emphasis on the development of entrepreneurship and SMEs (Klepić & Klepić, 2020, p. 62).

The European Commission has identified a major role for SMEs in developing the innovative and exporting capacity of the EC, either directly or indirectly through subcontracting with larger enterprises. At the same time SMEs face particular difficulties related to their size. Accordingly, the EC has an important role to play in reducing the burdens on SMEs and in assisting them through advice and support structures (Dyson, 1990, preface).

SMEs in Bosnia and Herzegovina are even more important given the fact that the economy during the war and afterwards has significantly collapsed. It is expected that SMEs could and should be the backbone of Bosnia and Herzegovina's development, which could enable faster growth and development (Klepić, Klepić & Mabic, 2020, p. 266).

Bosnia and Herzegovina is a complex state that consists of two entities, the Federation of B&H and Republika Srpska, and the Brcko District. The definition of SMEs is not fully harmonized and each entity, as well as the Brcko District, has its definition and classification (Klepić, 2019, p. 17).

Table 1. Classification of SMEs in Bosnia and Herzegovina

Classification criteria	Federation of BH			Republic of Srpska			District Brčko	
	Small		Medium	Small		Medium	Small	Medium
	Micro	Small		Micro	Small			
Number of employers	1 - 9	10 - 49	50 - 249	1 - 9	10 - 49	50 - 249	1 – 49	50 - 249
Income in KM (000)	400	4,000	30,000	10,000		50,000	2,800	11,000
Balance Sheet (Assets) in KM (000)	400	4,000	40,000	10,000		43,000	1,400	5,500

Notes: NEG – negative employment growth, PEG – positive employment growth, PPG – positive productivity growth, NPG – negative productivity growth

When defining small and medium-sized enterprises in the Federation of Bosnia and Herzegovina,[1] the Law on Accounting and Audit in the Federation of Bosnia and Herzegovina is not harmonized with the Law on Encouragement of Small Business . The differences are only in terms of value thresholds that define small and medium enterprises.

SMEs in the Federation are developing in a complex environment burdened by bureaucratic company registration procedures, fragmentation of institutional infrastructure for SME development, high administrative burdens, difficult access to finance especially for start-ups, inconsistent education system in terms of economic needs, inadequate level of entrepreneurship culture, and the lack of a strategic framework for the adoption and development of innovations, etc. All this is reflected in the competitiveness of SMEs, which results in slowing economic growth, or reducing the potential of the SME sector in generating new jobs.

The importance of SMEs in its economy was confirmed by the European Union through the adoption of the European Charter for Small and Medium Enterprises from 2000 and, as an upgrade, the Small Business Act from 2008, for the implementation of which B&H together with other Western countries Balkans, including Turkey.

Methodology of Research

Setting hypotheses

The defined problem has also defined the underlying objective of this research, which is to gain insight into the correlation of the training and education of human resources on the business performance of small and medium-sized enterprises. The sub-goals of this research are determined whether and to what extent the training and education of human resources are in correlation with each of the four perspectives of business performance based on the balanced scorecard model: the financial perspective, customer perspective, the internal business processes perspective, and the learning and growth perspective.

The problem and the objectives set for this study determined the content of the two main hypotheses and four sub hypotheses which state:
H1 – "There is a significant correlation between training and education of human resources and business performance of small and medium-sized enterprises".

H 1a – A correlation exists between training and education of human resources and the business performance of small and medium-sized enterprises from a financial perspective;

H 1b – A correlation exists between training and education of human resources and the business performance of small and medium-sized enterprises from a customer perspective;

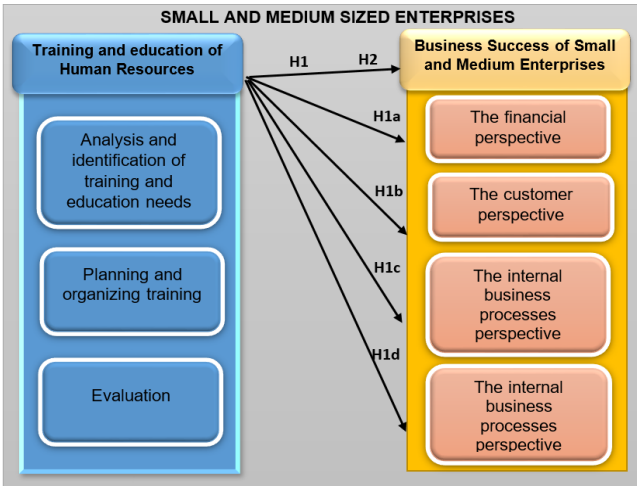
H 1c – A correlation exists between training and education of human resources and the business performance of small and medium-sized enterprises from the internal business processes perspective;

H 1d – A correlation exists between training and education of human resources and the business performance of small

and medium-sized enterprises from the learning and growth perspective.

H 2 – "There is a difference in the correlation between training and education of human resources and business performance of small and medium-sized enterprises in terms of their size."

Figure 1. The model of the correlation between the training and education of human resources and business performance of small and medium-sized enterprises



Source: Author's work

The scope of the research, methods of collecting and processing data model

The empirical research was conducted in the Federation of Bosnia and Herzegovina from August to September in the year 2020. The research was conducted in 46 companies. According to the distribution of the enterprises, based on the size of the enterprise, the sample consisted of 30 (65.2%) small and 16 (34.8%) medium-sized enterprises. The criterion for defining SME-s was one-dimensional. Small businesses are those up to 49 employees and medium between 50 and 249 employees.

An original questionnaire was created for the study, which consisted of three parts, in the context of which the views of top managers were collected on the training and education of HR as well as four business performance perspectives of companies based on the Balanced Scorecard model. In the first part of the questionnaire, basic questions were asked about the characteristics of the enterprises, while in the second part of the questionnaire questions were asked about the training and education of human resources in the companies. In order to measure and evaluate the training and education of human resources, a Likert scale type 1 to 5 is offered for answers of questions.

To measure the performance of the company for this paper, a modified BSC method with four perspectives was used. For each of the perspectives, four indicators were selected from a group of possible indicators for that perspective. Qualitative indicators were used in such a way that managers or owners were asked to give a subjective rating of performance for each indicator in four perspectives by assessing the movement over the last three years (on a scale ranging from 1 (strongly decreased) to 5 (strongly increased). The questionnaire was created using the Google forms option and the link to the survey questionnaire was sent to companies via mail. Enterprise responses were recorded in Microsoft Excel. The data collected was encoded and entered into the SPSS database.

Data were analysed using IBM Statistic SPSS 25.0. Pearson's and Spearman's coefficients of correlation were used to examine the correlation. T-test for independent samples and Mann-Whitney U test were used for testing differences significance according to firm size.

The significance limit was set at $p = 0.05$. P values that could not be expressed up to three decimal places were expressed as $p < 0.001$.

Operationalization of variables

The variable training and education of human resources in hypotheses was measured through analysis and identification of training and education needs; planning and organizing training and evaluation.

Analysis and identification of training and education needs is measured by setting questions which refer to methods of analysis and identification which are used in enterprises. Planning and organizing training was measured by setting questions which refer to: planning and organizing training and education - goals, content and programs; organizing and conducting training and education of employees, methods and techniques of employee education and methods and techniques of managers' education that are used in the enterprises. Evaluation is measured by the means of evaluations in enterprises.

The other variables are the business performance of SMEs viewed from four perspectives that the Balanced Scorecard method focuses on: the financial perspective, the customer perspective, the internal business processes perspective, and the learning and growth perspective.

The financial perspective of SMEs is measured by the following indicators: income, profit, costs and loss;

The customer perspective of SMEs is measured by: market share, retention of existing customers, retrieving new customers, and customer satisfaction.

The internal business processes perspective of SMEs is measured by: introducing innovations to business process, percentage of made errors, finishing production, and supplying the product/service to customers in time and after-sales service/customer service.

The learning and growth perspective of SMEs is measured by: investments in training and education of employees,

enabling employees to use new technologies, mutual employee collaboration and knowledge sharing and empowerment and consideration of employee suggestions

Research Results and Discussion

General information on research enterprises

The results of the research on the characteristics of the enterprises involved in the research are presented in a few words. The largest share of the researched companies has wholesale and retail, followed by Insurance, IT, etc. The largest number of companies (47.8%) was founded from 1996 to 2010 and then 26.1% from 1991 to 1996. Concerning the number of employees, 65.2% of them are in small businesses, those with less than 50 employees, while 34.8% of them are in medium-sized companies with between 50 and 250 employees. Most companies (67.4%) are legally organised as a limited liability company. In private ownership is 89.1% of all researched companies.

Table 2 shows the characteristics of the enterprises involved in the research.

Table 2. Sample characteristics

		Number of enterprises	%
Activity of the enterprise	Agriculture	0	0
	Manufacturing	4	8.7
	Energy production and supply	0	0
	Construction	4	8.7
	Wholesale and retail	8	17.4
	Tourism and hospitality	4	8.7
	Finance	1	2.2
	Insurance	5	10.9
	Other	16	34.8
	Information Technology (IT)	4	8.7
Date of establishment	Before 1991	6	13.0
	From 1991 to 1995	12	26.1
	From 1996 to 2010	22	47.8
	After 2010	6	13.0
Enterprise size	Small	30	65.2
	Medium	16	34.8
Legal form	Limited liability company	31	67.4
	Joint stock company	11	23.9
	Crafts and related activities	3	6.5
	Other	1	2.2
Ownership structure	Private property	41	89.1
	State ownership	2	4.3
	Mixed ownership with majority state ownership	1	2.2
	Mixed ownership with majority private ownership	2	4.3

Source: Own research

Research results on training and education of human resources

Table 3 shows descriptive statistics for assessing the analysis and identification of training and education needs. The results of the survey show that the average rating in the surveyed companies for "analysing the work performance of employed individuals" is 3.89, for "identifying organizational needs for training and education" it is 3.70 and for "analysing indicators of certain problems in the organization" it is 3.59.

Table 3. Analysis and identification of training and education needs

	M	SD
Do you analyse the efficiency and effectiveness of the organization (performance and efficiency indicators)?	3.50	1.03
Do you analyse indicators of certain problems in the organization (problems of productivity, lagging behind competitors, dissatisfaction and pressure of consumers and customers, dissatisfaction and complaints of employees, technological changes, restructuring, absenteeism, fluctuations, accidents?)?	3.59	1.05
Do you analyse the work performance of employed individuals in each workplace (productivity, fulfilment of plans, absences and delays, customer complaints, etc.)?	3.89	0.99
Do you analyse and / or check the knowledge of employed individuals in each workplace (professional, functional, general business ...)?	3.35	1.16
Do you analyse and / or check the abilities and skills of employed individuals in each workplace (intellectual, communication, interpersonal, problem, analytical, teamwork, creativity, innovation ...)?	3.43	0.98
Do you analyse and / or check the personality traits of the employees employed in each workplace (motivation, energy level, ethics, self-confidence, character, etc.)?	3.30	1.17
Do you identify organizational needs for training and education?	3.70	0.96
Do you identify and define the individual education needs of each employee individually?	3.43	1.03
Do you set different goals for different educational needs, groups and programs of individual employees or more of them?	3.39	1.06
M – Mean; SD –Standard Deviation		

Source: Own research

The tables 4, 5, 6, 7 and 8 refer to the second phase of the training and education process - planning and organizing of training. Table 4 shows the average grades for planning and organizing training and education (goals, content, and programs) in the researched companies.

Table 4. Planning and organizing training and education (goals, content, and programs)

	M	SD
New employees are provided with the necessary information to do their job effectively (access to e-mail, necessary regulations, procedures, instructions, etc.)	4.13	0.98
New employees are enabled to get acquainted with the organization's past, present, vision and mission, strategy, goals, organizational culture, values, ways of doing business, etc.)	3.74	1.00
Socialization of new employees with organizational culture, values, etc. …	3.80	1.05
The general goals of employee training and education have been determined (raising competitiveness, improving work performance, updating knowledge and skills of employees, etc...)	3.65	0.95
Specific goals have been identified that focus on the segment of behaviour or area of work performance that needs to be changed or improved	3.61	0.98
Training is provided for the current job of the employee	3.89	0.97
Employees are trained to expand and deepen knowledge and skills to adapt to changes in work and technology	3.65	0.92
Training is provided for the basic knowledge and skills of employees	3.80	0.91
Training is provided for technical or professional skills in individual professions	3.72	0.98
Employees are trained in social or interpersonal skills	2.96	1.19
Employees are trained in conceptual or strategic skills	2.72	1.11
Training and education of employees for career development, preparation for advancement, and performing more complex and responsible tasks in the organization	2.91	1.11
Training and education of employees and their preparation for future changes and tasks (education for the future and flexibility)	3.09	1.15
M – Mean; SD –Standard Deviation		

Source: Own research

The studied companies to the greatest extent provide "new employees with the necessary information to do their job effectively (access to e-mail, necessary regulations, procedures, instructions, etc.)", "training for the current job of the employee", "socialization of new employees with organizational culture, values, etc." and "training for the basic knowledge and skills of employees". Companies rarely provide their employees with "training in conceptual or strategic skills" and "training and education for career development, preparation for advancement and performing more complex and responsible tasks in the organization".

Table 5 shows how the studied companies organize and conduct training and education of employees.

Table 5. Organizing and conducting training and education of employees

	M	SD
Enables and encourages continuous lifelong learning for employees to enable them acquiring the necessary skills for the job as well as acquiring new and expand existing knowledge?	3.17	1.20
Encourages, benefit and values non-formal employee education?	3.39	1.24
Sends its employees to train outside the company to acquire new competencies and those they lack (other companies, courses, specializations, etc.)?	3.17	1.30
Enables the participation of employees in seminars, conferences, etc. in order to acquire the necessary and missing new and improve existing knowledge and competencies?	3.24	1.20
Sends its employees for additional education in educational institutions in order to acquire the missing competencies?	2.93	1.29
Sends its employees for education and certification in order to obtain the appropriate certificates to perform certain jobs?	3.17	1.35
M – Mean; SD –Standard Deviation		

Source: Own research

Researched companies to the greatest extent encourage, benefit and value non-formal employee education (3.39) and they enable the participation of employees in seminars, conferences, etc. in order to acquire the necessary and missing new and improve existing knowledge and competencies (3.24). They rarely they send their employees for additional education in educational institutions in order to acquire the missing competencies.

Table 6 shows descriptive statistics for assessing the frequency of using different methods and techniques of employee education. Research findings show that the most commonly used method and technique of employee education is "mentoring" with a score of 3.78 and it is followed by "a method of coaching subordinates when a more experienced employee or manager is teaching an employee" with rating 3.72. The "simulation learning" with score 2.41 and "Training in other companies, organizations, training centres" with score 2.46 are used very little and they have low ratings.

Table 6. Methods and techniques of employee education

	M	SD
A method of coaching subordinates when a more experienced employee or manager is teaching an employee	3.72	1.09
Job rotation; i.e., moving employees according to a predetermined time schedule from one job to another	2.74	1.18
Assignment of work tasks where lower levels are provided with experience working on specific problems and tasks	3.15	0.99
Mentoring	3.78	1.11
Lectures	2.87	1.26
Case study method; i.e. case study from practice	2.76	1.04
Audiovisual materials that employees can watch, listen to, etc. (audio, video, power point, etc.)	2.87	1.38
Simulation learning	2.41	1.29
Education via the Internet and Internet platforms	3.43	1.22
Participation in seminars, conferences, courses, and other forms of education outside the company	3.13	1.38
Training in other companies, organizations, training centres...	2.46	1.38
Education in educational institutions (schools, colleges, universities…)	2.54	1.28
M – Mean; SD –Standard Deviation		

Source: Own research

Table 7. Additional methods and techniques used to educate managers

	M	SD
Method of training by senior managers	3.57	1.19
Manager rotation	2.46	1.22
Assigning and teaching deputies (future leader)	3.09	1.19
Mentoring	3.33	1.33
Learning through participation in tasks and projects	3.85	1.15
Case study method; i.e. case study from practice	3.26	1.14
Participation in seminars, conferences, courses and other forms of education outside the company	3.22	1.36
Training in other companies, organizations, training centres...	2.80	1.38
Education in educational institutions (schools, colleges, universities...)	2.63	1.36
M – Mean; SD –Standard Deviation		

Source: Own research

Table 7 shows additional methods and techniques used to educate managers in the studied enterprises. Additional methods and techniques that are most commonly used to educate managers in researched companies are: “Learning through participation in tasks and projects”, “Method of training by senior managers” and “Mentoring”. On the other hand, additional methods and techniques that are least used to educate managers are: “Manager rotation”, “Education in educational institutions (schools, colleges, universities...)” and “Training in other companies, organizations, training centres...”.

Table 8 shows average grades for evaluation - the process of checking the degree to which the set educational goals have been achieved and in which the education has achieved the desired effects.

Table 8. Evaluation - the process of checking the degree to which the set educational goals have been achieved and in which the education has achieved the desired effects

	M	SD
Performs evaluation by participants at the end of the training	2.85	1.25
Performs evaluation by instructors / lecturers at the end of the training	3.00	1.25
After the training, the participants are evaluated by the chief, colleagues, or subordinates	3.30	1.41
During the training, it continuously surveys (monitors) the participants	2.91	1.21
Performs tests before and after the program	2.46	1.28
Evaluates the opinion and satisfaction of participants with training, educational program, conditions, teachers and content (survey questionnaire)	2.76	1.29
Evaluates the degree to which participants have adopted and know the concepts, principles, facts, techniques, and skills presented by the program (knowledge tests)	2.70	1.17
Monitors how much participation in the educational program has really changed behaviour at work,; i.e., whether a positive transfer of what has been learned to the work situation and work has been made	3.00	1.07
After the training, analyses the specific results and performance of employees who attended the training	3.33	1.16
Uses quantitative criteria to evaluate training results (performance, sales volume, delivery time, increased productivity, absenteeism, fluctuation, etc.)	3.07	1.12
Uses qualitative criteria to evaluate the training results (attitudes, perceptions, new ideas, different ways of thinking, dissemination of knowledge, etc.)	3.15	1.21
M – Mean; SD –Standard Deviation		

Source: Own research

The overall scores for “the Evaluation” are on average lower than the scores for “Analysis and identification of training and education needs” and “Planning and organizing training”, so it can be concluded that this stage in the process was the least used. The techniques that the companies use the most are: “After the training, analysing the specific results and performance of employees who attended the training”, “After the training, the evaluating participants by the chief, colleagues or subordinates” and “Using qualitative criteria to evaluate the training results (attitudes, perceptions, new ideas, different ways of thinking, dissemination of knowledge, etc.).

Estimation of business performance

Estimation of business performance was explored through a customised BSC method. Four perspectives for BSCs and trends for the past three years have been explored. Table 9 shows descriptive statistics for assessing enterprise's business performance on the BSC dimensions.

Table 9. Enterprise's business performance (data before the appearance of the COVID-19 virus)

	M	SD
Financial perspective		
Income	3.63	1.08
Profit	3.57	1.05
Costs	3.47	0.92
Loss	3.70	1.02
Customer perspective		
Market share	3.61	0.91
Retention of existing customers	3.74	1.02
Retrieving new customers	3.80	0.78
Customer satisfaction	3.93	0.90
The internal business processes perspective		
Introduces innovations in business process	3.70	0.92
Percentage of errors made	3.17	0.80
Finishes production and supplies the product / service to customers in time	3.83	0.95
After-sales service / customer service	3.83	0.93
The learning and growth perspective		
Investments in training and education of employees	3.33	0.87
Enable employees to use new technologies	3.83	0.95
Mutual employee collaboration and knowledge sharing	3.93	0.95
Empowerment and consideration of Employee Suggestions	3.87	0.98
M – Mean; SD –Standard Deviation		

Source: Own research

The average grades are high for all perspectives and the highest average grades are customer perspective (Retrieving new customers and Customer satisfaction), the internal business processes perspective (Finishing production and supplies the product / service to customers in time, After-sales service / customer service, Enabling employees to use new technologies) and the learning and growth perspective (Mutual employee collaboration and knowledge sharing and Empowerment and consideration of Employee Suggestions).

Correlation of training and education of human resources and business performance of SMEs

The average scores for all observed variables are high (Table 10). Looking into the process of education and training of human resources in the studied enterprises, the managers rated best Analysis and identification of training and education needs (3.51) and the lowest rated Evaluation (2.96). The managers rated best the customer's perspective in the enterprise with the rate 3.77 and then the learning and growth perspective with the rate 3.74. The worst is the perceived financial perspective with the rate 3.59 (Table 10).

Table 10. Average scores of the researched variables

	M	SD
Analysis and identification of training and education needs	3.51	0.78
Planning and organizing training	3.22	0.74
Evaluation	2.96	0.99
Financial perspective	3.59	0.78
Customer perspective	3.77	0.76
The internal business processes perspective	3.63	0.64
The learning and growth perspective	3.74	0.80
M – Mean; SD –Standard Deviation		

Source: Own research

Table 11 presents correlation of studied variables in the whole sample. The correlation of training and education of human resources and small and medium-sized businesses has been calculated by determining the correlation coefficient between training and education of human resources and business performances. Business performance is calculated using a BSC model. It also calculated the correlation of training and education of human resources and each of the perspectives from the BSC model in particular.

According to the results of the research, it has been found that there is a significant correlation between the training and education of human resources and the business performance of small and medium enterprises. All correlations are also positive for each phase of the training and education process. Based on the results of the study it can be concluded that hypothesis number 1 is fully accepted.

The correlations between training and education of human resources and all four perspectives of BSCs are significant. According to the research results, it can be concluded that the hypotheses H1a, H1b, H1c, H1c are confirmed.

Table 12 shows the correlation of researched variables in the subsample of small enterprises. All correlations are positive and are significant for the customer perspective and the learning and growth perspective.

Table 13 shows correlation of researched variables in the subsample of medium enterprises. All correlations are positive and are significant for the customer perspective, the internal business processes perspective and the learning and growth perspective.

Table 11. Correlations of researched variables in the whole sample

		Financial perspective	Customer perspective	The internal business processes perspective	The learning and growth perspective
Analysis and identification of training and education needs	CC	**0.358**^{*A}	**0.539**^{**A}	**0.345**^{*B}	**0.476**^{**B}
	p	0.015	<0.001	0.019	0.001
	N	46	46	46	46
Planning and organizing training	CC	0.252^{A}	**0.602**^{**A}	**0.381**^{**B}	**0.513**^{**B}
	p	0.091	<0.001	0.009	<0.001
	N	46	46	46	46
Evaluation	CC	0.194	**0.379**^{**A}	**0.333**^{*B}	**0.446**^{**B}
	p	0.196	0.010	0.024	0.002
	N	46	46	46	46

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
CC - Correlation Coefficient; A-Spearman's rho; B-Pearson Correlation
Source: Own research

Table 12. Correlations of researched variables in the subsample of small enterprises

		Financial perspective	Customer perspective	The internal business processes perspective	The learning and growth perspective
Analysis and identification of training and education needs	CC	0.359^{A}	**0.365***^{B}	0.126^{B}	**0.515****^{B}
	p	0.052	0.047	0.508	0.004
	N	30	30	30	30
Planning and organizing training	CC	0.241^{A}	**0.510****^{B}	0.270^{B}	**0.508****^{B}
	p	0.200	0.004	0.149	0.004
	N	30	30	30	30
Evaluation	CC	0.133^{A}	0.287^{B}	0.261^{B}	**0.592**^{**B}
	p	0.484	0.124	0.164	0.001
	N	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
CC - Correlation Coefficient; A-Spearman's rho; B-Pearson Correlation
Source: Own research

Table 13. Correlations of researched variables in the subsample of medium enterprises

		Financial perspective	Customer perspective	The internal business processes perspective	The learning and growth perspective
Analysis and identification of training and education needs	CC	0.372^{B}	**0.755****^{B}	**0.612***^{B}	**0.533***^{B}
	p	0.156	0.001	0.012	0.034
	N	16	16	16	16
Planning and organizing training	CC	0.226^{B}	**0.695****^{B}	**0.534***^{B}	**0.589***^{B}
	p	0.400	0.003	0.033	0.016
	N	16	16	16	16
Evaluation	CC	0.114^{B}	0.432^{B}	0.415^{B}	0.421^{B}
	p	0.675	0.095	0.110	0.104
	N	16	16	16	16

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
CC - Correlation Coefficient; B-Pearson Correlation
Source: Own research

Table 14. Differences in the researched variables regarding the size of the enterprise

	Enterprise size	M	SD	p[A]
Analysis and identification of training and education needs	small	3.37	0.70	0.099
	medium	3.77	0.88	
Planning and organizing training	small	3.15	0.72	0.346
	medium	3.36	0.77	
Evaluation	small	2.75	0.94	**0.046**
	medium	3.35	0.98	
Financial perspective	small	3.72[C]	1.25[D]	0.138[B]
	medium	3.88[C]	1.21[D]	
Customer perspective	small	3.73	0.72	0.575
	medium	3.86	0.85	
The internal business processes perspective	small	3.58	0.61	0.501
	medium	3.72	0.70	
The learning and growth perspective	small	3.80	0.66	0.488
	medium	3.63	1.04	

A-t test for independent samples; B-Mann-Whitney U test
M – mean; SD - standard deviation; C-medina; D-interquartile range
Source: Own research

Table 14 shows differences in the studied variables with regard to the size of the enterprise. A statistically significant difference between small and medium enterprises was found in the dimension of evaluation. Medium-sized enterprises have a significantly higher score on this dimension than small enterprises. No statistically significant difference was found in other dimensions of HRM and BSC perspectives regarding the size of the company. Despite that, it can be seen from the average grades that, except for the perspective of learning and growth, the average grades are higher in medium-sized companies.

According to the presented results in table 14 the hypothesis H2 - "There is a difference in the correlation between training and education of human resources and business performance of small and medium-sized enterprises in terms of their size" is party confirmed because there is a difference in correlations, but it is not significant except for regarding the evaluation dimension.

From the presented research, it can be concluded that the best rated are the customer perspective and the learning and growth perspective, which is very positive for SMEs and their business performance in terms of the future, including financially. It is evident that in the studied companies the focus is on customers and on investing in training and education of employees, and through these two perspectives there are better results in all perspectives.

Companies mainly use training and education in companies, while a very small number of companies use education of employees and managers outside the company, which is not good and there should be more cooperation with educational institutions but also other modes of education outside the company.

The results of the study of SMEs implemented in the Federation of Bosnia and Herzegovina showed that a significant positive correlation exists between training and education of human resources and the business performance of the small and medium enterprises. The results also show that all correlations are positive between each stage of training and education of HR and all BSC perspectives.

The results of the research also showed that in medium-sized enterprises there are higher average grades for all stages of the training and education process than those in small enterprises.

According to previous research, SMEs do not invest in training and education, nor in the development of HR as large corporations.

The results showed that companies should invest in all phases of the training and education process equally in order to achieve better results, because currently "the evaluation" stage has lower grades than other stages. The evaluation process, although it seems inconspicuous, is very important so that in the next process the HR department knows what mistakes were made and where the process should be improved. Also, it is very important to get feedback from employees.

Conclusion

Training and education activities allow organizations to adapt to market changes and sudden crises, compete with increasing competition, improve themselves and others, innovate and introduce new technology, produce new products, increase safety, improve services and reach strategic goals. Organizations invest in training and education of human resources more and more because they believe a skilled and trained workforce represents a competitive advantage, especially for SMEs.

The authors suggested that investment in training and development enhances competitive advantage, yields a return through better production, allows organizations to adapt, compete, improve performance, innovate, produce, be secure, improve service, and achieve goals, has a positive effect on job involvement, job satisfaction and organizational commitment. There is a calculable benefit to training employees. Better trained employees can work more and better, make fewer errors, require less supervision, have more positive attitudes and lower rates of attrition, and produce higher-quality products and services. These benefits positively affect the competitiveness and success of organizations (Dustmann, Fitzenberger & Machin, 2007; Truitt, 2011; Salas, Tannenbaum, Kraiger & Smith-Jentsch, 2012; Saks, Haccoun & Belcourt, 2015). Reviews of T&D literature have identified the multiple benefits of T&D for individuals, teams, organisations, and society (Susomrith, Coetzer & Ampofo, 2019, p. 498). Both employees and their organizations benefit from training and development. The individual develops his competencies and is more valuable in the labor market, has better compensation, progresses faster, and the organization increases its efficiency and effectiveness. Organizations find it easier to attract and retain new employees and reduce unwanted departures from the organization.

Susomrith, Coetzer & Ampofo (2019) wrote that small firm employees are less likely to obtain access from formal T&D events than are employees in large firms. Studies have identified several "barriers" to the provision of firm-sponsored, formal T&D in smaller firms. Thus, small firms have a strong preference for and are highly reliant upon informal learning processes. However, in some types of jobs, mere informal learning activities would be sufficient to acquire the depth of understanding necessary for complex work activities that require a high level of conceptual knowledge. This study shows a similarity with that research because it shows that the surveyed companies more often use non-formal ways of education. Furthermore, a study of companies in South Korea presented by Saks, Haccoun i Belcourt (2015) found that those that invest more in on-job learning achieve higher levels of learning outcomes (i.e., employee competence, labour productivity and enthusiasm of employees), and financial performance. In other words, investment in on-job training influences organizational performance through learning outcomes. The aforementioned study can be related to the results of this research which shows that companies apply on-the-job training more than off-the-job training, and then this can be positive given that this Korean study has proven positive effects of it.

Since Susomrith, Coetzer & Ampofo (2019, p. 498) stated that medium-sized businesses tend to be more similar to large businesses than small businesses, and thus they are managed in a relatively more formalised, professionalised and structured manner compared to small businesses. This research has shown similar outcomes, as it has shown that medium-sized companies have higher scores than small ones (although it should be noted that this difference is not significant according to the results of this survey). Some authors have investigated the effect of training and education on employees (Truitt, 2011), and some authors sought an impact on organizational performance (Saks, Haccoun & Belcourt, 2015). The link between training and organizational performance is strongly supported by research.

Past international research, presented in the theoretical section, that investigated the impact of training on the performance of companies, has shown that training and development affect productivity growth and higher operating profits (a survey conducted by the American Management Association), have a positive impact on human resources (e.g., employee attitudes, motivation, behaviour), organizational performance outcomes (e.g., performance and productivity) and financial outcomes (e.g., profit, financial indicators) (Research on training and organizational effectiveness). Likewise, these studies have shown that organizations that invest in training and education have higher revenues, profits, and productivity growth than companies that invest less in training. Research by the Conference Board of Canada found that those who spend the most on training and development believe they outperform their competitors in a number of performance indicators, such as employee satisfaction, customer satisfaction, productivity and profitability, compared with those that spend the least on training and development (Saks, Haccoun & Belcourt, 2015.). The research has not looked at training and education as a process and have not investigated the connection of individual phases of the training and education process on the business performance of companies. Hence the originality of this research, which observed the impact of all phases on the business performance of the company and concluded that companies do not pay enough attention to "evaluation".

Also, the results differ and are improved compared to previous research, as it was concluded that the best rated are the customer perspective and the learning and growth perspective, and that in the surveyed companies the focus is on customers and investment in employee training and education, and through these two perspectives there are better results in all perspectives.

The results can be used for the owners of SME's, management of SME's and departments of HRM, all of whom can benefit from this research. The obtained results clearly and unequivocally point to the need to develop a human resources management function in enterprises, and in this context, that special attention is paid to training and education of human resources, because by having competitive staff, enterprises are able to achieve their business objectives and compete with competition and ensure survival and development. Enterprises with higher-quality attractiveness and staff selection achieve better business performance viewed from all four perspectives of the BSC. It is necessary to create an organizational climate and organizational culture that supports employee learning and development, where the company monitors its employees and invests in them as their most valuable resources.

By investing in training and education, the company will raise competitive abilities, improve work performance, update the knowledge and skills of employees, avoid managerial obsolescence, direct new employees, prepare them for promotion and managerial succession, and meet individual growth needs.

With more choices and higher expectations from their jobs, quality employees are studying potential employers more carefully than ever. HRM and organizations should provide employees with flexibility, good pay, career development and advancement, organizational culture, additional values and a learning culture. Doing so will attract quality candidates, develop them, and retain them, while also creating better business results. If employees are not allowed to learn and progress, they will be dissatisfied or they will go to a company that invests more in its employees.

Although learning and development brings certain costs in the short term, in the long run it is an investment in the business performances of every enterprise.

SMEs in Bosnia and Herzegovina, due to the bad general political and economic situation, large emigration of the population, and the lack of labour force in B&H, despite the high unemployment, have difficulties putting together quality staffs. They need to pay special attention to training and education of employees because they are competing for staff on the labour market.

A further aspect of the originality of this research is evinced by the statements of numerous researchers who indicated that there is limited research on human resource development in small and midsized businesses.

The size of the sample and the method of creating the research sample represent the limits of the research. In the study some qualitative data enabled subjectivity because a subjective evaluation of the state as well as of impacts has been conducted.

A recommendation for future research is to enlarge the sample. Furthermore, for some future research beside the qualitative data, certain quantitative data need to be used and the research should be repeated in a certain period to study any evident changes. Another suggestion for future research is to compare large enterprises or to conduct a similar study of company employees, since the research focuses only on the management of organizations.

Endnote

[1] Federation of Bosnia and Herzegovina (2009). Law on accounting and audit in the Federation of Bosnia and Herzegovina. Sarajevo: Federation of Bosnia and Herzegovina, *Chapter I. General Provisions, Article 5, p. 3.*

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Povezava med usposabljanjem in izobraževanjem kadrov ter uspešnostjo malih in srednjih podjetij

Izvleček

Kadrovski oddelek (HR) je eden od ključnih oddelkov vsakega podjetja. To zlasti velja za majhna in srednja velika podjetja (MSP), kjer kadrovski oddelek pomeni konkurenčno prednost, ki vpliva na preživetje in razvoj. Spremembe v poslovnem okolju, potreba po novih znanjih, veščinah in sposobnostih zaradi sprememb na trgu in v poslu povečujejo vrzel med obstoječimi in zahtevanimi kompetencami zaposlenih. V procesu usposabljanja in izobraževanja kadrov zaposleni pridobijo potrebno znanje, izboljšajo svoje sposobnosti in/ali pridobijo nove veščine in izkušnje. Še pomembnejše pa je, da zaposleni pridobijo kompetence, ki jih potrebujejo da ostanejo (ali postanejo) uspešni pri svojem delu in prihodnjih delovnih mestih, ki jih bodo zasedali v podjetju. Glavni cilj te raziskave je ugotoviti povezavo med usposabljanjem in izobraževanjem kadrov ter uspešnostjo MSP. Raziskava je bila izvedena v MSP v Federaciji Bosne in Hercegovine med avgustom in septembrom 2020. Za raziskavo je bil ustvarjen izvirni vprašalnik, ki je bil uporabljen za pridobivanje mnenj o usposabljanju kadrov in izobraževanju višjega vodstva ter štirih perspektivah poslovanja podjetij na podlagi modela Balanced Scorecard. Podatke smo analizirali z uporabo SPSS 20,0. Iz statističnih postopkov so bili uporabljeni: Pearsonov koeficient korelacije, t-test za neodvisne vzorce, Spearmanov korelacijski koeficient in Mann-Whitneyjev U-test (odvisno od porazdelitve rezultatov). Rezultati raziskave so pokazali, da obstaja povezava med usposabljanjem in izobraževanjem kadrov ter uspešnostjo MSP. Poleg tega so rezultati raziskave pokazali razlike med podjetji glede na njihovo velikost, se pravi v majhnih in srednje velikih podjetjih. Vendar te razlike niso omembe vredne.

Ključne besede: poslovna uspešnost, korelacija, izobraževanje, majhna in srednje velika podjetja, usposabljanje

Scientific Impact of Central and Eastern European Higher Education Lecturers

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Abstract

The purpose of this paper is to obtain and analyse data on the higher education lecturers at the 16 largest, state-owned faculties of economics in seven central and eastern European countries (Bosnia and Herzegovina, Croatia, Kosovo, Montenegro, North Macedonia, Serbia, and Slovenia), about their scientific impact and reach. An analysis of their research areas and scientometrics (citations, h-indices) was performed, and aggregate rankings are presented. Data was collected from Google Scholar, Web of Science and Scopus by using proprietary specialized web crawlers ("bots"). The differences among countries and faculties are significant, and institutions should observe good practices from Slovenia, as its faculties are ranked highest. The insights are important for evaluating scientific progress, mobility, and cooperation, rewarding and promotion requirements, accreditations, project and institution funding, and higher education lecturers' promotion.

Keywords: Central and Eastern Europe, economists, Faculty of Economics, scientometrics, h-index, citations

Introduction

Every higher education lecturer should be devoted to three general areas of his occupation: teaching, science, and public service (AAUP, 2015; Blau, 1996; Boyer, 1997). An academic can be a brilliant pedagogue; great at passing complex knowledge in a simple manner on to students, but less prolific in producing high-quality (i.e.highly-cited) scientific papers (and vice versa). Serving as an expert ("technocrat") within public institution requires a third set of skills - managing people, their conflicted interests, and politics. It is challenging to be superb in each of the three mentioned areas. This paper specifically aims at the scientific reach of a lecturer at a faculty, notwithstanding the obvious need to investigate the others as well.

In this work a new dataset is obtained and analysed: the 16 largest faculties[1] of economics were selected from state-owned faculties in seven central and eastern European (CEE) countries. The aim is to observe these economists' fields of expertise, scientometrics (citations and h-index from different scientific data providers), and to comparatively analyse them. The data is harvested and published online[2] with open access. As such, this is the very initial work, hopefully building a foundation for a wider discussion and further research.

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To the best of our knowledge, there are no previous studies which comparatively examine the scientific impact of CEE higher education lecturers of economics, and this was the prime motivation for this paper. However, there are many studies which observe impact factors, citations, and similar metrics of economists, as well as designated journals (e.g., Scientometrics, e-ISSN: 1588-2861). Kocher et al. (2006) measured productivity in top economic research by using data envelopment analysis in 21 OECD-countries. Wolszczak-Derlacz and Parteka (2011) sampled 259 public higher education institutions from 7 European countries (Austria, Finland, Germany, Italy, Poland, Switzerland, and the United Kingdom) across the time period of 2001–2005, and evaluated efficiency in publication and graduations. Jurajda et al. (2017) presented a bibliometric comparison of publication performance in 226 scientific disciplines in the Web of Science (WoS) for six post-communist EU member states (Czech Republic, Hungary, Poland, Slovakia, Slovenia, and Croatia). Candan (2020) explored the efficiency and performance of economics research in 15 OECD member countries and evaluated them by using bibliometric elements for the period of 2010–2017, but only Hungary from CEE was included.

Previous researchers did not encompass the countries selected for this study, and this is a gap that this paper aims to fill. We can empirically observe differences among the scientific impact of lecturers at the faculties of economics in the CEE region. Therefore, the research questions can be stated as: are these differences factual and significant, and what is their scope?

After this introduction which included a brief overview of the previous literature, the second chapter delves into methodology and the data obtained (with detailed review of data preparation), while the third presents and discusses results. Finally, the fourth chapter concludes.

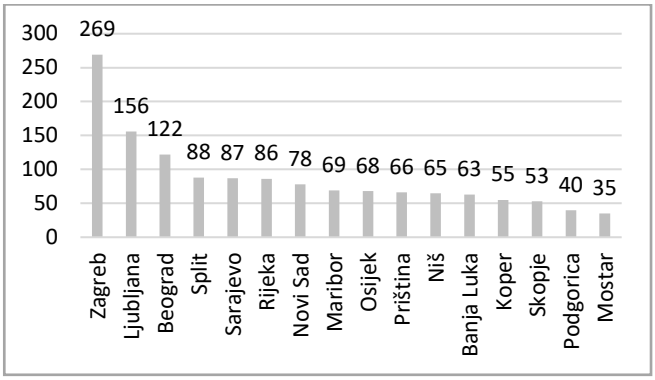
Methodology and Data

After composing the research questions, this study began with the collection of data on the academic (teaching) staff from the official websites of the 16 faculties of economics from seven neighbouring, transition CEE countries (Bosnia and Herzegovina, Croatia, Kosovo, Montenegro, North Macedonia, Serbia, and Slovenia), as presented in Table 1. From each of the larger countries three faculties in their largest cities were selected,[3] while smaller countries (where larger and smaller countries are differentiated by the criterion of population and area) were sampled with one, from the capital. The chosen CEE countries share a portion of their modern history and have comparable and compatible scientific systems (e.g., identical academic titles, similar structures, etc.), and can easily communicate through some unofficial version of amalgamated Bosnian-Croatian-Serbian language. However, their higher education systems are fragmented, and many lecturers do not have proper tools for collaboration and networking, which is one of the motivations for this research.

The sample was designed by selecting faculties from state-owned, public faculties because they have a particular scientific heritage and background, as opposed to those privately owned. Moreover, state-owned faculties in this region are largely financed with public resources, which weighs them with more accountability for their scientific accomplishments and gives taxpayers the privilege of demanding more information on their performances.

It can be seen that the size of the faculties, as measured by the number of teaching staff (Figure 1), is more or less similar, with the exception of Zagreb which has twice as many lecturers as, e.g., Belgrade and almost 8 times more than the lowest in the sample (Mostar). The sheer size of the Zagreb Faculty will push its aggregate scientometrics upwards; together with the unequal number of lecturers among countries this emphasises the need to maintain focus on measures of central tendency when discussing results.

Figure 1. Total number of teaching staff at selected CEE faculties of economics



Source: Author's research

Non-economists teaching at faculties of economics (typically involved in languages and law) were not excluded from the teaching staff mostly because their contribution to the scientific impact of their local community was assumed to be a valuable asset and important benefit to international visibility and recognition of their faculties. This was also done because many academics have complex expertise and it would be impossible to disentangle their interdisciplinarity into clear-cut categories.

Scientometrics providers and data collection process

After compiling all the data on the lecturers (as in Table 1), for each of the staff members, three data providers were queried: Web of Science (WoS), Scopus, and Google Scholar. These were chosen to obtain better insight into differences between them, because their data collection designs are different, and because they are commonly used and prevalent in the scientific community. Also, in some CEE countries there are formal requirements for lecturers to have a Google Scholar profile and to publish in journals indexed

by WoS and Scopus (e.g., Croatia). Waltman (2016) provides an in-depth review of the literature on citation impact indicators from Web of Science, Scopus, and Google Scholar. The differences between the databases are extensively explicated in the next section.

By using specialized web crawlers ("bots") developed particularly for this research, during May and June 2020 from these providers a selection of ten scientometrics was extracted for each staff member:

- from WoS: 1) total number of citations and 2) h-index,[4]
- from Scopus: 3) total number of citations and 4) h-index,
- from Google Scholar: 5) all-time total of citations, 6) all-time h-index, 7) all-time i10 index, 8) citations since 2015, 9) h-index since 2015, and 10) i10 index since 2015.

To maintain conciseness and comparability analysis was done over six metrics: all-time citations and h-index, from WoS, Scopus, and Scholar.

The process of data harvesting was cumbersome and had to be repeated several times with subsequent refinements and special-cases filtering (which was performed manually, by comparing and contrasting observed data from three databases, as it was infeasible to perform it by employing artificial intelligence), due to the following challenges and limitations:

a) some colleagues have vague, imprecise or even incorrect affiliations, and some have multiple affiliations,
b) data providers often rely on authors to comb through articles and to (dis)associate themselves from papers, and if authors have not done it recently this gives room for improperly conjoined authorships (with some authors having greater scientometrics then they should have, while others have lower);
c) if there were no results for particular name and surname some data providers went for the "next best thing" – they gave results for similar looking and/or sounding names or surnames, which deceived bots into collecting data for a different person instead of what was asked for (e.g., when searching for Aleksandar X, Google Scholar displays Aleksandra X, etc.);
d) many colleagues have changed their surname which led bots to no results when looking for scientometrics under current last name,
e) some colleagues have the same name and surname as their counterparts from other scientific fields, which misled bots into collecting data from non-economists;
f) many colleagues have two last names, and some scientometric providers differentiate when having a dash between them (Surname1-Surname2 regarded differently as Surname1 Surname2);
g) the treatment of letter "Đ" – some providers transform it into D which renders searches with "Đ" within name or surname without any results;
h) etc.

Table 1. Faculties in the sample and their teaching staff

Country and country ISO 3166 code	City	Local title	Number of teaching staff		Date of data collection
Bosnia and Herzegovina (BH)	Banja Luka	Ekonomski fakultet Banja Luka	63	185	28.5.2020
Bosnia and Herzegovina (BH)	Mostar	Ekonomski fakultet Sveučilišta u Mostaru	35		28.5.2020
Bosnia and Herzegovina (BH)	Sarajevo	Ekonomski fakultet Sarajevo	87		28.5.2020
Croatia (HR)	Osijek	Ekonomski fakultet Osijek	68	511	27.5.2020
Croatia (HR)	Rijeka	Ekonomski fakultet Rijeka	86		27.5.2020
Croatia (HR)	Split	Ekonomski fakultet Split	88		27.5.2020
Croatia (HR)	Zagreb	Ekonomski fakultet Zagreb	269		27.5.2020
Kosovo (XK)	Priština	Fakulteti Ekonomik Prishtine	66		30.5.2020
Montenegro (CG)	Podgorica	Ekonomski fakultet Podgorica	40		29.5.2020
North Macedonia (MK)	Skopje	Ekonomski fakultet Skopje	53		30.5.2020
Serbia (RS)	Belgrade	Ekonomski fakultet Beograd	122	265	29.5.2020
Serbia (RS)	Niš	Ekonomski fakultet Niš	65		29.5.2020
Serbia (RS)	Novi Sad	Ekonomski fakultet u Subotici, odeljenje u Novom Sadu	78		29.5.2020
Slovenia (SI)	Koper	Fakulteta za Management Koper	55	280	27.5.2020
Slovenia (SI)	Ljubljana	Ekonomska fakulteta Ljubljana	156		27.5.2020
Slovenia (SI)	Maribor	Ekonomsko poslovna fakulteta Maribor	69		27.5.2020
		Total:	**1400**		

Source: Author's research

If no profile was found at WoS, Scopus, or Google Scholar after repeated searches as stated above, it was assumed that the scientometrics for the given person are equal to zero. This does not imply that this person has no scientific merit or impact, only that (given challenges and limitations of this research) chosen scientific online data providers did not (yet) encompass them.

Detailed proofing of every single of the 4,200 queries (1,400 lecturers from three data providers) and 14,000 metrics was both unfeasible and would defeat the purpose of this paper, and because of the above reasons it should be noted that some errors have likely remained in the database. Nevertheless, it can be stated that these are in the absolute minority, and that the general conclusions of this research can stand regardless of possible errors.

Scientometric data

The well-known and widely used h-index was developed by Hirsch (2005). It reflects the productivity of authors based on their publication and citation records.

At WoS the h-index is based on the WoS Core Collection citations of the publications shown on the author record. WoS Core Collection comprises of six sub-databases (Web of Science, 2020a). WoS declares (Web of Science, 2020b) that the h-index reflects not just the number of papers or the number of citations, but (since it is not influenced by a single highly-cited paper) that it provides some indication of the number of well-cited papers. However, the h-index is dependent on the subject area considered, as well as on the time since publication of important papers.

Scopus (a brand of Elsevier) covers some 23,500 peer-reviewed journals, including 5,500 full open access journals, 300 trade publications, 850 book series, 9.8 million conference papers from 120,000 events, 210,000 books, and over 77.8 million records (Scopus, 2020a). It declares that their h-index is based on the highest number of papers included that have had at least the same number of citations, and also advises that it should only be used in a mix of quantitative and qualitative metrics (Scopus, 2020b).

Google Scholar does not declare specifically which sources it includes, only that it currently covers articles published between 2014 and 2018, with the exclusion of patents, books, and dissertations, publications with fewer than 100 articles published between 2014 and 2018, and publications that received no citations to articles published between 2014 and 2018. It claims to cover a "substantial fraction of scholarly articles published in the last five years. However, [we] don't currently cover a large number of articles from smaller publications" (Google LLC, 2020). Google Scholar is free access and covers a wider area of publications, not only scholarly reviewed papers, but also websites, blogs, newspapers, etc. As such it can be viewed as a tool to gain some insight into wider public – not only scientific – impact. It also publishes the i10-index, the number of publications with at least 10 citations.

The differences between the providers makes the data obtained from them complementary, but not interchangeable; hence we employ all three in order to gain a wider and fuller perspective.

Finally, after testing for normality ANOVA/Kruskal-Wallis will show whether the differences between average citations and h-indices among faculties (cities) and among countries are significant.

Results and Discussion

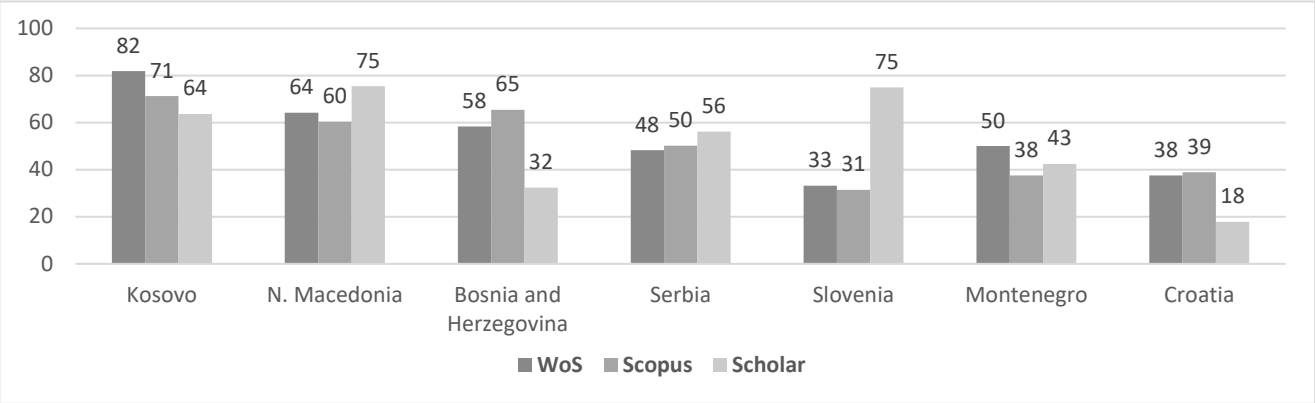
Many lecturers do not have profiles at WoS, Scopus nor Google Scholar, and it is also clear that countries rely differently on scientific data providers (Figure 2). More than 70% of lecturers in Slovenia do not have a Google Scholar profile, as opposed to only 18% in Croatia where that is mandatory for academic advancement. Every researcher is free and can choose not to have a Google Scholar profile, but since Google is the primary global data provider this decision has consequences on the visibility, impact, and influence of that researcher. Within this study it should also be acknowledged that Google Scholar is valuable since it enables authors themselves to declare their own narrow research interests (a feature not available elsewhere, as other databases merely categorize everyone within economics), which then brings substantial additional value to the data obtained by other sources.

On the other hand, Slovenia has the lowest aggregates of lecturers that do not have WoS or Scopus profile. At the overall average, approximately half of the lecturers do not have any profile whatsoever at WoS, Scopus, or Google Scholar. It should be noted that some of the lecturers' scientific impact is here "invisible" when their papers are published in their native language (non-English).

When comparing scientometrics harvested from data providers, it is important to note that Scholar has different sources and that it diverges somewhat from both Scopus and WoS. Figure 3 (logarithmically scaled) presents each author as a single datapoint with total citations as coordinates. On the other hand, WoS and Scopus share much more resemblance and they could nearly be regarded as alternatives or substitutes for each other (Figure 4, again with log-scales).

The descriptive statistics of the number of citations and the h-index, grouped by countries, are given in Table 2 and Table 3, respectively. The trimmed mean is calculated by removing 1% of values from both ends of the data set, thereby retaining 98% of the mid-data, and is useful to compare central tendency without outliers.

Figure 2. Percentage of staff that do not have any data from data providers, by country



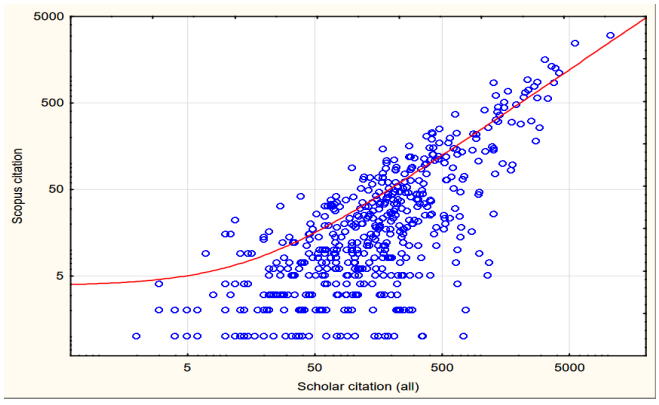
Source: Author's research

Table 2. Descriptive statistics of citations, grouped by countries, sorted by mean

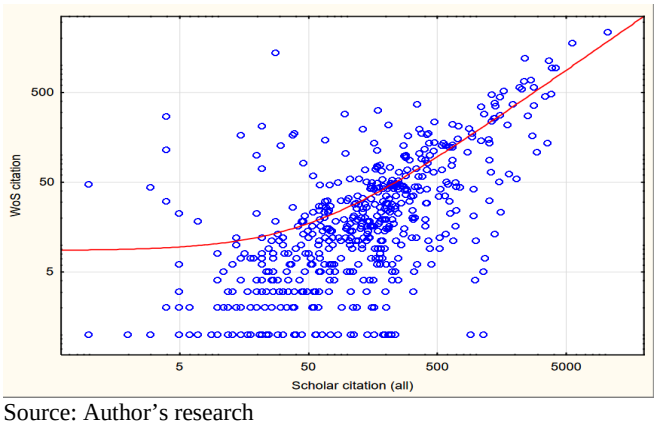
Data provider	Country	Valid N	Mean	Trimmed mean	Sum	Min.	Max.	Std. Dev.	Coef. Var.
Google Scholar	Slovenia	280	309	241	86430	0	10579	1013	328
	Croatia	511	197	178	100708	0	2836	355	180
	Serbia	265	71	63	18731	0	999	139	197
	Bosnia & H.	185	64	48	11865	0	2192	198	308
	Montenegro	40	31	31	1249	0	173	40	129
	N. Macedonia	53	28	21	1486	0	419	69	247
	Kosovo	66	19	17	1256	0	190	40	208
Scopus	Slovenia	280	135	112	37740	0	2968	320	237
	Croatia	511	25	19	12936	0	923	78	309
	Serbia	265	17	14	4448	0	409	43	257
	Montenegro	40	12	12	468	0	145	26	226
	Bosnia & H.	185	14	9	2521	0	574	53	388
	N. Macedonia	53	8	5	445	0	187	27	317
	Kosovo	66	7	3	451	0	280	35	513
WoS	Slovenia	280	103	86	28846	0	2286	247	240
	Croatia	511	25	20	13000	0	1356	85	333
	Serbia	265	21	18	5435	0	312	49	240
	Montenegro	40	10	10	409	0	112	22	217
	Bosnia & H.	185	14	10	2573	0	560	51	368
	N. Macedonia	53	4	3	230	0	67	11	256
	Kosovo	66	6	2	379	0	271	34	588

Source: Author's calculation

Figure 3. Citations from Scholar vs. Scopus and WoS

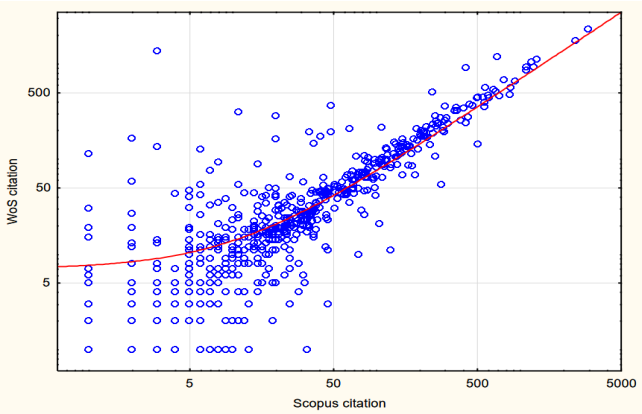


Source: Author's research



Source: Author's research

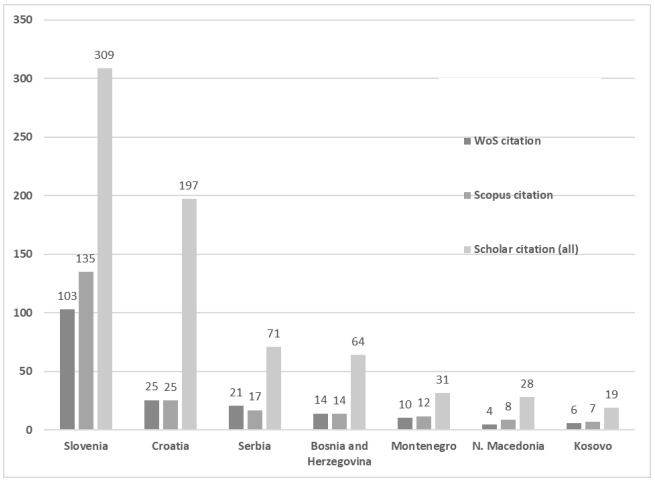
Figure 4. Citations from Scopus vs WoS



Source: Author's research

Since WoS and Scopus share resemblance as visualized in Figure 4, rankings of countries by average citations from WoS and Scopus are identical. However, there is a large gap between Slovenia and other CEE countries in the sample, with Slovenian lecturers having approx. four times more citations at WoS and Scopus than the second best (Croatia), while the differences between the third and the rest are not as stark (Figure 5). Figure 5 (as well as Graph 6) present the relative numbers (averages).

Figure 5. Arithmetic means of citations, by country

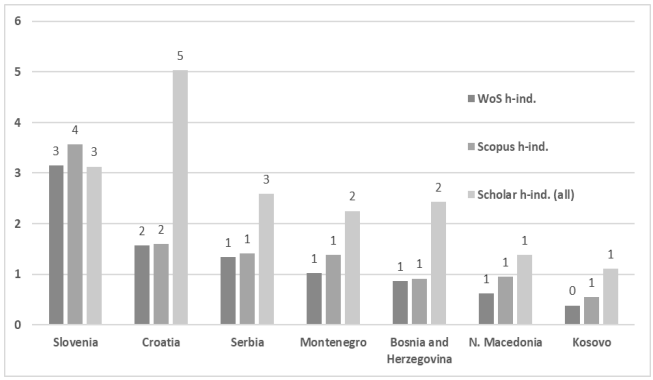


Source: Author's calculation

When analysing countries according to their h-indices similar patterns emerge: Slovenia leads the way at WoS and Scopus, but at Google Scholar Croatian lecturers present much more impact than their CEE counterparts. However, it should be kept in mind that approximately 75% of Slovenian lecturers do not have Scholar profile. The obligation in Croatia to have Google Scholar profile when commencing the academic advancement procedure most likely is an important factor here.

Figure 6 exhibits that when focusing on average h-index, Croatian lecturers have much more impact through Google Scholar than through other providers.

Figure 6. Arithmetic mean of h-index, by country



Source: Author's calculation

Economic inequalities could also explain intra-national variances, which come into play when the focus shifts from countries to cities. The descriptive statistics of the number of citations and the h-index, grouped by cities, are given in Table 4 and Table 5, respectively.

As expected, the highest positions are held by faculties in Slovenia, followed by the institutions from the largest cities (capitals). However, there are some surprising results, such as the relatively low rank of Belgrade.

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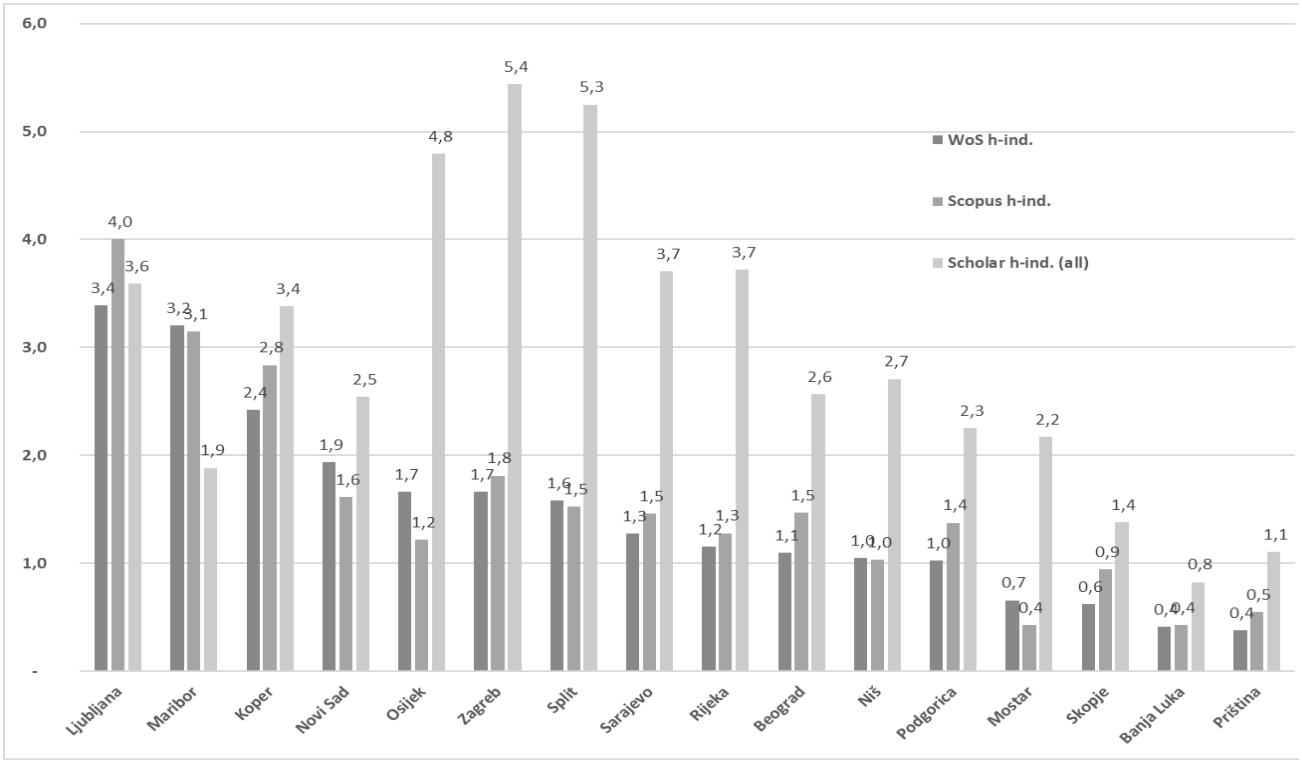
When we turn to the h-index grouped by cities, we see (Table 5) that it mostly follows the statistics of citations. The exceptions are Croatian faculties at Google Scholar which are ranked as the top four.

Table 3. Descriptive statistics of h-index, grouped by countries, sorted by mean

Data provider	Country	Valid N	Mean	Trimmed mean	Sum	Min.	Max.	Std. Dev.	Coef. Var.
Google Scholar	Croatia	511	5.03	4.90	2572	0	26	4	88
	Slovenia	280	3.13	2.85	876	0	33	7	218
	Serbia	265	2.59	2.49	687	0	15	4	138
	Bosnia & H.	185	2.43	2.31	450	0	19	3	120
	Montenegro	40	2.25	2.25	90	0	8	2	104
	N. Macedonia	53	1.38	1.22	73	0	11	3	193
	Kosovo	66	1.11	0.98	73	0	10	2	166
Scopus	Slovenia	280	3.56	3.43	997	0	22	4	114
	Croatia	511	1.59	1.50	814	0	16	2	129
	Montenegro	40	1.40	1.33	55	0	6	2	117
	Serbia	265	1.38	1.38	372	0	11	2	129
	Bosnia & H.	185	0.94	0.80	169	0	10	2	185
	N. Macedonia	53	0.91	0.83	50	0	9	2	167
	Kosovo	66	0.55	0.42	36	0	9	1	235
WoS	Slovenia	280	3.15	3.03	883	0	20	4	119
	Croatia	511	1.57	1.49	798	0	15	2	127
	Serbia	265	1.33	1.26	353	0	10	2	137
	Montenegro	40	1.03	1.03	41	0	6	1	141
	Bosnia & H.	185	0.86	0.80	160	0	9	1	172
	N. Macedonia	53	0.62	0.55	33	0	5	1	173
	Kosovo	66	0.38	0.25	25	0	9	1	323

Source: Author's calculation

Figure 7. Arithmetic mean of citations, by city



Source: Author's calculation

Table 4. Descriptive statistics of citations, grouped by cities, sorted by mean

Data provider	City	Valid N	Mean	Trimmed mean	Sum	Min.	Max.	Std. Dev.	Coef. Var.
Google Scholar	Ljubljana	156	409	313	63776	0	10579	1258	308
	Zagreb	269	244	219	65560	0	2836	443	182
	Koper	55	226	170	12455	0	3440	634	280
	Split	88	184	177	16166	0	975	214	116
	Osijek	68	151	136	10250	0	1255	238	158
	Maribor	69	148	114	10199	0	2529	479	324
	Sarajevo	87	107	84	9333	0	2192	261	243
	Rijeka	86	102	92	8732	0	1002	176	173
	Belgrade	122	83	76	10088	0	999	170	206
	Niš	65	66	57	4302	0	713	122	185
	Novi Sad	78	56	51	4341	0	443	88	158
	Mostar	35	53	53	1843	0	1004	169	320
	Podgorica	40	31	31	1249	0	173	40	129
	Skopje	53	28	21	1486	0	419	69	247
	Priština	66	19	17	1256	0	190	40	208
	Banja Luka	63	11	9	689	0	115	27	250
Scopus	Ljubljana	156	176	145	27498	0	2968	399	226
	Koper	55	93	73	5095	0	1206	212	229
	Maribor	69	75	68	5147	0	569	110	147
	Zagreb	269	30	23	8160	0	923	90	295
	Sarajevo	87	24	18	2106	0	574	71	295
	Rijeka	86	22	14	1895	0	719	89	403
	Belgrade	122	21	18	2515	0	409	54	264
	Split	88	19	18	1703	0	195	37	190
	Osijek	68	17	14	1178	0	256	50	287
	Novi Sad	78	15	14	1189	0	108	25	167
	Podgorica	40	12	12	468	0	145	26	226
	Niš	65	11	8	744	0	248	35	308
	Skopje	53	8	5	445	0	187	27	317
	Priština	66	7	3	451	0	280	35	513
	Banja Luka	63	5	2	344	0	236	30	550
	Mostar	35	2	2	71	0	31	6	299
WoS	Ljubljana	156	130	107	20272	0	2286	304	234
	Maribor	69	70	65	4853	0	504	104	147
	Koper	55	68	51	3721	0	1037	177	261
	Rijeka	86	29	14	2525	0	1356	154	525
	Novi Sad	78	27	23	2088	0	309	54	201
	Zagreb	269	26	20	6866	0	659	69	270
	Osijek	68	24	20	1621	0	282	51	215
	Sarajevo	87	23	17	2043	0	560	71	302
	Split	88	23	19	1988	0	360	47	207
	Niš	65	18	14	1168	0	312	51	284
	Belgrade	122	18	16	2179	0	250	45	253
	Podgorica	40	10	10	409	0	112	22	217
	Priština	66	6	2	379	0	271	34	588
	Banja Luka	63	6	4	359	0	140	21	376
	Mostar	35	5	5	171	0	47	11	217
	Skopje	53	4	3	230	0	67	11	256

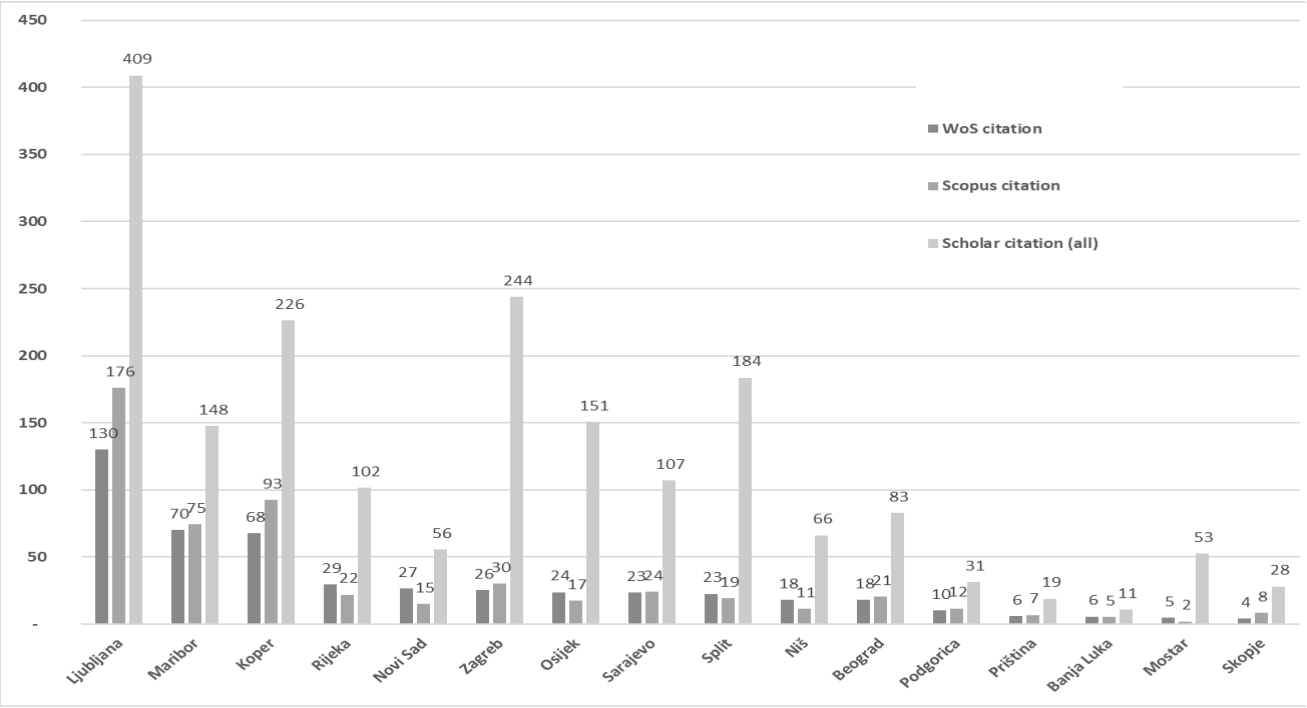
Source: Author's calculation

Table 5. Descriptive statistics of h-index, grouped by cities, sorted by mean

Data provider	City	Valid N	Mean	Trimmed mean	Sum	Min.	Max.	Std. Dev.	Coef. Var.
Google Scholar	Zagreb	269	5.44	5.29	1464	0	26	5	92
	Split	88	5.25	5.19	462	0	16	4	74
	Osijek	68	4.79	4.68	326	0	17	4	80
	Rijeka	86	3.72	3.62	320	0	16	3	88
	Sarajevo	87	3.70	3.56	322	0	19	3	89
	Ljubljana	156	3.59	3.28	560	0	31	7	208
	Koper	55	3.38	2.89	186	0	33	6	190
	Niš	65	2.71	2.59	176	0	13	4	131
	Belgrade	122	2.57	2.48	313	0	15	4	151
	Novi Sad	78	2.54	2.46	198	0	11	3	122
	Podgorica	40	2.25	2.25	90	0	8	2	104
	Mostar	35	2.17	2.17	76	0	13	2	110
	Maribor	69	1.88	1.61	130	0	22	5	281
	Skopje	53	1.38	1.22	73	0	11	3	193
	Priština	66	1.11	0.98	73	0	10	2	166
	Banja Luka	63	0.83	0.75	52	0	6	1	180
Scopus	Ljubljana	156	4.00	3.84	624	0	22	4	112
	Maribor	69	3.14	3.03	217	0	14	3	103
	Koper	55	2.84	2,62	156	0	17	4	126
	Zagreb	269	1.81	1.70	487	0	16	2	125
	Novi Sad	78	1.62	1.57	126	0	7	2	108
	Split	88	1.52	1.49	134	0	6	1	93
	Belgrade	122	1.47	1.40	179	0	11	2	137
	Sarajevo	87	1.46	1.38	127	0	10	2	142
	Podgorica	40	1.38	1.38	55	0	6	2	117
	Rijeka	86	1.28	1.15	110	0	13	2	156
	Osijek	68	1.22	1.14	83	0	8	2	152
	Niš	65	1.03	0.97	67	0	6	1	134
	Skopje	53	0.94	0.80	50	0	9	2	167
	Priština	66	0.55	0.42	36	0	9	1	235
	Banja Luka	63	0.43	0.33	27	0	7	1	277
	Mostar	35	0.43	0.43	15	0	3	1	172
WoS	Ljubljana	156	3.39	3.24	529	0	20	4	122
	Maribor	69	3.20	3.10	221	0	13	3	101
	Koper	55	2.42	2.23	133	0	15	3	131
	Novi Sad	78	1.94	1.88	151	0	8	2	91
	Osijek	68	1.66	1.58	113	0	9	2	103
	Zagreb	269	1.66	1.56	447	0	15	2	132
	Split	88	1.58	1.55	139	0	6	2	102
	Sarajevo	87	1.28	1.20	111	0	9	2	143
	Rijeka	86	1.15	1.06	99	0	10	2	157
	Belgrade	122	1.10	1.03	134	0	10	2	168
	Niš	65	1.05	0.95	68	0	8	2	162
	Podgorica	40	1.03	1.03	41	0	6	1	141
	Mostar	35	0.66	0.66	23	0	3	1	133
	Skopje	53	0.62	0.55	33	0	5	1	173
	Banja Luka	63	0.41	0.34	26	0	5	1	245
	Priština	66	0.38	0.25	25	0	9	1	323

Source: Author's calculation

Figure 8. Arithmetic mean of h-index, by city



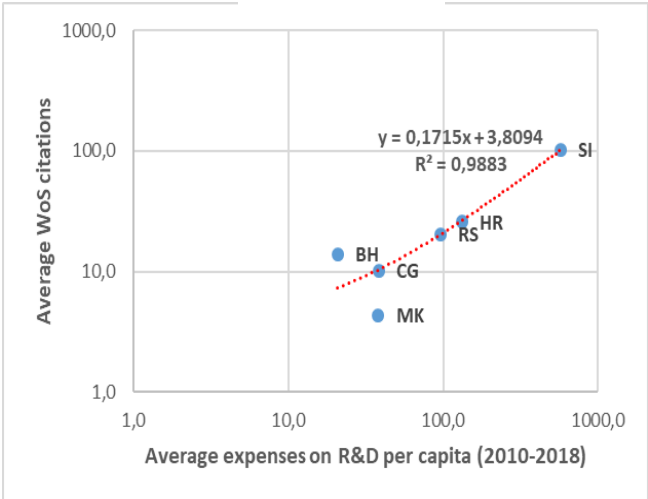
Source: Author's calculation

Are all the above differences significant, or are they random? Kolmogorov-Smirnov, Lilliefors and Shapiro-Wilk's W tests for normality were taken, and as they all exhibited $p < .01$ the hypothesis that the respective distributions are normal was rejected. Therefore, Kruskal-Wallis non-parametric analyses of variance was performed, and all the variables (scientometrics) were found to be highly significant ($p < ,001$). Thus, we can conclude that metrics are significantly different between countries and between cities.

The results imply that there are substantial inter- and intra-national discrepancies regarding scientific impact and influence of higher education lecturers of economics in the CEE region. There are many possible explanations regarding the differences of economists' scientific impact between countries. We can conjecture that most of them are due to general economic inequalities. If within selected countries we compare total expenditure on R&D (average from 2010 to 2018, by countries, unavailable for Kosovo) per inhabitant with average WoS citations per lecturer, we see a sharp trend line (Figure 8). Causality could here be disputed due to low number of data points, but there is an inherent logic connecting expenses on R&D and scientific impact of these investments.

Scientists almost everywhere could always complain that they are underfunded, but this is especially the case in emerging countries, as they were already constantly lagging behind and still are woefully lacking in resources. Even today many researchers from the observed countries do not have access to prime scientific resources – papers and data behind paywalls. Also, for decades talents went abroad; some of the best and brightest left in pursuit of better opportunities which certainly impoverished the remaining communities (Schierup (1995), Straubhaar (2000), Horvat (2004)). These are some of the possible explanations of the divergence found within bibliometric data.

Figure 8. R&D expenses per capita compared to average WoS citations



Source: UNESCO (2020) and Author's calculation

Furthermore, the obtained data can be valuable to:

- lecturers themselves in search for colleagues in their field,
- editors of journals when seeking reviewers,
- organizers of scientific conferences,
- journalists looking for expert opinions,
- policy makers when deciding on academic promotion requirements,

– faculty management in scrutinizing inter-institutional development, mobility, scientific progress, project funding, cooperation and rewarding,
– industry servicing scientific community (e.g., in devising rankings, accreditations, etc.) and
– other stakeholders.

Conclusion

This paper contributes by obtaining and analysing a novel dataset on the scientometrics of CEE higher education lecturers of economics. Using web algorithms developed specially for this purpose, citations and h-indices were collected from Google Scholar, Web of Science, and Scopus for 1400 positions at the 16 largest faculties from seven countries. Colleagues from the neighbouring countries, from similar fields, now have a new tool for networking, as the data on the lecturers at public faculties is collected and available in the public domain.

The countries in the sample have very contrasting features; even though they share some of their history and background there has always been a significant economic gap (both in terms of science and the real economy) between them. These differences are evident in the scientific impact made by these locations. On average, nearly half of the lecturers do not have any profile at WoS, Scopus, or at Google Scholar, which renders them globally "invisible". This could be because they publish in their native languages, because they deal with locally specific issues, or because they are not committed to scientific publishing.

Besides as a ranking tool, the results are significant as they bear relevance for evaluating scientific progress, mobility, and cooperation, rewarding and promotion requirements, accreditations, funding projects and institutions, promotion of lecturers, and for other purposes.

Future researchers should expand the scope of the sample and include other neighbouring CEE countries. It would also be interesting to compare the amount of funds received by a faculty from the taxpayers with its scientific impact. In addition, qualitative impact measures could also be taken into account, which could enable detection of group identities as described by Vogel (2012). Furthermore, state-owned higher education institutions should be contrasted with privately-owned ones. All things considered, we call for a deeper and wider exploration of gaps between higher education lecturers of economics in the region.

Endnotes

[1] One should be aware of the differences in terminology in higher education; in central and eastern European as well as in this paper "Faculty" is an institution similar to "College" in the USA, with synonyms such as "higher education institution" and "School".
[2] Link is temporarily hidden due to anonymization of authorship during the review process.
[3] The exception is the affiliation of the author (Osijek) which is not among the three largest in Croatia but was included in order to compare it to the selected sample.
[4] For an analysis of h-index within WoS, see Hu et al. (2020).

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Znanstveni vpliv predavateljev visokošolskega izobraževanja v Srednji in Vzhodni Evropi

Izvleček

Namen te študije je pridobiti in analizirati podatke o visokošolskih predavateljih na 16 največjih ekonomskih fakultetah v državni lasti v sedmih državah Srednje in Vzhodne Evrope (Bosna in Hercegovina, Hrvaška, Kosovo, Črna gora, Severna Makedonija, Srbija in Slovenija), o njihovem znanstvenem vplivu in dosegu. Izvedena je bila analiza njihovih raziskovalnih področij in scientometrija (citati, h-indeksi), pri čemer je predstavljena skupna razvrstitev. Podatki so bili zbrani iz Google Scholar, Web of Science in Scopus z uporabo lastniških specializiranih spletnih pajkov ("botov"). Razlike med državami in med fakultetami so velike, institucije pa bi morale upoštevati dobre prakse iz Slovenije, saj so se fakultete iz te države uvrstile najvišje. Vpogledi so pomembni za ocenjevanje znanstvenega napredka, mobilnosti in sodelovanja, zahtev po nagrajevanju in napredovanju, akreditacije, financiranje projektov in ustanov ter napredovanje predavateljev v visokem šolstvu.

Ključne besede: Srednja in Vzhodna Evropa, ekonomisti, ekonomska fakulteta, scientometrija, h-indeks, citati

Engaging Economics and Traffic Engineering Students in Community Issues Using the MultiCreation Approach

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Abstract

Effective teaching methods for the coming generations of pragmatic students and teachers are evolving towards much greater involvement on all sides, attempting to bridge real life and academia in innova-tive ways. Our theoretical foundation lays upon the Triple Helix, n-Tuple Helix theory and the innova-tion triangle, but in a problem-based multidisciplinary setting. After introducing and validating the Mul-tiCreation approach in teaching/learning for the business-academia collaboration, where multiple disci-plines, diverse profiles of students, professors, and managers have taken up various roles to address relevant business issues, we were encouraged to expand its applicability beyond the business world - toward societal problems. We retained the problem-based and participatory learning but shifted the positioning of the problem towards the safety of primary school children, incorporating economic, pro-ject-based, managerial, traffic engineering, logistical, regulatory, and governance issues. By including two primary schools, collaborating with their principals, advisory teams, and teachers, as well as chil-dren and parents, in two different cities, we aimed to provide complete research, engineering and educa-tion for the stakeholders so that the schools could just hand in documentation to the relevant municipal bodies to be acted upon effectuation. The involved students came from two faculties - of economics and traffic engineering, steered by three university professors on the subjects of project management and basic and advanced techniques for traffic management. The blended learning components took place as prescribed in the MultiCreation approach, during two semesters of two academic years. They combined countermeasures and solutions. The

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MultiCreation approach has been enhanced regarding its components and workflow and its effectiveness has been validated in a multi-stakeholder environ-ment of direct and indirect educational beneficiaries.

Keywords: Problem-based learning, participatory learning, MultiCreation approach, Traffic Engineering, community-academia collaboration

Motivation and Theoretical Background

Establishing functional bridges among disciplines, industries, countries, students, domains, subjects, applications, and diverse stakeholders is an ongoing process - and the goal to facili-tate university students to apply their learnings in a guided manner has been our motivation to take up an approach already applied in practice that helps achieve these goals - the MultiCrea-tion approach by (Petrevska Nechkoska and Angeloska Dichovska, 2020). We retained the problem-based and participatory learning, situated learning (Lave and Wenger, 1991, 1996), but shifted the positioning of the problem towards traffic safety of children in primary schools - incorporating economical, project-based, managerial, traffic engineering, logistical, regulato-ry and governance issues.

In any problem-driven research, one of the main theoretical challenges is positioning the mul-tidisciplinary setting of the scientific domains, which are interrelated, so as to address real problems in a conceptual manner. Hence, using our theoretical backgrounds we touched upon management, governance, engineering, traffic, innovation, higher education - hoping to achieve at least an initial brief portrayal of the incorporated disciplines.

In its broadest sense, there are constructivist efforts to create ecosystems, communities of practice, networks (Ataizi, 2012) which have the levers of 1) filtering - organising and manag-ing important information, 2) amplifying - helping to understand important but little known information, 3) investing and providing - offering means to provide members the resources they need, 4) convening - bringing together different individuals and groups, 5) community building - promoting and sustaining values and standards and 6) learning and facilitation - helping work more efficiently and effectively, all in continuous iterative cycles (JRC, 2021). Universities ought to respond to societal needs (Farnell, 2020) and numerous such endeavours in fact are underway - though more are necessary - university-led and stakeholder-led initia-tives, connecting engagement to ‘accountability’, ‘relevance’ and ‘impact’. Furthermore, by linking public engagement and research impact, the authors conclude that public engagement is a pathway to impact. Phillips et al., 2015, recognise that corporate social responsibility initi-atives extend beyond meeting the immediate interests of stakeholders, and they stipulate and profile diverse roles such as: 1. The role of the entrepreneur: social mission and opportunity recognition; 2. Networks and systems; 3. The formation and development of cross-sectoral partnerships; and 4. The role of institutions. Each of these roles are to be populated by various actors, dynamically, even interchangeably. Traditionally, such initiatives and projects, under the initial offerings of services, platforms, hubs, the purpose ultimately aimed for requires much profiling and in-depth work necessary for a impelling shared vision, participation, and engagement, community and knowledge, trust and confidence and communication (Li, 2005) (Booth, 2012). From an entrepreneurial perspective (O’Shea et al., 2021) have identified the stages of Co-intuiting, Co-interpreting, Co-integrating, Shared sustainability intention and Emotional climate, with three levels of details, depending on the context of application, and they are valid in a diverse set of entrepreneurial activities, including, but not limited to, social entrepreneurship. The theories found most in practice pave the foundation to ignite the trans-formative capacity of all forms of collaboration (e.g., the 6i+ model, strategy, and approach: international, interdisciplinary, intersectoral, intergenerational, innovative, inclusive…) to al-low interactions to emerge around purposes for the common good (Caro, 2019; Caro et al., 2020). The active engagement of stakeholders from the n-helix spectrum is considered a must (Caro & Serra, 2020). The n-tuple helix theory (Leydesdorff, 2012), gradually developed via the Triple Helix, Quintuple Helix theory) (Etzkowitz, 2008; Etzkowitz and Leydesdorff, 1995, 1998, 2000) relates the universities, industry and government configuration with posi-tive, negative overlaps among the subsystems, all having diverse levels of subdynamics of national or regional scope. Our main inspiration resides in such a setting, while the innovation triangle and engine which produces effects is the workflow in such systems.

On the theoretical background of our content of interest - traffic engineering - we are touch-ing upon contextual factors and a multi-stakeholder perspective. Traffic accidents have been harming enormous numbers of people for over a century. For traffic safety policy to be suc-cessful, it must have only one goal – protecting the public and community. The public and community must recognize and support this goal (Evans, 2004). This statement sounds very promising, but when it comes to reality, it appears to be very difficult to achieve (at least ac-cording to the experience in defining policy instruments, project management, and managing traffic safety targets in the Republic of North Macedonia). As the traffic demand increases in and around public schools, concerns regarding traffic safety have been raised. To respond to these concerns, traditionally a law enforcement approach has been taken.

But is the law and police enforcement the most effective way to approach traffic safety issues? After creating and validating the MultiCreation approach in academic teaching/learning, the main idea of this paper was to expand its applicability beyond the business world into societal problems in a way that will encourage and inspire individuals to look for new approaches and to be creative in designing

appropriate traffic safety solutions (Petrevska Nechkoska and An-geloska Dichovska, 2020), (UKLO for the Community project[1]). Best practices show that a consistent, integrated, and comprehensive approach is needed. Implementation of multidisci-plinary "4-E approach" (Education + Enforcement + Engineering + Environment) (Fromkin et al., 2004) became 'conditio sine qua non' to achieve a sustainable and safe transport system, taking care of human lives and the quality of living aiming towards liveability in our neigh-bourhoods and integrated traffic planning.

After analysing the "State-of-the-art", or "Global Best practices" that have successfully demonstrated 4-E implementation in road safety-related projects in many different countries, we were motivated to make a diversion from the traditional approach to a new 4-E approach, in designing potential solutions regarding children's traffic safety in school zones. An appro-priate set of problem-oriented solutions, founded on real data collection for different transport system users, and project documentation and a project management outline as content are pre-sented.

These activities have enabled collaboration, network, creativity, knowledge, skills, and compe-tences (CEDEFOP, 2019) for all stakeholders, achieving a synergistic effect in addressing (and hopefully solving) rather complex societal issues.

This paper will showcase (and basically follow the same presentation construction) the under-lying methodology we used to enhance the chosen MultiCreation approach for addressing societal issues (ADDIE) and help foster the Action Design Research on project and content generation and collaboration. We also portray the MultiCreation approach for addressing soci-etal issues via its components and roadmap, portraying how it aligns but also how it differen-tiates from that used for business issues. Conclusions and prospects end the paper.

Methodology

We have taken the MultiCreation approach as a baseline designed for addressing business problems via broad, multidisciplinary, multi-stakeholder collaboration (Petrevska Nechkoska and Angeloska Dichovska, 2020) and applied it to another kind of problem – a societal issue - by involving numerous and diverse stakeholders, two different faculties and three subjects, as well as stakeholders from two towns - distinctive from the basic MultiCreation approach. The instructional design (David Merrill et al., 1996; Wagner, 2011) and didactics (Tubbs, 2014) that guided us have been used to engage and teach students through problem-based learning by doing, while producing effects for the entire community. The ADDIE model (Kurt, 2017) has been followed to incorporate analysis, design, development, implementation, evaluation in the formative and summative senses, complemented by the dual mission of the Action Design Research - ADR (Sein et al., 2011) in the information systems domain. The project was man-aged using the DENICA method for tactical management in complexity (Petrevska Nechkos-ka, 2019). This paper follows the same structure as the first on MultiCreation.

Here are the ADDIE model components that will enable comprehension of the roadmap we took and how the analysis and findings have been generated.

Analysis - A

The analysis stage in this instance was conducted in collaboration with the schools, the facul-ties, subjects, and among the participating professors. The positioning of the problem was as follows: The societal problem of traffic safety in the proximity of primary schools for primary school children, in two primary schools from two towns, collaborating with their principals, advisory teams and teachers, as well as children and parents. The students came from two faculties - Faculty of economics in Prilep and Faculty of traffic engineering in Bitola, both at the University St. Kliment Ohridski, Bitola, North Macedonia. The implementation was steered by three university professors on the subjects of project management and basic and advanced techniques for traffic management, out of which one acted as project manager to facilitate the entire project, while the two advised in their subjects, adaptation of instruction and outcomes, as well as the multidisciplinary threads beyond the typical subject matter. The blended learning components took place as prescribed in the MultiCreation approach, during two semesters of two academic years (summer semester of 2019 and winter semester of 2020). The title of the project was: "UKLO for the community" ("УКЛО за заедницата") - acronym for the University St. Kliment Ohridski - UKLO to denote contribution to the com-munity in both towns.

This instance of the MultiCreation approach in societal issues enlisted stakeholders from the two faculties from the two towns: 50+ undergraduate students, 3 professors, 50+ primary school staff (administrative and teaching), 50+ parents, 300+ school children, 10+ collabora-tors (police, municipality advisors, other stakeholders, …), 2 social entrepreneurship advisors, and an alumni network that supported the final event (Western Balkans Alumni Association[2]).

The main goal of the project was to provide complete research, engineering, and education for the stakeholders so that the schools could just hand in necessary documentation to the rele-vant municipal bodies to be acted upon effectuation.

Objectives for the students:

- To enable theoretical and practical knowledge of the concepts in the separate subjects: pro-ject management and basic and advanced techniques for traffic management as well as mul-tidisciplinary cross-fertilization;

- To facilitate application of acquired knowledge in a societal domain;
- To facilitate the students towards analysis and evaluation of a problem - and deconstruct it using the project management concepts and mechanisms, using a broad stakeholder perspec-tive;
- To improve the skills of: problem solving, learning by doing, cross-fertilisation, social entre-preneurship, teamwork, situation awareness, time management, creativity, innovativeness, adaptability, initiating change, professional communication
- To enable proficiency in virtual teams' collaboration along with all necessary tools and tech-niques
- To enable feeling of belonging and pride for contributing to society beyond regular student life
- To 'equip' the students with a proactive roadmap on social entrepreneurship and project management
- Motivate social entrepreneurship and voluntary contribution to society by the involved pro-fessors

Objectives for the higher-education institutions (university):

The ones apprehended by the MultiCreation approach are as follows:

- Establish subject to subject and teacher to teacher collaboration in a multidisciplinary man-ner;
- Trace a multi-stakeholder collaboration focused on a problem, utilizing various resources in a broad and complex ecosystem;
- Complement lectures with practical use and applicability;
- Referential reputation as competent centre for scientifically sound business advice to in-crease partner network and future revenues;
- Promote use of the e-learning platform and portals per subject, per project, per study group;
- Streamline the focus of different subjects towards mutual compatibility - perceivable also by the students" (Petrevska Nechkoska and Angeloska Dichovska, 2020).

Accompanied by the following two objectives:

- Bridge two faculties within a university, addressing the same problem from different per-spectives as one entity of diverse collaborators;
- Build a reputation for the university as a contributor to the society with tangible projects.

Objectives for the schools:

- Engage actively in solving problems without waiting for central municipal or state-directed action that requires funding and priorities;
- Practice integral curriculum (as prescribed by the Ministry of Education);
- Open space for collaboration with universities, parents, neighborhoods, institutions, citizens on problem-based approach (aside from political and hierarchical context).

Design - D

In applying the MultiCreation approach for societal issues, we adhered to the principles of 'practice-inspired research and theory-ingrained artefacts, reciprocal shaping of the participant and their context, and mutually influential roles of the multi-participant landscape' (Sein et.al. 2011) (Petrevska Nechkoska and Angeloska Dichovska, 2020). Blended learning (Petrevska Nechkoska and Mojsovska Salamovska, 2017) again assists the multimodal collaboration channels, which is especially necessary since the geographic and physical distance has been substantial having participants from at least two towns and their regions. The E-platforms and traditional channels have been present and utilised:

(1) Moodle as an E-learning platform mainly used for placement of materials and asynchro-nous, usually one directional teacher-students communication; as well as bi-directionally through student assignments, forums and other activities. The project portal contained all in-structions and timeline of developments so that every participant (students, managers, teach-ers) could always orient, revert, check and project own and team actions.
(2) Facebook groups have been used for rapid communication where confirmative response was expected.
(3) Storage space in the cloud, USB sticks.
(4) Polls, surveys, collaborative writing, and asynchronous remote project work by using the Google Sheets, Forms, Docs, and similar tools.
(5) Skype/Viber served as a synchronous remote team communication.
(6) Free mobile apps/messengers for instant messaging used for urgent matters.
(7) E-mail correspondence.
(8) Teaching and contact hours, as well as consultations person-to-person, and group/team consultation on-campus (Petrevska Nechkoska and Angeloska Dichovska, 2020).

Development - D

Complementary to the alignment of the instruction for the subjects, the project entailed actual project management on the core team of stakeholders from all institutions (including students, parents, relatives, neighbours and school children) to be able to go through the respective stages and achieve the expected outcomes.

These are the activities that took place (most important ones):

- Negotiations with the primary schools regarding what the problems are and how we could help;
- Cooperation agreement/memorandums between the faculties and the schools;
- Appointment of persons in charge of communication with each stakeholder;
- Enlisting students willing to participate in the project from both faculties;
- E-learning (Moodle) platform portal for the project;
- Comprehensive onboarding and situational project document, disseminated to all stakehold-ers with

necessary guidelines on the project, expectations, governing principles and commu-nication rules;
- Meeting of the three professors as the core team (frequent);
- Kick-off event including media dissemination;
- Tracing the stages for group work;
- Alignment of the subject class content (lectures and exercises) with the project.
- Drafting specific responsibilities as up to 10 'must-haves' from each student participant per subject (to be evaluated and graded properly and in relation with the other non-participating students);
- Outlining generic responsibilities for the students (from managerial aspect, professional communication, win-win mindset…);
- Timeline of activities and keeping alert for modifications;
- Setting up teams of students from each subject from each faculty as a means of merger be-tween the faculties (teams are consisted of members of both faculties);
- Surveying, interviewing the stakeholders - to report on progress and to engage further on
- Inspiring school teachers to incorporate the issues in their daily lectures;
- Final event with all participants;
- Ongoing PR activities on multiple channels;
- Certificates, confirmations for internships and other administrative and logistical issues.

These components are taken from the MultiCreation approach for business-academia collabo-ration, while being enhanced and extended for societal issues applicability.

Implementation - I

The project from idea to realization lasted for a year, spread over two academic semesters. The core team of three professors had meetings on a regular basis (at least once per week) and the project manager coordinated the stakeholder collaboration, dissemination, logistics, authoriza-tions, and all other aspects to make the project possible. Consultations with the students were held on the level of subject, but also as teams collectively. All instruction materials and guide-lines were placed on the e-learning portal Moodle[3], as one stop shop for dissemination and collaboration, as were reports, data, repositories, measurements, etc. Use of best practices in similar situations was facilitated, as well as conceptual and implementational activities in the schools, which also met and aligned accordingly between one another. Parents and neighbors were surveyed, interviewed, participated in focus-groups; measurements and traffic data were obtained on the two locations one semester. Student mentors from the previous semester were engaged. The creativity was at its best - all stakeholders produced a remarkable set of videos, scenarios, tools, promotional materials, workflows, games, lecturing content, to address the problem in a collaborative manner.

A specific note from the Faculty of traffic engineering is as follows:

"Prior to the development of solutions, a thorough understanding of the issues of all included participants was necessary. For that purpose, an extensive review of the current road network design around school areas has been investigated, the traffic flow data for vehicles, pedestri-ans, and bicycles have been obtained by manual count method. Additionally, input from prin-cipals of each school, discussions from parents' council members have been analysed. The so-lutions were categorized into two groups:

(i) solutions that can be applied consistently to every site
(ii) those that applied to the specific school; both include a successful mix of different traffic engineering measures such as:

- Traffic engineering elements and pedestrians' treatments design,
- Traffic engineering elements and bicycle treatments design,
- Traffic calming measures design,
- "Kiss & Ride System" design for a school zone."

These measures were designed and evaluated in the microsimulation environment by using the VISSIM micro-simulator for the selected primary schools. Proposed solutions provide re-duced conflict points between vehicles and vulnerable users, decreased traffic congestion, travel time, and delay, protection of the environment.

Specific note from the Faculty of economics is as follows:
"Since the project management processes belong to five major project management process groups (Initiating; Planning; Executing; Monitoring and Controlling and Closing), the main goal of the EFP team members was to perform some of the initiation and planning project management process groups i.e. to prepare management issues of the project documentation and to perform project plan description. Namely, EFP team members were in charge to:

- describe the problem needs and problem justification
- define goals and objectives of the project
- define target groups;
- develop project activity plan with duration of the project;
- define expected outcomes;
- define relevant milestones and deliverables;
- define known risks and how they will be overcome;
- develop a project budget etc."

Evaluation - E

Following are our insights into the formative and summative evaluation that were used to pro-vide learning outcomes, surveying recent progress, and clarifying prospects for

further ad-vance, throughout the project and around the achieved outcome.

Formative evaluation denoted daily communication and reflection, within the scope of the project. The students have an opportunity to reflect on and demonstrate their thinking, accu-mulated knowledge regarding project objectives and goals. The communication channels were open literally at all times for discussion and reflection regarding student questions. Addition-ally, the teachers communicated with a wide spectrum of stakeholders, such as policymakers and nonprofit organizations.

Summative Evaluation analysed of student's learning outcomes and learning objective in the project. The students were asked to fill in a 25-question questionnaire in different formats to be able to assess and give feedback regarding their experience with the project. All 22 stu-dents that reached the final stage filled in the questionnaire with statements of exceptional experiences and insights. When analysing the feedback, the researchers identified existing benefits and future potentials.

The improvement of knowledge to cope with real problems, the application of new technolo-gies for communication such as Moodle, implementation of sophisticated software tools for analysis and evaluation of different solutions, a synergy through incorporating a range of spe-cialised knowledge between different students' profiles are just some of the answers to which over 80% of students answered positively. Regarding the most prevalent problems we can emphasize: difficulties in mutual communication and coordination, teamwork, troubleshoot-ing, and interpersonal relationships; some occurrences of lack of materials and time, as well as insufficient knowledge in the IT domain.

As nine key benefits that the students stressed are the following (ranked highest according to the number of statements):

1. Development of self-worth,
2. Self-confidence,
3. Critical thinking,
4. Teamwork,
5. Communication skills,
6. Friendships and networking,
7. Practice and experience,
8. New knowledge (societal entrepreneurship, virtual team collaboration, economical and managerial aspects for technical sciences students and vice versa - technical sciences for stu-dents of economics),
9. Satisfaction, motivation, and increased ambition.

Summative Evaluation: Analysis of multiple stakeholder's opinions and advice

The school principals, teachers, decision-makers, and representatives were present at the final event, where the teams presented, elaborated on, and clarified their work, analyses, and inno-vative solutions, and ceremonially handed this as project reports to the school principles. The feedback was remarkable, with ambitions for real implementation and fast reaction of munici-pality policymakers to realize the projects. Policymakers must understand the conceptual as-pects of the projects to provide wider community benefits.

The MultiCreation Approach for Societal Issues Components and Roadmap

Considering the "MultiCreation" approach established by Petrevska Nechkoska and Ange-lovska Dichoska (2020), we have developed a new model for collaboration among different stakeholders (in this case: academia, policy makers, community, and non-profit organizations) aiming to address community problems and facilitating value with co-creation. The model is generic, participatory, iterative, consisted of three different interconnected phases with con-nected processes in each (Figure 1). On this occasion, we are describing the main phases and stages of a mechanism that functions like a funnel, having feedback and connection loops among all stages during the project.

Phase 1: Problem identification

In the first phase, stakeholders, primarily community members and non-profit organizations (in our case the model has been tested with primary schools as non-profit organization repre-sentatives), take into deliberation a plethora of identified problems. In accordance with well-defined criteria, they evaluate the priority of every element for further consideration.

Phase 2: Solutions identification

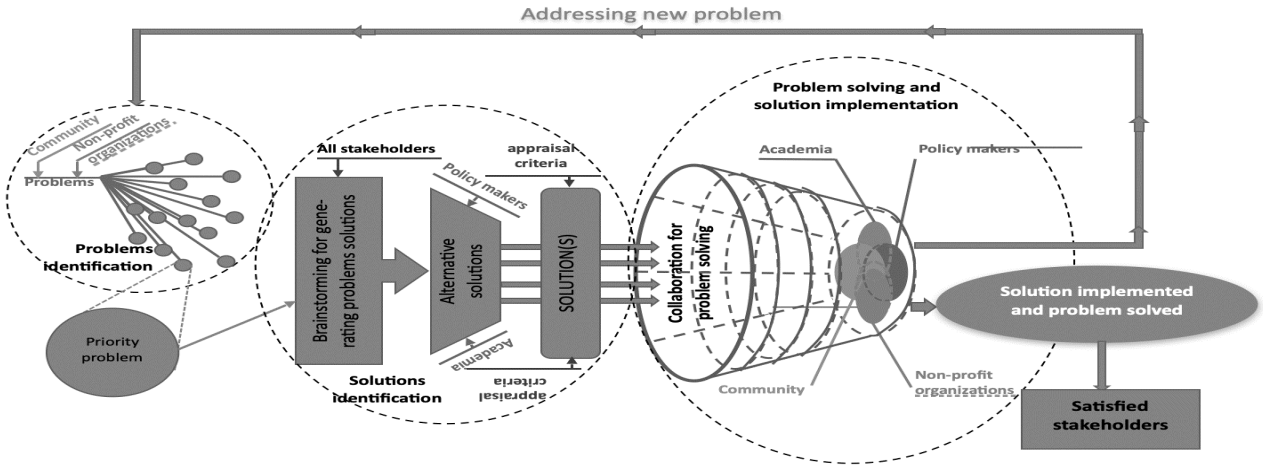
Once a priority problem has been identified, the means of overcoming the problem should be generated. Therefore, the second phase begins with brainstorming to generating ideas to this end, including representatives of all stakeholders' groups. Later in this phase, representatives from academia and policy makers perform in-depth analysis and define appraisal criteria in order to select a feasible solution. Appraisal criteria can be either quantitative or qualitative, but they should take into consideration at least technical, economic, financial, managerial, legal, and environmental issues regarding the proposals. The key deliverables from the second phase are project documentation and a comprehensive description of the solution(s) that can be implemented.

Phase 3: Problem solving and solution implementation

The third phase is the implementation process of the project proposal and should lead towards stakeholder satisfaction. Stakeholders work together to implement the project. Collaboration and communication among stakeholders is a crucial part of the project implementation. There-fore, those processes require feedback, not only by the community but from policy makers, academia, and non-profit organizations

as well. Finally, since the model is iterative, the improvement of the implemented solution can be done across the phases and stages of the mod-el. Furthermore, beside adjustment of the implemented project through iterations, a new prob-lem can be addressed, and a new solution can be generated and implemented.

Figure 1. The generic iterative model for collaboration among academia, policy makers, community and non-profit organizations addressing societal issues



Source: Authors

The MultiCreation model for addressing societal issues adheres to the main principles of the approach, but the difference it introduces is bundling the stages in phases since the stakehold-er ecosystem is much broader in cases of societal issues, and the complexity increases.

Here are the regular stages as outlined in the initial MultiCreation approach (Petrevska Nechkoska, Angeloska Dichovska, 2019) and how they align within the MultiCreation for societal issues phases.

Phase 1: Problem identification

Stage 0: Identifying the problem in the real environment and finding institutional, civil society, public, media … partner(s) to collaborate

Stage 1: Examining the study programs to find at least 2 subjects that can address the problems through the curriculum

Stage *2:* Responsible team of professors address the knowledge base in the respective domains and search for possible solutions. This step encompasses also the current scien-tific domains of the chosen subjects

Stage 3: Informing the business partner about the research and technology that will be used to address their problem, examining their aspects of research & technology

Phase 2: Solutions identification

Stage 4: Organizing the main components within the HEIs: lectures, lab exercises, stu-dents, teams, timeline, documents, consultation, communication

Stage 5: Investigating existing knowledge, establishing a foundation for the generation and creation of new innovative solutions and contributions

Phase 3: Problem solving and solution implementation

Stage 6: Guiding students to apply what they learned in the subjects with what they investigated as possible solutions towards applying and/or creating new knowledge

Stage 7: Facilitating teamwork on all sides, clearing up ongoing problems, maintaining communication channels, receiving feedback (formative and summative)

Stage 8: Checkpoints with the societal partners - briefings, fine-tuning, resolving issues ... and finalizing the project with presentations of the reports and solutions to the ini-tially defined problems, receiving feedback (formative and summative)

Stage 9: Instigating curiosity and creativity on the partner side for application and evaluation of the novel solutions to existing problems offered by the stu-dents/professors

Stage 10: Contributing to the instructional design theory and practice, as well as the re-spective disciplines of the investigated problem, and the disciplines of the subjects that took part in the project, dissemination, multiplication, instantiation

Conclusions and Future Prospects

Our endeavour to engage university students and teachers to address societal issues and learn significant subjects such as project management and basic and advanced techniques in traffic management along the way by collaborating in engaged setting has resulted in knowledge and value co-

creation for all involved stakeholders. The MultiCreation approach was an appropri-ate foundation that traced the steps - pointing out the roadmap and components needed, while the team of professors guided the entire project in specific content- and context-related realisation. We have been able to experience problems of applicability and point out specifics of addressing societal issues vs business problems, as well as a very broad range of stakehold-ers, geographic dispersion, two faculty profiles of students and non-business and non-profit voluntary motivation. On the positive side, the goal to help the societies we live in by invest-ing non-monetary values such as competence, time, professionalism, and devotion by the en-gaged professors, has resulted with motivation and respect by all direct and indirect benefi-ciaries who were encouraged and acted in creative and innovative ways, not practiced before the project. On the negative side, in spite of the great effort and intellectual output, creating complete documentation for the schools that would otherwise have been managed by the no-toriously slow central municipalities, has still not led to a rapid implementation. Ultimately, we believe (as authors, researchers, scientists, professors, volunteers) that the project resulted in improvements for the students and all other stakeholders on many levels, even if the tangi-ble results have yet to be seen.

Endnotes

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[2] Western Balkans Alumni Association, https://www.western-balkans-alumni.eu

[3] http://moodle.eccfp.edu.mk/course/view.php?id=190

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Vključitev študentov ekonomije in prometnega inženirstva v vprašanja skupnosti z uporabo pristopa z večstranskim ustvarjanjem

Izvleček

Učinkovite metode poučevanja naslednjih generacij pragmatičnih študentov in učiteljev se razvijajo v smeri veliko večje vključenosti na vseh straneh ter poskušajo povezati resnično življenje in akademsko okolje na številne inovativne načine. Naša teoretična podlaga temelji na principu trojne spirale, teoriji spirale z n-členi in inovacijskem trikotniku, vendar v multidisciplinarnem okolju ter na podlagi konkretnih primerov. Po uvedbi in potrditvi vsestranskega ustvarjalnega pristopa pri poučevanju/učenju za poslovno-akademsko sodelovanje, kjer so različne discipline, različni profili študentov, profesorjev in menedžerjev prevzeli različne vloge pri obravnavi ustreznih poslovnih vprašanj, smo želeli razširiti to uporabo tudi izven poslovnega sveta - na družbene probleme. Obdržali smo učenje na podlagi konkretnih primerov in sodelovalno učenje, vendar smo problem preusmerili v prometno varnost otrok v osnovnih šolah - vključujoč ekonomska, projektna, vodstvena, logistična, regulativna vprašanja in vprašanja glede upravljanja ter prometnega načrtovanja. Z vključitvijo dveh osnovnih šol, sodelovanjem z njihovimi ravnatelji, svetovalnimi skupinami in učitelji ter otroki in starši v dveh različnih mestih smo želeli zainteresiranim stranem zagotoviti popolne raziskave, načrtovanje in izobraževanje, tako da bi šole lahko predale dokumentacijo ustreznim občinskim organom, ki so pristojni za ukrepanje. Sodelujoči študenti so prihajali z dveh fakultet - ekonomske fakultete in fakultete za prometno inženirstvo, vodili pa so jih trije univerzitetni profesorji na področju vodenja projektov ter osnovnih in naprednih tehnik upravljanja prometa. Komponente kombiniranega učenja so potekale, kot je predpisano v vsestranskem ustvarjalnem pristopu, med dvema semestroma dveh študijskih let s kombiniranimi protiukrepi ter rešitvami. Vsestranski ustvarjalni pristop ima izboljšane komponente in potek dela, njegova učinkovitost pa je potrjena v okolju več zainteresiranih strani pri neposrednih in posrednih udeležencih izobraževanja.

Ključne besede: učenje na podlagi konkretnih primerov, sodelovalno učenje, vsestranski ustvarjalni pristop, prometno inženirstvo, sodelovanje med skupnostjo in akademskim okoljem

Performance in B2B Sales: An Explanation of How Channel Management and Communication Influence a Firm's Performance

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REVIEW PAPER

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Abstract

Communication between seller and buyer is done through multiple channels. There are multiple ways to use technical media and channel selection to create more information, but does this lead to a better performance of a firm? Research on the impact of different marketing channels in the industry regarding performance factors remains scarce. The performance of a firm is the most significant factor and will be monitored through different attributes. The purpose of this paper is to review the drivers of a sales process in terms of sales cycles, channels and communication in relation to it's effect on performance. Beyond the characteristics of sales the review delineates the changes from the past to the present. The contribution of this review is to understand the various capabilities in channel management and communication that can be adapted to the sales process and increase a firm's performance.

Keywords: Channel management, communication, sales performance, sales cycle, industrial marketing

Introduction

Business is becoming more complicated. Salespeople who are the figurehead of a company continue to find themselves in a more volatile and fast changing environment (Patterson, 2007).

In the field of Business-to-Business (B2B), salespeople strive to choose the right marketing channels to communicate in an efficient way with the customer. A high number of channels are available, and salespersons must find an efficient way to approach the buyer (Käuferle & Reinartz, 2015).

Within the sales environment, channel management is important to build a sustainable relationship with the customer and maintain a partnership during the whole sales cycle (Holland & Young, 2010).

With respect to the marketing channels and a firm's performance, the way salespeople communicate is of the highest significance. According to Polo and Sese (2016) 90% of customers use multiple channels to communicate with the firm.

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This poses a new challenge for firms to effectively manage the multiple marketing channels. The findings from academic research in this field show that firms must rethink their strategy of how they communicate with the customer. It is important to consider the needs of a customer when deciding marketing channels and to adapt channel management to their own organization.To find out the needs of the customer requires resources and time to analyse the behavior. This could lead to a decline in a firm's performance. In the same vein, Sawhney (2006) argues that in case of complexity in the sales process, the sales cycles in general will be longer.

While existing literature examined channel usage or channel choice (Bilgicer et al. 2015; Ackermann and von Wangenheim, 2014) which brings valuable insight to this topic, there is a lack of research on performance implications. In this regard academics have described and explored the impact of various factors on the buyer-seller relationship in the case of channel management and media selection. Firms must find a balance between resources for communication through multiple channels and factors which influence a firm's performance.

The objective of this paper is threefold: first, to analyze the existing literature in terms of sales cycles since it is of utmost importance to understand the whole sales cycle. Second, this paper seeks to gather information about the actual state-of-the-art marketing channels. Finally, the author will investigate communication in relation to the channel selection and examine the connection to the firm's performance. Put simply, this paper seeks to answer the question:

What are the performance implications of a modern sales cycle?

To avoid uncertainties through the whole sales process this paper also raises additional questions:

Do sales cycles differ between the industry sectors?

What marketing channels have been established and used within the industry?

This comprehensive review focuses on sales cycles, channel management and communication in the context of B2B sales. This paper reviews existing literature from the past till present and derives relations to the actual sales environment. The paper describes the drivers in sales cycles, marketing channels and communication to understand the sales process and the effect on the performance of a firm.

Finally, it offers potential approaches to the findings from the literature and propose theoretical concepts for the industry in respect to the firm performance.

Challenges in B2B sales

Sales and related marketing processes have changed dramatically in the last couple of years. The increasingly complex customer behavior and digitalization innovation have gained new technologies and new ways of communication to connect the buyer and seller (Saura et al., 2019; Schmitz & Ganesan, 2014; Rodriguez et al., 2014).

Technological advancement gives humans the possibility to imagine, produce and support products of high variety (Matzler et al., 2016). New technology has brought huge advantages in respect to information for both the seller and the buyer. The correct notation for this innovation is "Big Data". Regarding the availability of online-based information, platforms have been established which have transformed the sales channels in different ways. With the advent of the Internet, social behavior in B2B sales changed totally. These changes lead companies to rethink their business strategies and business models (Saura et al., 2018). Salespeople were forced to keep up the alliance with the buyer and find new and efficient ways to organize their interactions (Dixon & Tanner, 2012).

Customers have increased their expectations. The buying or decision-making process is becoming more complex, products have gained more diversity and internal and external organizational factors have changed in shorter cycles than in the past (Ingram, 2004).

The changing complexity in sales, especially in B2B sales was also recognized by academics. A review of sales literature from 1998 to 2013 of Rodrigues et al. (2014) showed that in case of interactive marketing most scientific articles deal with terms like Technology, Customer Relationship Management (CRM), Internet and social media. Very little addressed the traditional selling methods like direct marketing (Rodriguez et al., 2014).

The findings above were the starting point for the author to conduct a systematic literature review to reveal the relationship between sales related processes and a firm's performance.

Methodology

Marketing channels proliferated in the last decades thanks to technological advancement as well as mass information on products or services which became available. Firms which are product centered are struggling to keep or establish a connection to the customer. The problem for these firms is to find an efficient way to communicate the right amount of information within the possible marketing channels.

The objective of this paper is to analyze the sales process on the characteristics which have an impact on a firm's performance. The author carried out a systematic literature review and focused on sales cycles, marketing channels as well as communication through these channels.

The first step is an online search of the general literature in the field of B2B sales. This is necessary to understand sales

in different fields of activity and their processes. Afterwards the correlated marketing channels used for communicating with the customer will be examined. The next step is to find out more about the communication usage through the evolved channels. This investigation offers insights on the effectiveness and differentiation through channel management. Finally, the interconnection between performance and channel management will be evaluated. The findings will be discussed in the following paragraphs.

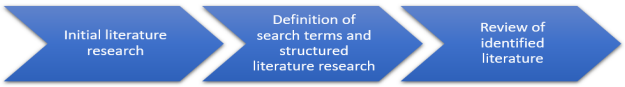
For the literature review the following scientific online sources were utilized: Google Scholar, ELSEVIER, SAGE, EMERALD, SPRINGER, and ABI/Inform. In the first step the author used the terms "B2B sales", "international business", business development", manufacturing industry" and engineered products". In the second step the author refined the research and combined the terms in step one with the following:

- channel management
- channel strategy
- channel distribution
- marketing management
- sales cycle
- business cycle
- efficacy
- efficiency
- performance
- adaptive
- profit
- communication
- organization

Regarding the search process it was noted that some of the terms did not provide relevant input for the present article. This was expected in case the initial search process was on a broader concept to gain an in-depth insight into the sales process.

The research yielded 48 scientific articles or books that were relevant based on keywords, title and abstract. The articles on marketing and sales cycles are more theoretically based. Empirical articles on the topic of "performance" combined with "sales", "output", "firm" etc. were relevant in terms of combining theoretical findings with practical experiences.

Figure 1. Literature research and analysis strategy



Source: Author´s own design

There are also limitations on the above literature review which were taken into consideration. The present article was not constructed to cover a qualitative meta-analysis. Furthermore, the review focused on the industrial B2B activity fields and, therefore, did not express a valid general perspective. This means that there is not a universally permissible statement in the total sales environment.

Literature Review

Definitions

Kotler and Keller (2012) argued that the definition of marketing could be interpreted to identify customer needs, design the product or service accordingly and meet the expectations of the customer. In literature there are many theoretical definitions of marketing. One of the most famous definitions is that of Peter Drucker who holds that marketing is the process of knowing the customer so well that there is no need for selling. If you know the needs of the customer in depth, the products will sell themselves (Kotler, 2009).

The communication between firms and their customers require specific resources and capabilities. In literature these capabilities are called channels. The author found a variety of possible notations for channels in the existing literature. The common terms found in academic literature are marketing channel, media channel, distribution channel as well as sales channel (Polo and Sese, 2016; Anders et al. (2020); Käuferl & Reinartz (2015); Lapule & Colla, 2016). In the present article the author uses the term "marketing channel" which are for example: www (Internet), social platforms, phone, face to face (F2F), printed magazines, among others.

The term "performance" is also well researched in literature. Therefore, the author examined different terms related to firm performance. Through the research of this article the author found the following relevant terms like sales performance, channel performance, firm performance, or financial performance. For this present article the author is committed to using "firm's performance" to describe the efficacy of the processes and the efficiency of the organization.

Table 1. Empirical findings on performance

Performance Category	Topic	Author
Firm Performance	Impact of Marketing on Firm Performance	Krasnikov & Jayachandran, (2008)
Sales Performance	Communication Adaptiveness	Boorom et al., (1998)
Sales Performance	Self-efficacy in sales education	Knight et al., (2014)
Sales Performance	Framework to measure performance	Hulthén et al., (2016)
Channel Performance	Customer channel choice	Polo & Sese, (2016)
Channel performance	Distributing through multiple channels	Käuferle & Reinartz, (2015)
Financial Performance	Customer focused marketing	Vorhies et al., (2011)

Source: Author's research results

Pattern of sales cycles and their evolution

To get a holistic picture of the sales process the author investigated the sales cycles. Other researchers draw the same conclusion that it is necessary to know the sales cycle to determine the possible impact on performance. The more a salesperson knows about the detailed steps in a sales cycle the less uncertainty there is (Polo & Sese, 2016; Damerow, 2017; Holland & Young, 2010).

Before the detailed steps of a sales cycle are highlighted it would be interesting to explore how it could influence the performance of a firm. Neely (1995) suggests performance measurement to accentuate it from two different point of views. On the one hand the effectiveness of a process shall be measured and on the other hand the process itself shall be efficient. That means efficiency is one characteristic which shall be measured. Not only in sales but also in other business processes, effectiveness refers to requirements which must be met whereas efficiency means the economical aspect of what salespeople do to satisfy the customer. The complex relation of the two perspectives in performance is also described by other researchers. Delpechitre et al. (2019) confirms that sales performance has two different sides. One is the administrative performance, and the other is the firm's performance.

The different perspectives of a sales process offer a close connection to the firm's performance. Scholars recommend investigating the sales process to determine the necessary steps. To envision a holistic view the author described the emergence of the industrial sales cycle.

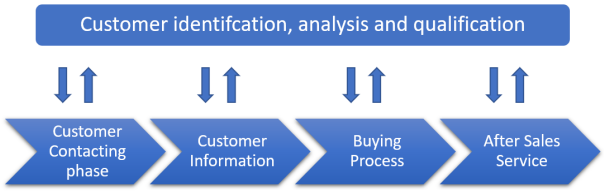
Sales cycles could have heterogeneous, individual or intermediate steps. Viio (2011) described that in the early 19th century the persuasion model AIDA (Awareness, Interest, Desire and Action) was commonly used in sales. Later, when sales and trade were well established in the economy this model was developed further to manage the sales process more professionally. Dubinsky (1980) established, referring to the former AIDA model, a seven-step model which was more precise and reduced uncertainty for salespeople.

Diversity in customers' expectations is the most common trend in the B2B sales that scholars examine in current research (Schmitz & Ganesan, 2014). This is also confirmed by other academics, for example, Sauer et al. (2018) who described that the social behavior of customers has changed and is changing continuously.

According to these findings and the general situation of technology and customer behavior, one can argue that it would be necessary to adapt the sales cycle from time to time. The author found various sales cycles which are available in literature. The main differences are the intermediate steps which are more or less dependent on the product or service. To ensure the agility of a sales cycles it could be more important to include adaptation steps.

A possible approach to adapt a sales cycle (shown in Figure 2 below) was described by Bickebanck and Elste (2016). They argued, that through all the intermediate steps it shall be proven if the process is in line with the expectations of the customer. From the authors view this cycle could fit firms in the industry sector which have to continuously check their sales processes. The crucial point of this proposed cycle is that in each phase there is the bilateral exchange of information which keeps the process agile and adjustable at any time.

Figure 2. Sales life cycle



Source: Adapted from Binckebanck & Elste, 2016

The scientific enhancement on sales cycles shows that there could be one driving factor in terms of a firm's performance. This concludes that there could be an effect on the sales performance.

Marketing channels

Sales in the B2B context as well as the environment around sales have changed their external processes (Zoltners et al., 2004). The marketing channels play a crucial role within these external channels to facilitate exchange of information between buyer and seller. Research articles in the field of channel management are interesting for practioners as well as for academics.

As described in the paragraph before, the aim of such marketing channels is to connect the buyer and the seller so they can exchange information. Kotler and Keller (2012) defined a marketing channel from a wider perspective and described it as passing on information, work or service from the producer to the customer. In the authors perspective these channels could also transport empathy and strengthen a relationship with the customer.

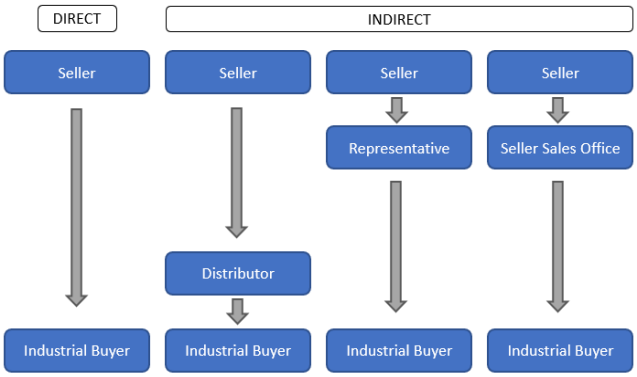
Beside the wide range of available marketing channels which in general have a positive impact, and provide information and availability, there are also risks. Customers behaviour varies and use my specific channels others uses multiple channels and will be overloaded with information. These risks could also create uncertainty for the customer. Dixon and Tanner (2012) also argued that salespeople have to find the right marketing channel to be efficient in their interaction. Their research showed that sales is not a standardized process, and that sales will be guided by the customer and therefore no generalization is possible.

To understand the complex topic of marketing channels the author examined the existing marketing channels in detail. To simplify such a complex topic, there are only two ways to

communicate between the seller and buyer: direct communication and indirect communication (Gabrielsson et al., 2002).

Kotler and Keller (2012) carried out wide research on marketing channels and established an overview, which is highlighted in figure 3, of commonly used channels in industrial firms. This paper selected the most commonly used channels for the industry and addresses their advantage and disadvantages.

Figure 3. Industrial marketing channel



Source: Adapted from Kotler & Keller, 2012

Direct or single channel

It is self-explanatory that in the past mostly only direct channels were available. This direct communication is also important nowadays to receive emotional feedback from each other. Anders et al. (2020) confirmed in their survey that direct marketing channels are of the utmost importance and mainly use phone calls and F2F meetings to communicate with the salesperson. In times of a pandemic, the author assumes that also online F2F meetings should count for direct channels, where you can see your customer or buyer and conclude on a more personal note. Beside the positive adaptive properties, the direct channel is limited by the capacity for information exchange.

Indirect channel

In recent years e-commerce has grown tremendously, and communication has irrevocably changed. Nowadays, everyone ubiquitously accesses and searches the internet on an increasing number of mobile devices. Lawrence et al. (2019) reported that in 2014, 68% of buyers made online purchase and 94% conducted online search for products. In a pandemic the author assumes that this figure will rise again due to restrictions on making personal purchases and online e-commerce will proliferate.

The author revealed different indirect and online channels terms from the literature. The most popular ones are Dual-, Hybrid-, Omni-, Multi- and Cross-Channel. These channels are well known; hence, the wording “Multi-Channel” is the one most used in academic research (Picot-Coupey et al., 2016).

Challenges and drivers

According to the examined literature it is not easy to decide as to which channel is the most efficient. There are many attributes that have an influence. Firms and organizations must find or adapt their channel management according to the request and behavior of the market. These market or customer requests change over time and are also driven by the available technologies at that time. To establish the right structures and fulfil customer requirements, companies must focus on their efficiency and the value added which they want to offer the customer.

So, what are the drivers in channel selection? Gabrielsson et al. (2002) revealed in their qualitative study on the personal computer industry in Europe that cost, and efficiency are the driving forces for selecting the right sales channel. That would have been right for standardized products like personal computers at that time. However, the research did not consider e-commerce. So, the given attributes cannot be generalized for standardized products. Therefore, this paper systematically looks for answers in the literature.

Picot-Coupey et al. (2016) carried out important research on different marketing channels and channel management. He conducted a longitudinal research through qualitative interviews and participant observation of French retailers. He demonstrated that there is no consensus on the definition of “Multi-Cross or Omni-Channel”. However, one of the contributions of his research is that it provides a distinction between these channels. Furthermore, through observation and interviews it was possible to evolve the following drivers.

- Organizational
- Cultural
- Managerial
- Marketing
- Financial

The results show that there are two major challenges which firms have to manage when approaching from an omni-channel perspective. First, there is the organizational and managerial challenge. Second, there is the information system and CRM challenge.

The impact on the efficiency of channel management is ubiquitous within the given literature. The weighting factors has been moved from former cultural and organizational to information and the CRM. So, the customers have to consider the information they have to communicate and the CRM. If products require an additional explanation, it is necessary to provide personal support besides online data sheets and drawings. Both channels have to be synchronized so that there are no uncertainties will appear. This paper indicates that management as well as organizational structures must match with the request of a customer. Therefore, instruments for feedback loops would be necessary to monitor if the salespeople as well as the organization is well structured.

To verify if weighting factors have changed, this paper investigated further empirical research. Common approaches for channel selection, which are mentioned in the literature, show that channel selection rely either on internal and/or on external sales environment. Käuferle and Reinartz (2015) explored the field of industry wholesaling from an empirical point of view. They asserted that the drivers vary based on the degree of usage. Various channels have different levels of performance, cost and searching convenience. To select their sales channel, they decided on the following factors:

- Diversity of products
- Share of key accounts
- Sellers resource capabilities
- Level of technological turbulences

The main findings of Käuferle and Reinartz (2015) is that their weighting factor is the usage of information through different channels. In their research they maintained that the complexity of the product is dependent on the usage of the channels. That means if it is a standard product and requires no explanation, the majority will use online channels to gather information. If the product is rather complex, they will need both online and personal support.

Depending on the above characteristic, it is necessary to consider the impact of channel management in a firm. Modification in a firm influence the firm's performance. That is why firms struggle to transfer their channel management. Most important is that the management provides a clear analysis of customer needs.

A common finding on the review of different empirical analysis shows that the product complexity as well as the preference of customer usage has the most influence on the firm's performance.

Communication

Information is one of the drivers which influences the performance of a firm in the context of channel management. Depending on the complexity and variety of a product, it is necessary to hand over to the customer as much information as is possible. While marketing and communication in general is well researched (Rodriguez et al. 2014), there is a lack of research on communication within the setting of B2B.

In general, there are only two ways to communicate: direct or indirect (Wills, 1990). Both communications play an important role but in the present research the focus is on direct communication.

Technologies for communication have changed in the last years and have also influenced the sales environment to increase efficiency and get better performance. Dixon and Tanner (2012) pointed out that new communication technologies have brought advantages to both the seller and the buyer. Beside these positive characteristics, the complex sales environment has increased the information flow between the customer and buyer. Damerow (2017) argued that not only the interchanging of information is a challenge, administration is also important. His research submits that companies must adopt a "shared funnel" approach. That means that marketing and sales departments must work together and share as much information as possible. Within such an approach it is necessary that the common database used is not outdated, otherwise it will be inefficient and decrease the firm's performance.

Many companies have amassed data from their customers but have failed to analyse their needs. Both seller and buyer have changed their preferences in communication over time, which has affected the marketing channel in sales. This change in media and communication technology has been recognized by academics and researched in several ways.

Anders et al. (2020) has shown that in historical sales (which means the time before internet was available), salespeople communicated directly. Sellers and buyers used phone-based or face-to-face (F2F) communication which enabled the salespeople to know their buyers and their behavior. It was easy to create empathy for the buyer and adopt a selling strategy. As time went on additional methods of communicating with the buyer increased. Kotler (2009) confirms that the traditional communication methods consisted of F2F meetings, letters or fax, seminars, magazines, phone calls and trade fairs.

Later, with the availability of internet, electronic communication like email became one of the most common methods of communication and it is still today. With email communication, the amount of information and data increases nonlinearly (Kotler, 2009).

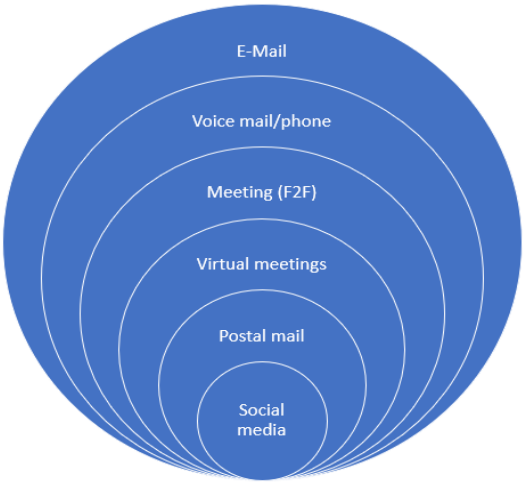
- Personal or F2F meetings
- E-mail
- Company Website
- Banners & Pop-Ups in Websites
- Blogs
- Podcasts
- Mobile marketing
- Social network sites (Facebook, LinkedIn…)
- Webinars
- Virtual trade shows

The above mentioned possibilities are the main digital communication methods in the industrial B2B. Scholars confirm that communication methods are transferred from traditional ways to digital ones (Anders et al., 2020; Kotler, 2009; Holland & Young, 2010).

Anders et al. (2020) have determined, with their qualitative research, the media preferences between the buyer and seller. The empirical research addressed buyers from different sectors of manufacturing, mining, healthcare, construction, and others. More than 30% of the attendees of this survey are from the manufacturing industry. This contributes to the present review in regard to the industrial business perspective. Figure 4 shows the general preferences for

communication with salespeople. The author assumes that this survey would reveal other findings if it were to be repeated. The actual crisis will lower the number of F2F meetings and will bring virtual meetings to the second place. In the case of a firm's performance such a crisis shows that virtual meetings can be rather effective. There is nearly no need to travel. It is possible to see each other face to face and empathize while discussing the content. Communication behaviors have changed through this crisis whereby the industry sectors have improved in firm performance.

Figure 4. Media preference for communication with salespeople



Source: Adapted from Anders et al., 2020

Discussion

The scientific sections explored above have been used to answer the research question: What are the implications of modern sales cycle on performance? To answer this question, it was necessary to review the relevant literature as well as empirical research. From the practical approach it is self-explanatory that the sales channel management and the communication style have an influence on the performance of a firm. To understand the connection from the scientific perspective the author examined performance from different perspectives. On the one hand there is administrative performance and on the other hand there is the total firm performance (Delpechitre et al., 2019).

However, Lawrence et al. (2019) investigated multichannel strategies and their profitability in a B2B environment. They confirm that each channel has its advantages, and the customer has the chance to utilize it in their own manner. This is a common finding which other academics agree on. Lawrence et al. (2019) focused on the net profit depending on whether the customer purchased online or in close contact with a salesperson. His experimental research clearly outlined that for products which need extra explanation it is of the utmost important to have direct contact with a salesperson. This additional feature will reduce the uncertainty on the customer's side. They also argue that the net profit increases with the buyer.

In contrast, Lapoule and Colla (2016) carried out an empirical experiment in the beauty industry where the salesforce plays a crucial role. In their research they argue that in the past most beauty products were sold in stores or salons where salespeople promoted their products. Even if there was no great complexity to the products or much to explain, the traditional way of selling the products was through salespeople. In the experiment they showed that through multichannel advertisement and online purchasing it was possible to increase the firm's performance. However, this effect could also lead to a decline in the salesforce which then could have an influence on the firm's performance.

Industrial products, especially engineered products require extra explanations. For such products it is comfortable to use online channels for detailed product information. But online and internet channels are not enough for complex engineered products; therefore, the personal sales channel support is needed to avoid insufficient product choice (Käuferle & Reinartz, 2015). Findings in the B2B context demonstrate that if buyers only use online channel for their buying process, it may be counterproductive. From these findings it could be derived that in addition to the online channel a direct channel should exist. Each channel has its own advantage and will lead finally to a higher performance (Lawrence et al., 2019).

In general, the author found out, that if the buyer uses more than one channel the sales performance will increase (Joshi, 2009, Mohr & Nevin, 1990). There are several theories that agree that different channels can contribute to the effectiveness of communication in two dimensions, fulfilling needs and in parallel, reducing risks (Lawrence et al., 2019; Polo & Sese, 2016; Damerow, 2017). Research on channel management articles show that buyers tend to use more than one channel to get information about a product or service.

Within the academic industry there seems to be a common understanding that a multichannel approach should be used. Lawrence et al. (2019) claims that the richness and bidirectionality of communication in the salesperson channel also increases efficiency. Even when there other capabilities for communicating with the buyer, the personal contact should be continued in case the richness and experience of the salesperson contributes towards increasing the sales performance (Polo & Sese, 2016). The substitution of salespeople through online channels will not be possible for all industries and all products. For complex products as well as for products where you need explanations an experienced salesperson could help increase the firm's performance in the long run.

To explain products or share information, media tools must be used in an efficient way to hand over the right information at the right time. The existing literature describes a lot of capabilities to communicate between seller and buyer. Through the communication capabilities a lot of information

is transferred from the seller to buyer and vice versa. In case of huge information and easy ways of communication, firms have to be careful that the sales process doesn't become inefficient.

Boorom et al. (1998) approached the sales performance from the interaction perspective. The authors claimed that communication apprehension and interaction with the customer influence the performance. Their study was based on the hypothesis that salespeople who are by nature motivated and more communicative will have more success in the sales process. Based on qualitative interviews and empirical data, they produced evidence that the communication process has to be adaptive. Given the vast variety of sales environment they deduct that there isn't a common set of communication rules that will guarantee higher sales performance.

With a multichannel approach it is necessary to rethink the statement of Boorom et al. (1998). In general, the hypothesis is valid, but firms have to consider that less salespeople are needed to communicate with the customer. The main information will be transferred through online communication.

Within the channel selection and business strategy the topic of communication could massively influence the firm's performance. Communication is one key performance parameter to check to determine if the sales channel will be effective. Empiric research on different industries have shown that the salesperson spends one third of their time on sales related activities. The remaining time is needed to provide service to other departments in the organization or is spent on administrative work (Zoltners et al., 2004). Research from Zoltners et al. (2004) has shown that when there is a decline in the salesforce there will be an increase in administrative work. This must be considered in relation to performance of the firm.

Furthermore, relying on the arguments of Zoltners et al. (2004) the author found that through the multichannel approach there is a more frequent request for communication. Given the information exchange and availability at any time both buyer and seller must be careful with the information flow. Too much information could lead to overflow and inefficiency. This will increase the amount of information and could adversely affect the firm's performance (Delpechitre et al., 2019). In this case Anders et al (2020) suggest controlling the media synchronicity. It is important that the information on different channels is synchronized which could also increase the administrative workload.

The author revealed that the general statement that the usage of multiple channels will improve a firm's performance may not apply to all sections of the industry. Firms must be careful when restructuring their business strategy in terms of channel selection. Of course, there are big advantages nowadays and firms have to adapt their strategies from time to time. However, the author emphasizes that the administration, and communication of channels and information, have an influence on the firm's performance that should not be neglected.

Limitations and Future Research

The present research is subject to several limitations and suggestions for further research. First, the present literature review examined empirical studies regarding firm performance. In these empirical studies the management, firm or organization perspectives were mentioned. Along the lines of communication capabilities and preferred communication tools used in B2B sales it would be interesting to know in which way the actual crisis has influenced the preferred communication media. After one year of the pandemic and home officing, it seems that virtual online meetings like Skype or Teams could have big influence on the communication style. It should be verified if the media preferences of Anders et al. (2020) are still valid. So, a further research question could be: Which are the preferred media communication tools in B2B sales? Second, the finding that salespeople can improve the richness of a customer relationship is well known in literature. In empirical studies the positive effect of such customer - salesperson interaction is underestimated. In many B2B sales situation in the industry, especially in complex sales situation, this interaction between a salesperson and the customer is crucial for performance. A research question could be: What are the determinants for a long-term customer – salesperson interaction? Third, future research should investigate the authors findings to determine if they can be proven for different industries and regions.

Conclusion

A vast variety of products, high diversity of communication channels as well as technological advancement have influenced the sales environment. These changes have motivated scholars to research in depth the field of sales, communication, and performance (Saura et al., 2019, Schmitz & Ganesan, 2014, Rodriguez et al., 2014).

The author reflected on the sales cycles in the context of B2B sales. In addition, he suggested an adaptive sales cycle from Bickebanck and Elste (2016) which could be used for adaptive industrial processes. In the next step the existing marketing channels were examined. The author explored the most important challenges and drivers which influence the performance of a firm.

Finally, the impact of the most important drivers like communication and information were investigated. The author discussed the preferred communication style in the industry during "normal" times. Communication is changing as a result of the pandemic. Online meetings could be the new preferred communication tool and show a positive effect on the firm's performance.

This is one of the first papers which explored the driving factors in regard to sales cycles, channel selection and communication in relation to a firm's performance.

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Uspešnost pri prodaji B2B: kako upravljanje kanalov in komunikacija vplivata na uspešnost podjetja

Izvleček

Komunikacija med prodajalcem in kupcem poteka po več kanalih. Več načinov uporabe tehničnih medijev in izbira kanala ustvarja več informacij, vendar ali to vodi do boljše uspešnosti podjetja? Raziskav o vplivu različnih tržnih kanalov v industriji na dejavnike uspešnosti ni veliko. Uspešnost podjetja je najpomembnejši dejavnik in spremljali ga bomo z različnimi atributi. Namen te študije je pregledati gonilnike prodajnega procesa v smislu prodajnih ciklov, kanalov in komunikacije glede vpliva na uspešnost. Poleg prodajnih značilnosti pregled razčlenjuje spremembe med preteklostjo in sedanjostjo. Namen pregleda je razumevanje različnih zmogljivosti pri upravljanju kanalov in komunikaciji za prilagoditev prodajnega procesa ter povečanje uspešnosti podjetja.

Ključne besede: upravljanje kanalov, komunikacija, uspešnost prodaje, prodajni cikel, industrijsko trženje

An Economy's Emergent Properties and How Micro Agents with Inconsistent or Conflicting Interests Are Holistically Organized into Macro Entities

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Abstract

The existing literature documents that computer simulations can reveal how characteristics of micro-level individuals give rise to macro-level phenomena of systemic wholes. This paper seeks to establish such an important simulation-based observation as a theoretical result on a sound foundation. Going beyond addressing when holistic phenomena can naturally emerge from micro-level characteristics, this paper investigates how and why many macro-level entities appear to answer market calls through organically gathering micro-level agents into uniformly-oriented operational wholes, even though these agents have inconsistent or even conflicting interests. This paper develops conclusions based on results of systems science and establishes a sufficient condition under which characteristics of micro-level agents can naturally lead to the appearance of macro-level properties of a systemic whole even though the former are heterogeneous and behave in an

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unintended and uncoordinated manner. This paper suggests to root each theoretical result of economics on elementary facts of personal belief-value systems and expands methods of networks and computer simulations to those of systems science. It explains when macro socioeconomic phenomena emerge out of unintended and uncoordinated actions and interactions of micro economic men, and provides a more general approach for developing reliable conclusions than those observed from computer simulations. It additionally derives conditions for when macro-level economic entities appear to answer market calls and how micro-level individuals with inconsistent or even conflicting interests can be organically congregated into operational business organizations.

Keywords: Competition; emergence; holistic phenomena; market signal; system; value; yoyo model

Introduction

Since the time when the Great Recession occurred in 2008, scholars have realized that the currently available economic theories can neither predict the imminent arrival of a crisis nor help understand the underlying mechanism behind the originating imbalances that eventually led to the devastating consequences regarding unemployment and the real economy. To possibly overcome this recognized deficit in the relevant knowledge, the Oxford Review of Economic Policy developed a "Rebuilding Macroeconomic Theory Project" (Vines & Wills, 2018). The project examined a set of 6 broadly-based questions related to the benchmark New Keynesian DSGE (Dynamic Stochastic General Equilibrium) model (Smets & Wouters, 2007). The authors focused on ways to improve or completely replace the benchmark model with another one; and the scholars involved in the project did not believe that a paradigm shift was needed, only perhaps enriching, and improving the formulas of the model (Vines & Wills, 2018).

In contrast, a team of scholars from Italy proposes to embrace a paradigm shift by employing the theory and methods of complexity science (Delli Gatti et al., 2010). Specifically, they suggest applying the concept of complex networks and computer simulations instead of the current reductionist approach at the heart of the mainstream DSGE models. They demonstrate that computational techniques can vividly simulate the natural emergence of macro-level phenomena from unintended and uncoordinated behaviors of micro-level individuals when they follow some simple rules of action, such as financial contagion (Allen & Gal, 2000), trade-credit relationships (Boissay, 2006; Battiston et al., 2007).

These two strings of efforts reveal a divergence of beliefs and logics of thinking in terms of how the community of economists should work in the coming years or even decades:

- Gradually enrich the benchmark New Keynesian DSGE model so that it can better predict forthcoming economic crises, provide more appropriate policy suggestions, etc.; or
- Radically adopt a revolutionary new approach so that the consequent theories will be mostly different from those currently available, and the methods employed are powerful and effective, both theoretically and practically.

According to Vines and Wills (2018, p. 5), a paradigm shift in an economic theory means drastic changes in both the content of the theory and the method employed to develop the theory. Hence, this paper supports the Italian team's recognition of a forthcoming paradigm shift in economic theories in general and macroeconomics in particular (Delli Gatti et al., 2011). Specifically, in terms of contents, this paper suggests rooting each and every theoretical result of economics on some of the elementary facts of personal systems of beliefs and values, as suggested by Forrest et al. (2020). And, in terms of methods used to develop theoretical results, this work expands those of networks and computer simulations, as suggested by the Italian colleagues (Delli Gatti et al., 2010), to all methods of systems science established for studying organizations, evolutions and interactions of organizations (Forrest et al., 2013).

Other than the holistic view of this work in the previous paragraph in comparison with the literature along the two lines given above, the main contributions of this paper are outlined below. First, it employs the concept of centralized systems to theoretically explain when macro socioeconomic phenomena emerge out of unintended and uncoordinated actions and interactions of micro economic men. Such rigorously established conclusions are surely more general and reliable than those observed from computer simulations, such as those developed by Allen and Gal (2000), Boissay (2006), Battiston et al. (2007), and many others. The reason is that each computer simulation-based observation is constrained by specified parametric values. Second, other than converting simulation-based observations into theoretical conclusions, this paper shows how to establish conditions for when macro-level economic entities appear to answer market calls and how micro-level individuals with inconsistent or even conflicting interests can be organically congregated into operational business organizations. The importance of this end cannot be overemphasized in light of the trend of developing macroeconomic results on micro-foundations, where macro-level conclusions need to be founded on micro-level components (Blanchard, 2018; Lucas, 1976).

The rest of the paper is organized as follows. Section 2 investigates how macro-level holistic phenomena can naturally appear out of the properties of micro-level components. Section 3 demonstrates that other than the emergence of macro-level phenomena out of unintended and uncoordinated micro-level properties, the business world consists of many purposively organized macro-level entities by making use of micro-level components, which generally

have inconsistent or even conflicting interests. Section 4 concludes this paper with ideas for possible future research.

Systemic Centralisability and Emergence of Holistic Phenomena

This section analyses the concept of systemic centralisability and ways that it can be employed to explain the emergence of macro socioeconomic phenomena from unintended and uncoordinated actions and interactions of micro economic men (Delli Gatti et al., 2010; Farmer & Foley, 2009).

Relevant terminologies of systems science

For our purpose in this paper, this section only introduces concepts of systems relevant to the discussion in the following paragraphs. For a more systematic study of systems science, please consult jointly with Forrest (2018), Forrest et al. (2013), Klir (2001), each of which emphasizes a different aspect of the particular science.

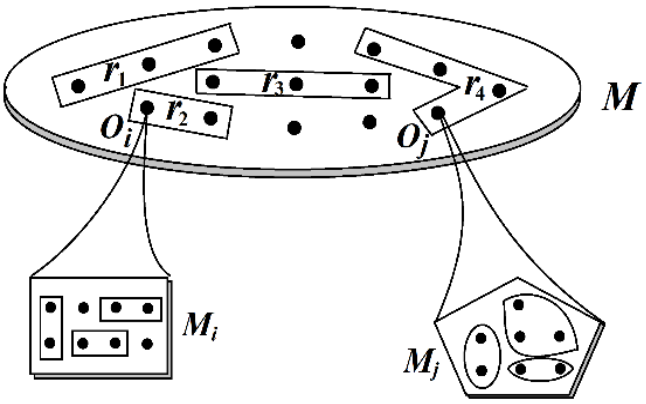
By system, it means a whole, or an organization, or a structure, where micro-level parts or components are somehow associated with one another to form an organically functional macro-level entity. Historically, this concept can be traced back to the very start of the recorded human history (von Bertalanffy, 1968). To derive useful results and develop scientifically sound theories of systems, various particular specifications of this concept have been introduced by diverse authors for a myriad of purposes (Klir, 2001). Among the most productive is the following specification: S is a system, if and only if S is an ordered pair (M,R) of sets, where M consists of all objects of the system S and R all relations that associate the component objects in the object set M in the formation of the system S. That is, each element in the relation set R is a relation defined on the object set M (Lin, 1987). Notice that elements in the object set M are not specified in this definition. Therefore, some of these elements can also be systems themselves. When this happens, this definition of systems reflects the relationship between micro-level economic men (and their individually different characteristics and functionalities) and macro-level business entities (and their holistic interactions).

This very idea that some objects of a system may also be systems themselves is depicted in Figure 1. In particular, the system of the macro-level is S=(M,R), where each object in M is shown as a dot, while the set R consists of four relations r_1, r_2, r_3 and r_4, each of which is shown as an enclosed area. As depicted, objects O_i=(M_i,R_i) and O_j=(M_j,R_j) in set M are also systems. This systemic intuition readily reveals the following fact: the macro-level relations r_1, r_2, r_3 and r_4 may or may not be determined or influenced by the micro-level relations in O_i and in O_j. This observation will be shown in Section 3 below.

For a given system S=(M,R), it is said to be trivial if $M = \emptyset$; that is, the object set is empty. This concept of trivial systems is needed for theoretical reasonings, such as the study of interactions of systems, as for the same reason that the concept of zero is necessary in the study of numbers. For two systems S_i = (M_i,R_i), i = 1, 2, they are equal or identical, denoted S_1= S_2, provided that their objects sets and relation sets are the same. Symbolically, S_1= S_2, if and only if

$$M_1 = M_2 \text{ and } R_1 = R_2. \quad (1)$$

Figure 1. Appearance of object systems



System S_1 is said to be a partial system of the system S_2, if $M_1 \subseteq M_2$ and for each relation $r_1 \in R_1$ there exists a relation $r_2 \in R_2$ such that $r_1 = r_2|M_1$, where $r_2|M_1$ is the restriction of r_2 on M_1, which is defined by

$$r_2|M_1 = r_2 \cap M_1^{n(r_2)}, \quad (2)$$

where $M_1^{n(r_2)}$ is the set of all strings of elements from $M_1$of length $n(r_2)$. For example, $M_1^3 = \{(m_1, m_2, m_3): m_i \in M_1, i = 1,2,3\}$.

A system $S = (M, R)$ is referred to as centralized, provided that (a) each object in M is a system, and (b) there exists a nontrivial system $C = (M_C, R_C)$ such that for any distinct elements x, $y \in M$, say $x = (M_x, R_x)$ and $y = (M_y, R_y)$, the following hold true:

$$M_C = M_x \cap M_y \text{ and } R_C \subseteq R_x|M_C \cap R_y\big|M_C, \quad (3)$$

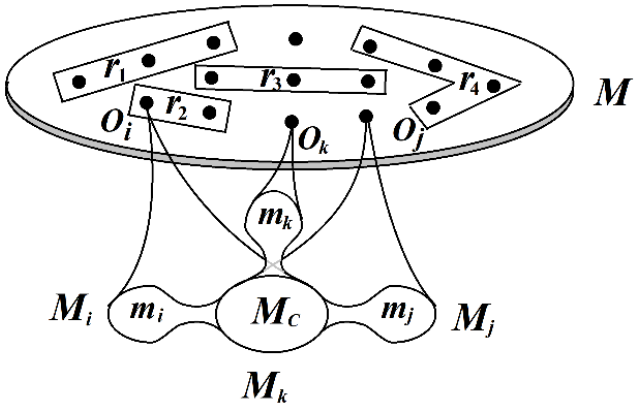
where

$$R_x|M_C = \{r|M_C: r \in R_x\} \text{ and } R_y\big|M_C = \big\{r|M_C: r \in R_y\big\}. \quad (4)$$

System C is referred to as a centre of the centralized system S. The concept of centralized systems was initially introduced by Hall and Fagen (1956) to describe such a system in that one object or a subsystem plays a dominant role in the system's operation. The leading part can be thought of as the centre of the system, because when it changes slightly it affects the entire system, causing considerable alterations. Figure 2 shows the structure of a centralized system $S = (M, R)$ with center $C = (M_C, R_C)$, where for any chosen objects $O_i = (M_i, R_i)$, $O_j = \big(M_j, R_j\big)$ and $O_k = (M_k, R_k)$ of S, the following hold true: $M_s = m_s \cup$

M_C and $m_s \cap M_C = \emptyset$, $s = i, j, k$, for some sets m_s, $s = i, j, k$.

Figure 2. The structure of a centralized system



Assume that κ and θ are two given cardinalities satisfying that θ is regular, and for any $\alpha < \theta$, $|\alpha^{<\kappa}| < \theta$, where $\alpha^{<\kappa} = \{\{f: \lambda \to \alpha\}: \lambda < \kappa\}$ and $|X|$ stands for the cardinality of the set X. For relevant concepts of set theory, see Kuratowski and Mostowski (1976). Assume that $S = (M, R)$ is a given system that satisfies: (i) $|M| \geq \theta$, (ii) each object $m = (M_m, R_m) \in M$ is also a system, and (iii) for any $m = (M_m, R_m) \in M$, $|M_m| < \kappa$. Then in the language of systems science, the following result holds true:

Theorem 1. If at least θ objects in the object set M of the system S contains a common element, then S has a partial system $S^C = (M^C, R^C)$ such that S^C forms a centralized system and $|M^C| \geq \theta$.

This systemic result is initially shown in (Lin, 1999). For related discussions on applications of this result in business research see Forrest (2018).

In order for us to apply this result to address our concerns here, let us specify this very general conclusion by letting $\theta = c$ and $\kappa = \aleph_0$, where c is the cardinality of the set of all real numbers and $\aleph_0$ the cardinality of the set of all natural numbers. Consequently, the assumption above reduces to the following condition: A given system $S = (M, R)$ satisfies (i) $|M| \geq c$, (ii) each object of S is also a system with a finite number of objects. Then, Theorem 1 becomes:

Corollary 1. If there is such an element that belongs to at least c objects in M, then system S has a partial system $P = (M_P, R_P)$ satisfying that $|M_P| \geq c$ and P is a centralized system.

This result was initially given by Lin (1988) when he attempted to explain two sociological phenomena systemically.

In the following subsection, we will examine how this corollary can help us explain macro-level phenomena that naturally appear out of micro-level properties of individual component parts. Or, we will look at how a system's holistic properties can emerge out of seemingly unintended and uncoordinated actions and interactions of the system's objects.

Macro-Level Phenomena Emerging Naturally from Micro-Level Properties

To see how the previously listed results of systems theory can be employed to confirm the appearance of macro-level phenomena, emerging out of unintended and uncoordinated micro-level individual desires, let us detail our analysis of Schelling's (1969) example of racial segregation in cities. In this well-regarded work, Schelling shows that when people are allowed to choose which neighbourhoods they live in, each person's relatively insignificant preference for neighbours of his/her own type can, and generally does, lead to macro-level residential segregation through individually and locally repeated housing decisions. In other words, individual's purposive desires of finding neighbours with slightly similar characteristics and behaviours, although they are not coordinated, can possibly lead to the emergence of racial segregations in cities. In such a situation, the emerged segregation is a holistic property of the city as a system, while individual persons' desires and relevant behaviours are properties of the component level. This end reaffirms the cliche that 'birds of a feather flock together.'

Suppose that A is a set of people and $A^{<\omega}$ is the collection of all finite subsets of people in A. Then for any finite subset, three possibilities exist:

(1) There is no relation that associates the people in x in any way.
(2) There is exactly one relation that connects the people in the subset x; and
(3) There is more than one relation that links the people in x.

For situation (1), we construct a system $S_x = (x, \emptyset)$, where the relation set contains no element. For scenario (2), we build a system $S_x = (x, R_x)$ as follows: in the relation set R_x, there is only one element that depicts the relationship among the people in the finite set x. For the case (3), we construct a collection of systems:

$$\{S_x^i = (x, R_x^i): i \in I_x\}, \tag{5}$$

where I_x is an index set that depends on the finite subset x, so that I_x and the collection of all relations between the people in subset x are correspondent one-to-one to each other; that is, for any $i \in I_x$, the relation set R_x^i contains only one element that describes an existing relationship between the people in x; and conversely, for any relationship g between the people in x, there is exactly one $i \in I_x$ satisfying that the relation set R_x^i of system $S_x^i = (x, R_x^i)$ contains exactly one element r_g that describes g. For scenarios (2) and (3), let the set of all existing relations between the people in

$x \in A^{<\omega}$ be denoted as C^x. Then, scenario (2) is equivalent to $|C^x| = 1$, and scenario (3) is equivalent to $|C^x| > 1$.

Next, let us consider the particular system $S = (M, \emptyset)$ with an empty relation set so that

$$M = \{S_x : x \in A^{<\omega}(|C^x| \leq 1)\} \cup \{S_x^i = (x, R_x^i) : x \in A^{<\omega}, i \in I_x(|C^x| > 1)\}. \quad (6)$$

Now, Corollary 1 says that if (i) the cardinality $|M| \geq c$, and (ii) there exists at least one person from A who belongs to at least c many object systems in M, then there exists a subset $M^C \subseteq M$ such that $S^C = (M^C, \emptyset)$ forms a centralized system and $|M^C| \geq c$.

The construction of the system $S = (M, \emptyset)$ implies that condition (i) means that there exists a complicated network of relationships among the people in A; and condition (ii) implies that there exists at least one person in A who is sufficiently associated with the other people in A. When studying the network of relationships among people in an economy, condition (i) can be seen as satisfied without much doubt, while condition (ii) surely holds true if we look at a prominent politician. More specifically, when one studies economic issues that involve a set A of people, the sophistication of the network of relationships among the people can be measured by the number of mathematically-defined relations (Lin, 1999, p. 97) as follows: if r describes a relation between and among the people in A, then there is an ordinal number $n = n(r)$, a function in r, such that $r \subseteq A^n$, where

$$A^n = \underbrace{A \times A \times \ldots \times A}_{n \text{ times}} = \{f : f \text{ is a mapping } n \to A\}. \quad (7)$$

That is, to apply Corollary 1 with all necessary rigor, one needs to rewrite each relation between people in the language of set theory. In particular, each relation must be written in such a way that it consists of the following basic blocks only: "x is a set," "$x \in y$," "$x = y$," "and," "or," "if … then," "if and only if." For details see (Kuratowski & Mostowski, 1976). Because of this requirement, we can generally say based on Corollary 1 that as long as a particular human desire appears in the minds of a sufficiently large number of people and these people materially act to realize the desire in real life, then a partial system of sufficient scale of the whole system will reflect the realization of the desire. In other words, for a micro-level desire to blossom into a macro-level phenomenon, even for the case that people with the desire behave uncoordinatedly, the following condition must be met: the people with the particular desire engage in a large number of actions for the purpose of materializing the desire in real life.

In short, a condition for a micro-level desire of the component parts of an economy to eventually lead to the emergence of a macro-level characteristic of the entire economy is the following: a large population of people possess that desire and proactively engage in efforts to materialize the desire, even though they act uncoordinatedly.

Now, let us look at Schelling's (1969) example of racial segregation in cities. In this case, especially in the past in America, the majority of the population felt comfortable to have people of their own type as neighbours, while people were allowed to repeatedly relocate. Evidently, each relocation presented an opportunity for relocators to materialize their desires, which are either spoken or unspoken. Corollary 1 implies that such deeply-rooted desire in individual minds of the population and opportunities for individuals to make repeated adjustments, although uncoordinated, eventually led to racial segregation in American cities.

Similarly, Thurner and colleagues' (2012) example can be systemically revisited and explained. In particular, Thurner et al. show that risk controls at local levels by individual lenders can collectively induce a significant instability in prices and involuntarily create more systemic risk. These local lenders, for instance, banks and other financial institutions, rationally adjust their individual leverage exposures of collateralized borrowers in order to avoid unnecessary risks, when the prices of the assets used as collateral are dropping. As a consequence of such uncoordinated adjustments of leverage exposures, margin calls are issued, leading to massive selling of collateralized assets at just the wrong time. Hence, dangerously spiked volatility in price fluctuations appears at the macro-level. Although the emergent property of the economic system as a whole does not seem derivable from the rationales and behaviours of individuals – the lenders, the emergence of the systemic volatility in price fluctuations can be readily seen by using Corollary 1. Specifically, although in terms of absolute numbers, there are a few lenders when compared to the entire population, they in reality affect a large segment of the economy through their lending activities. That is, a large portion of the population is adversely disturbed by margin calls so that the resultant massive selling by individual borrowers eventually merges into a market-wide risk of large magnitude. In such a situation, even though the selling of individual borrowers seems to be uncoordinated on the surface, these individuals' actions in reality are unconsciously coordinated by the lenders, due to the overall small number of them.

Macroscopic Organizations of Micro Economic Agents

This section provides a theoretical explanation for how markets signal for additional competition and innovation. This helps various macro-level organizations, consisting of micro economic men and agents of inconsistent or even conflicting interests, to be organized. In other words, other than many socioeconomic phenomena that naturally emerge at the macro-level out of unintended and uncoordinated actions and interactions of micro economic men and agents (Delli Gatti et al., 2010; Farmer & Foley, 2009); as discussed in the previous section, there are many entities in the business world that are organized purposefully to answer calls or

invitations of various markets or to satisfy forever changing consumer demands (Forrest et al., 2017).

Identification of market signals for new products and additional innovation

First, let us examine how markets within the present business world call for new products and innovation. For this purpose, let us look at such a market that is served by m incumbent firms with their mutually substitutable offerings, $m = 1, 2, \ldots$ Assume that each of these incumbent firms enjoys the backing of loyal customers who only purchase the offering provided by their favourite firm, as long as the price is no more than their reservation value. Within this market, the incumbent firms compete with each other over those customers, called switchers, who switch from the offering of one firm to that of another depending on whose price is more competitive. The price of a product here does not mean the absolute dollar value of a product. Instead, it stands for the price of per-unit value of a product. For example, the price of a pair of walkie talkies is a lot lower than that of two iPhones. However, other than functioning as equipment for short-distance communications, an iPhone has many other capabilities. So, if one compares their prices of per-unit values, two iPhones are much lower priced than a pair of walkie talkies.

Considering how readily information and knowledge are available due to the rapid development of information and communication technology, assume that the pricing strategies of all interacting firms are known to each other so that the incumbent firms employ their best responses in terms of price by playing the Nash equilibrium through pure self-analysis. Then, the following result holds true:

Theorem 2. In the Nash equilibrium of the afore-described market, if the segment of switchers is greater than the minimum loyal-customer base of the incumbent firms, then at least one new firm can gainfully enter the market by providing its substitute offering, and the total expected profit of all entering firms can be potentially as large as the profit of the incumbent with the smallest base of loyal customers.

The extremely technical proof of this result is given in the Appendix. In terms of the literature, a similar result as Theorem 2 is established by Forrest et al. (2017). However, in comparison, our result here generalizes the previous version in the following sense: The latter result is shown to hold under very strong conditions – the boundary conditions of all the incumbent firms are identical, where the firms' bases of loyal customers have the same magnitude, they have the same reservation prices, the same cost of production, the same sales price, the same amount of available resources, etc. Theorem 2 above holds true without being subject to any of these constraints.

In layman's language, Theorem 2 states that when there is a sufficient consumer surplus (or a large enough totality of switchers), new competition naturally appears, no matter what entry barriers the incumbent firms attempt to install. That is, it is market characteristics that beget the introduction of new or improved products and innovations, that incite the aspiration of new entrants with the promise of potentially making more profits than at least some of the existing firms.

The conclusion in Theorem 2 can be applied practically in different ways. First, in the perspective of the incumbent firms in a relatively stable market, their market establishment places them in a state of mutual forbearance. They alleviate rivalry by dividing markets in proportion to their strengths (Bernheim & Whinston, 1990). They discretely allow stronger ones to dominate market segments n which they are less efficient (Li & Greenwood, 2004). Such co-dependence of these incumbents helps de-escalate rivalry (Yu & Cannella Jr., 2012) so that interfirm hostility declines (Haveman & Nonnemaker, 2000). To protect their market territory and status, which means steady flows of profits, the incumbent firms need to stay vigilant regarding the magnitude of the segment of switchers. As soon as this magnitude grows into a sufficiently large scale, new competition will appear; and that will mostly likely disrupt the existing state of mutual forbearance among the incumbent firms. Therefore, these incumbents must continuously improve their offerings to satisfy consumers' continually evolving consumption preferences.

Second, in the perspective of firms that attempt to enter into a relatively stable market beyond those they had already established themselves, the large scale of the market segment of switchers indicates that all the available offerings in the marketplace cannot truly satisfy the demands of these particular consumers. Hence, entrepreneurial firms that attempt to enter into this or some other market need to creatively identify the preferences and needs of switchers, and determine their optimal entry timing (Zachary et al., 2015), defined as the order of entry into the existing market in various contextual referents. In terms of literature, Lieberman and Montgomery (1988) propose the concept of first-mover advantage. They believe that first (or early) movers enjoy extra time over later ones for them to establish and occupy market territories. That is, entry timing matters in terms of economic performance (Fosfuri et al., 2013). However, studies (e.g., Lieberman & Montgomery, 2013; and references found there) also suggest that time equally benefits later entrants, because delayed entry helps firms avoid costly pitfalls experienced by earlier movers. So, empirical analyses reveal such a logic that it explains why first movers have advantages over later ones and, simultaneously, why later movers enjoy recompenses over earlier ones (Lévesque et al., 2013). To resolve such a predicament, Theorem 2 comes to the rescue. In particular, for entrepreneurs who want to start their own companies, they can purposefully develop their firms to enter such a market based on their innovative understanding of the market signal – the existence of a sufficiently large segment of switchers – and their designs and productions of creative solutions. For established business entities that look for a new market to enter, they need to delay their entry into such a market until the market situation clears and settles. Theorem 2 states that as long as they can compete with incumbent

firms through advanced technology, more efficient management or other means, they will have a chance to make more profits than some of the established incumbent firms.

Third, when Theorem 2 is applied to an emerging market, such as the PC market in the 1970s and 1980s (Sobel, 1999), other than the fact that the population of consumers is not well defined, the market segment of switchers expands quickly. It grows in magnitude constantly without any bound in sight. In such a market, first and early movers, if they want to first survive and then succeed, have to aggressively reach out to potential consumers, many of whom would be switchers initially at least, in order to establish their corresponding bases of loyal customers, while lowering the number of switchers as much as possible. At the same time, it is prudent for established companies in the business world to simply wait until those poorly funded and/or inexperienced start-up firms have steadily developed the market before entering. Other than waiting for the formation of a new market with sufficient depth and width, Theorem 2 says that the patience of waiting can provide these companies, as later movers, with the expectation of higher profitability than some of the early movers. This conclusion aligns with Golder and Tellis (1993). In particular, after analyzing 500 products in 50 different product categories, they empirically find that pioneers take approximately 10% of the market share with approximately 50% of them failing outright, while early followers occupy approximately 28% of the market with only approximately 8% failures. Additionally, Theorem 2 supports Markides and Geroski (2005) in the conclusion that large, multi-business enterprises exploit slack resources and complementary capabilities to scale up their operation and bypass early entrants.

Macro structures built on micro agents of inconsistent orientations

No matter which case among those discussed in the previous subsection we look at, efforts to succeed in the market that signals for new competition and additional innovation have to start with forming macro-level organizations by employing micro-level individuals and component parts. In particular, for the case of a relatively stable market, one smart incumbent strategy is to uphold their established mutual forbearance with each other so that their corresponding flows of profits can be more or less readily maintained. To accomplish this goal, these incumbent firms need to organize their business efforts around protecting their market territories and status quos – a macro-level organizational structure – by effectively mobilizing their working units and individual employees – micro-level entities – towards a common goal.

For the case of ambitious start-ups that attempt to launch their operations by entering a relatively stable market, the entrepreneurs have to first organize intellectual manpower to creatively decipher the meaning of a market signal; second, design and produce a brand-new market offer that will potentially satisfy the market demand; and third, bring the final product onto the market. All these macro-level efforts require orienting micro-level individuals towards an identified purpose. As for the case of an emerging market, first and early movers have to develop their bases of customers and then that of loyal customers by introducing their innovative market offers, while established companies in the business world only enter when the market has developed its sufficient depth and width. All these macro-level business attempts come to fruition through *organized* efforts of micro-level individuals.

In short, many macro-level systemic phenomena emerge naturally from micro-level component parts, as discussed in the previous section. At the same time, a lot of macro-level organizations, events and processes are purposively organized to answer market calls and to meet consumer demands by effectively mobilizing micro-level individuals and component parts. By comparing the two situations – one naturally emergent, and the other human-organized, we can see that the former amplifies micro-level individual properties, no matter how unintended and uncoordinated they might be, onto systemic phenomena. And the latter organically places micro-level individuals and component parts into functional organizations towards the realization of an identified goal. So, a natural question arises: how can micro-level individuals and component parts with inconsistent or even conflicting interests work together to accomplish an identified macro-level common goal?

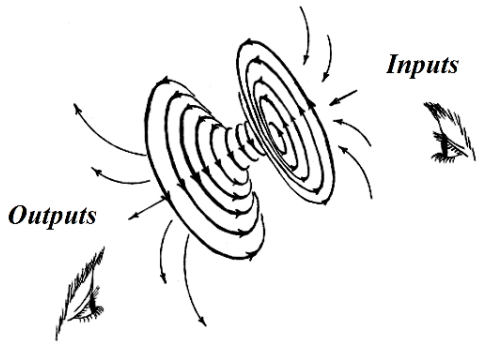
To answer this question, we examine the following related questions individually: (i) why do micro-level individuals and component parts mostly possess their individually inconsistent or even conflicting interests? (ii) What method do firms effectively employ to orient their employees' otherwise divergent efforts into a unified force? (iii) How are micro-level individuals and component parts with individually inconsistent or even conflicting interests practically placed into a cohesive organization?

Regarding question (i), let us focus on how each individual person forms his/her system of beliefs and values during the person's formative years. As for a component part of a whole, its beliefs and values consist of those shared by the members of the component. In terms of the concept of personal systems of beliefs and values, it means a person's view on how the world functions and how s/he needs to behave in order to stay within moral boundaries. Because of the existence of such a belief-value system within each person's cognition, a person is recognized by others with his/her particular identity and integrity (Forrest, 2018, p. 302).

To help accomplish our goal here, let us borrow the systemic yoyo model of systems (Lin, 2009). Specifically, each system can be intuitively or figuratively imagined as a multi-dimensional entity as shown in Figure 3. This systemic intuition indicates that each entity, which is naturally a system according to Klir (2001), in the universe, be it physical or intellectual, and be it a tangible or intangible thing, a living being, an organization, a market, or an economy, can be intuitively seen as a kind of realization of a certain multi-dimensional spinning yoyo with both an eddy

and a meridian field around. It remains in a spinning motion. If it stops its spinning, it will no longer exist as an identifiable system. For all detailed discussions on why this abstract yoyo structure behind each and every system exists, please consult with Lin (2009).

Figure 3. The abstract yoyo model of each system in 3-dimensional space



This yoyo model implies that each person lives in a large pool of spinning fields, which are the fields of other people, physical things, abstract thoughts, and a myriad of other matters. As soon as a person is born, his/her yoyo field starts to interact with many different yoyo fields. It is through these interactions with people, with physical objects, with abstract thoughts, and with the various other things and matters that the person develops his/her system of fundamental beliefs and values through employing the four inherent endowments: self-awareness, imagination, conscience, and free will. This situation of how a person forms his/her beliefs and values is similar to the way that a civilization formulates its value system (Lin & Forrest, 2011). Within these interactions, there are always inevitable differences. That explains why each person has his/her own unique system of very specific beliefs and values. It is this specific belief-value system that dictates the person's decision making for the rest of his/her life. Although with time the belief-value system evolves with certain components updated while some others replaced, the most fundamental parts remain more or less constant. As for individually inconsistent or even conflicting beliefs and values, they generally stem from the differences in the environments within which people grow up and form their initial beliefs and values. Compared to the magnificent scale of the entire ocean of spin fields of the world, although differences in environments might be subtle or minor, they are still generally major to individuals involved. These environmental differences lead to important inconsistencies and conflicts in relevant personal belief-value systems. That explains systemically why, for example, children who grow up within the same household possess quite different, even conflicting personalities, characteristics, and thinking processes (Scott et al., 1991).

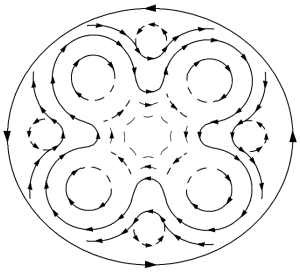
In terms of question (ii), what method(s) can firms effectively employ to orient their employees' efforts that are otherwise divergent into a unified force? The answer is that firms, which expect to successfully offer products in the consumer market, clearly state and rigorously commit to their missions. In particular, in its mission, a firm plainly spells out its purpose of existence, including its values and beliefs, what it does and what the targeted market segment it serves. Because employees tend to have inconsistent or even conflicting beliefs and values, firms have to employ their missions and commit seriously to the missions to organically unite the otherwise divergent employee efforts towards the practical end of materializing their stated business goals. This approach has been confirmed as effective empirically by McGrath (2013) and theoretically by Forrest et al. (2020).

At this juncture, we need to note that although the goal of a firm might be to make as much profit as possible or contribute to the wellbeing of the society in a particular way, or others, the maximization of the business objective, as given in the mission statement, has to include the component of remaining competitive in the product market. This end is reinforced by Theorem 2, because only by maintaining its financial competitiveness in the marketplace, is a firm able to survive long enough to potentially materialize its mission. And only a financially solvent firm is able to materialize the non-economic goals of business.

As for question (iii), how are micro-level individuals and components with individually inconsistent or even conflicting interests practically placed into a cohesive organization? The answer lies in the systemic yoyo intuition in Figure 4. Specifically, the figure is the bird's eye view of the yoyo model of a general, market-oriented firm (Figure 3), where the entire dish spins in a counter clockwise direction, while each local eddy field models an employee's systemic structure, consisting of all elements in his/her system of beliefs and values and their associations. The different arrow directions model how individual employees display their inconsistent or even conflicting interests with each other.

Because each employee tends to have his/her own unique system of beliefs and values, we can readily see that for most employees, their personal belief-value systems will more or less disagree with the stated mission of the firm. Therefore, another question that naturally follows the one that is just addressed in the previous paragraph is: when a firm's mission is in conflict with the personal beliefs and values of an employee, can the firm still make use of the talent of the employee while keeping his/her well-being in mind? For this question, Figure 4 suggests that the answer to this question is: Yes, it is possible. As the conclusion of this section, we use the conventional method of microeconomics to reconfirm this answer.

Figure 4. The eddy field of a focal firm



Assume that other than maximizing its objective, as defined in the written mission statement, the focal firm of our concern constantly examines how well its mission is accomplished. Let the aforementioned employee be i and let Y be such a variable that measures a particular aspect of i's personal system of beliefs and values that disagrees with the mission of the firm. In real life, although it is very possible that this variable Y cannot be explicitly measured or even defined clearly, its existence is definitely unquestionable from the assumption that the firm's mission and employee i's personal belief-value system disagree with each other.

Let employee i's utility function be expressed as follows: $U_i = X_i Y$, the degree of accomplishment of the stated mission, be measured by the following mission function: $\text{mission} = X_C/Y$, where X_i stands for the aggregate consumption of employee i, and X_C, the aggregate expenditure of the firm for running its business. Then the objective function of the firm can be particularly given by

$$\begin{aligned} obj = obj(U_i, \text{mission}) &= U_i \times \text{mission} \\ &= X_i \times X_C, \end{aligned} \tag{8}$$

in which the particular variable Y disappears. That means that although the firm's mission is in conflict with the personal belief-value system of employee i, in the objective function the firm still cares about employee i as much as if the two do not have any conflict. The key here is that the firm has the freedom to define its objective function in an appropriate functional form. For relevant discussions on managerial efficiency, see Forrest and Orvis (2016).

Conclusion

This paper examines two diverging efforts that exist in the present literature regarding how to reshape the existing economic theories so that economists will be able to forecast the arrival of imminent economic crises in a timely fashion, provide policy makers with needed scholarly supports, among others (Delli Gatti et al., 2010; Vines & Wills, 2018). Considering the fact that predicting natural disasters has been an unsettled world-class challenge to the entire world of natural science and mathematics (Lin & OuYang, 2010), the effort of simply modifying the current system of equations in the benchmark New Keynesian DSGE model to forecast imminent economic crises (Vines & Wills, 2018) is destined to be fruitless. In particular, most large-scale natural events play out through their processes without being disrupted by humans, no matter if their disastrous consequences are predicted or not. However, economic disasters are very different. They are reflexively influenced by human expectations; their courses of evolution are greatly and determinately affected by human participants' estimates and consequent actions (Soros, 2003). This end explains why the attempt of using a few simple DSGE equations (Smets & Wouters, 2007), mathematically speaking, to forecast disruptively different outcomes of reflexive human processes based on any records of the past is practically impossible (Lin & OuYang, 2010). To this end, as a reference, it is necessary for us to note the following effort. For years, there was a well-funded research centre for mid-term weather forecasts in Europe. This centre developed for its purpose of prediction a system of more than five million equations in over five million variables, while the actual forecasts of weather had experienced uncertainties in terms of both mathematics and actual predictions (Lorenz, 1993). For a similar reason, the effort of providing adequate scholarly supports for policy making is destined to be unsuccessful if the focus is only on revising the current DSGE model, because adequate policy making is essentially dependent on forecasts of the future (Forrest et al., 2020).

Failures of forecasting the future using the DSGE model or any modified equation-based future version are rooted in the fact that such efforts attempt to extrapolate either the past or the present into the future. Hence, any result of such forecast cannot and will not capture changes that are sudden and disruptively different from the past or the present (Wu & Lin, 2002). That is the reason why this paper embraces and generalizes the approach of Delli Gatti et al. (2010) from merely employing concepts and methods of complexity and computer simulations to those of systems science.

Because of the novelty of the employed approach – systemic logic of thinking – and methodology, which is based on both set theory and game theory, this paper is able to develop

- A new way to interpret abstract conclusions of mathematics in terms of when some characteristics of micro-level individuals can give rise to macro-level phenomena of systemic wholes, as revealed by Delli Gatti et al. (2010; 2011) through using computer simulations; and
- How market sends out its invitations for new products and additional innovations and why new competition appears.

And on top of these outcomes, this paper theoretically explains

- How racial segregation in American cities appeared (Schelling, 1969) ;
- How risk controls at local levels by individual lenders can collectively induce a significant instability in prices and involuntarily create more systemic risk (Thurner et al., 2012); and
- How various macro firms are organized with micro economic men and agents, although these micro components have inconsistent or even conflicting interests.

In short, one main conclusion of this paper is that not all macro-level phenomena can have direct micro-foundation or micro-founded explanations, as believed by some economists since the 1970s (Blanchard, 2018; Lucas, 1976).

Potential future research, building on this paper, can examine, for example, (1) how individually inconsistent or

even conflicting beliefs and values can be smoothly unified under the mission statement of a firm, while the naturally resultant adverse effects or relevant managerial inefficiency (Forrest & Orvis, 2016) are reduced to a minimal level; (2) how an organizational culture conducive to a firm's market success (McGrath, 2013) can be successfully fostered on top of individually inconsistent or even conflicting beliefs and values; and (3) what particular methods of predicting economic crises can be developed on the idea of structural changes (Lin & OuYang, 2010) instead of current extrapolation of the past or present into the future (Vines & Wills, 2018).

Appendix: Proof of Theorem 2

For incumbent firm i, its selling price P_i satisfies $C_i \leq P_i \leq M_i$, where C_i is the cost of production and M_i the maximum selling price, which is equal to the reservation price of loyal customers. Hence, there is $\alpha_i \in [0,1]$ such that $P_i = C_i + \alpha_i(M_i - C_i)$, $i = 1, 2, \dots, m$. For the rest of the proof, instead of P_i, the incumbent firms compete by adjusting α_i, $i = 1, 2, \dots, m$. Without confusion, we will use P_i in the place of α_i, where all costs of production and maximum selling prices are respectively normalized to 0 and 1.

In terms of performance, each incumbent firm is constrained by its available resources (Harmancioglu et al., 2009; Barney & Arikan, 2001) and how the resources are mobilized (Peteraf & Barney, 2003; Forrest et al., 2020). If the factors involved in business operation include x_1, x_2, x_3, …, then for incumbent firm i (= 1, 2, 3, …, m), the magnitude $N_i(x_1, x_2, x_3, \dots)$ of its loyal-customer base is bounded at the upper and lower sides: $L_i(x_1, x_2, x_3, \dots) \leq N_i(x_1, x_2, x_3, \dots) \leq U_i(x_1, x_2, x_3, \dots)$, where L_i is the lower ends and U_i the upper bound. That is, there is a unique number $\beta_i \in [0,1]$, i = 1, 2, …, m, satisfying that $N_i(x_1, x_2, x_3, \dots) = L_i(x_1, x_2, x_3, \dots) + \beta_i[U_i(x_1, x_2, x_3, \dots) - L_i(x_1, x_2, x_3, \dots)]$. Hence, the magnitude N_i of firm i's loyal-customer base can be normalized to $\beta_i \in [0,1]$ such that the segment of switchers is of the magnitude β such that $\beta = 1 - \sum_{i=1}^{m} \beta_i$ and $0 \leq \beta \leq 1$. In the rest of the proof, these normalized parameters are used.

In Nash equilibrium, the given market does not have any pure strategy of pricing for the incumbent firms. In fact, for any portfolio $(x_1, x_2, \dots, x_m)$ of pure strategies of prices, let $i_1, i_2, \dots, i_k \in \{1,2, \dots, m\}$ such that $1 \leq k \leq m$ and $x_{i_1} = x_{i_2} = \cdots = x_{i_k} < x_j$, for $j \in \{1, 2, \dots, m\}$ and $j \neq i_s, s = 1,2, \dots, n$. If $k = 1$, then firm i_1 has ready won over all switchers and can therefore slightly raise its price x_{i_1} to bring in additional profits as long as the new price is still the lowest. If $1 < k \leq m$, then one of the firms $i_1, i_2, \dots, i_k$ can lower its price slightly to create additional profits by attracting all switchers. Therefore, the portfolio $(x_1, x_2, \dots, x_m)$ of pure strategies is not a Nash equilibrium.

Let $F_i(P)$ be the price distribution of incumbent firm i with price P. Then, in Nash equilibrium, our market has a unique portfolio $(F_1(P), F_2(P), \dots, F_m(P))$ of mixed strategies, where for $k = 1,2,3, \dots$,

$$F_k(P) = 1 - \frac{1}{\beta_k}\left(\frac{(1-P)\prod_{i=1}^{m}\beta_i}{\beta P}\right)^{\frac{1}{m-1}}, F_k(1) = 1, F_k\left(\frac{\beta_k}{\beta_k+\beta}\right) = 0. \quad (9)$$

In fact, the objective of firm k is to maximize its expected profit from its loyal customers and its share of switchers by selecting an appropriate price distribution $F_k(P)$:

$$max_{F_k(P)} E(\Pi_k) = \int_{-\infty}^{+\infty}\left\{\beta_k P + \prod_{i=1, i\neq k}^{m}[1 - F_i(P)]\,\beta P\right\} dF_k(P), \quad (10)$$

where Π_k is firm k's profit, $E(\Pi_k)$ its expected profit. Hence, the equilibrium indifference condition for firm k is

$$\beta_k P + \prod_{i=1, i\neq k}^{m}[1 - F_i(P)]\,\beta P = \beta_k, k = 1, 2, 3, \dots \quad (11)$$

which implies

$$\prod_{j=1, j\neq i}^{m}\left[1 - F_j(P)\right] = {\beta_k(1-P)}\Big/{\beta P}, i = 1,2, \dots, m. \quad (12)$$

Dividing the first equation by the jth in equation (12) produces

$$1 - F_j(P) = \frac{\beta_1}{\beta_j}[1 - F_1(P)], j = 2, 3, \dots, m. \quad (13)$$

Substituting equation (13) into equation (11) leads to the following, and so equation (9) follows:

$$\beta_1[1-F_1(P)] = \left(\frac{(1-P)\prod_{i=1}^{m}\beta_i}{\beta P}\right)^{\frac{1}{m-1}}. \tag{14}$$

The second part of equation (9) can be checked directly. For the second part, firm k needs to attract as many switchers as possible to increase its profits from the guaranteed level β_k by charging from its loyal consumers the reservation value 1. So, $\beta_k P + \beta P \geq \beta_k$, which implies $P \geq \beta_k/(\beta_k+\beta)$. Hence, the third part of equation (9) follows.

When the afore-described market is in the Nash equilibrium, all the normalizations above jointly imply that $\beta_i = \beta_1$, $i = 2,3,\ldots,m$. In fact, these β_is are not all equal to each other, let $\beta_k = \max\{\beta_1, \beta_2, \ldots \beta_m\}$ and $\beta_k > \beta_{k_0}$, for k and k_0 satisfying $1 \leq k, k_0 \leq m$. Then, equations (10), (11) and (9) jointly imply that the expected profit of firm k in the Nash equilibrium is

$$E(\Pi_k) = \int_{-\infty}^{+\infty}\left\{\beta_k P + \prod_{j=1,j\neq k}^{m}[1-F_j(P)]\beta P\right\}dF_k(P) = \int_{\frac{\beta_k}{\beta_k+\beta}}^{1}\beta_k\, dF_k(P) = \beta_k F_k(P)\Big|_{\frac{\beta_k}{\beta_k+\beta}}^{1}$$

$$= \beta_k\left\{\frac{1}{\beta_k}\left[\frac{(1-\frac{\beta_k}{\beta_k+\beta})\prod_{j=1}^{m}\beta_j}{\frac{\beta\beta_k}{\beta_k+\beta}}\right]^{\frac{1}{m-1}}\right\} = \left(\prod_{j=1,j\neq k}^{m}\beta_j\right)^{\frac{1}{m-1}}.$$

The meaning of loyal customers and the existence of k_0 jointly imply

$$E(\Pi_k) = \left(\prod_{j=1,j\neq k}^{m}\beta_j\right)^{\frac{1}{m-1}} \geq \beta_k = \left(\underbrace{\beta_k\beta_k\ldots\beta_k}_{m-1 \text{ times}}\right)^{\frac{1}{m-1}} > \left(\prod_{j=1,j\neq k}^{m}\beta_j\right)^{\frac{1}{m-1}} = E(\Pi_k),$$

which is a contradiction. Hence, all loyal-customer bases of the incumbent firms must have the same magnitude, which is denoted as α. So, equation (9) implies that in Nash equilibrium, the afore-described market has a unique symmetric portfolio $(F_1(P), F_2(P), \ldots, F_m(P))$ of pricing strategies, where $F_k(P) = F(P)$, for $k = 1,2,3,\ldots$

To complete the proof of Theorem 2, assume without loss of generality that one new firm only enters the market by uniformly randomizing its price P between the production cost and the expected maximum selling price. The previous discussion indicates that all these variables can be normalized into $P \in [0,1]$.

To deal with the market disruption caused by the entrant, each of the m incumbent firms sets its price by considering those of all rivals, including the entrant and other incumbent firms. So, equations (9) and (11) jointly produce the following equilibrium indifference condition of incumbent firm k

$$\beta_k P + \beta P(1-P)\prod_{j=1,j\neq k}^{m}[1-F_j(P)] = \beta_k. \tag{15}$$

From this equation, $\beta_k = \alpha$ and $F_k(P) = F(P)$, $k = 1,2,3,\ldots$, we obtain

$$F(P) = 1 - \left(\frac{\alpha}{\beta P}\right)^{\frac{1}{m-1}} \tag{16}$$

which is defined when $1 \geq P \geq \alpha/\beta$. Hence, the expected profits of the entrant is

$$E_e(\Pi) = \begin{cases} \frac{-m}{2(m-2)}\frac{\alpha^2}{\beta} + \frac{m-1}{m-2}\frac{\alpha^{\frac{m}{m-1}}}{\beta^{\frac{1}{m-1}}} + \beta\left(\frac{\alpha}{\beta}\right)^{\frac{m}{m-1}}, & \text{if } m \geq 3 \\ \frac{\alpha^2}{2\beta} - \frac{\alpha^2}{\beta}ln\frac{\alpha}{\beta} + \beta\left(\frac{\alpha}{\beta}\right)^{\frac{m}{m-1}}, & \text{if } m = 2 \end{cases} \tag{17}$$

And the expected profit of any of the m incumbent firms is

$$E_m(\Pi) = \int_{\alpha/\beta}^{1}\{\alpha \times P + \beta \times P(1-P)\prod_{j\neq i}^{m}[1-F(P)]\}dF(P) + \alpha \times \left(\frac{\alpha}{\beta}\right)^{\frac{1}{m-1}}$$

$$= \int_{\alpha/\beta}^{1}\alpha dF(P) + \alpha\left(\frac{\alpha}{\beta}\right)^{\frac{1}{m-1}} = \alpha. \tag{17}$$

Now, it is ready to check that $\frac{\partial}{\partial \alpha}[E_e(\Pi) - E_m(\Pi)] > 0$ and that when $\alpha = 1/(m+1) = \beta$, $E_e(\Pi) - E_m(\Pi) > 0$. Hence, there is $\alpha^* \in (0, 1/(m+1))$ such that when $\alpha \geq \alpha^*$, the expected profits $E_e(\Pi)$ of the entering firm is greater than that $E_m(\Pi)$ of any of the incumbent firms. So, the conclusion of Theorem 2 follows.

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Razvijajoče se lastnosti gospodarstva in kako so mikro agenti z nepredvidljivimi ali nasprotujočimi si interesi celostno organizirani v makro entitete

Izvleček

Obstoječa literatura navaja, da računalniške simulacije lahko razkrijejo, kako značilnosti posameznikov na mikro ravni povzročajo pojav sistemske celote na makro ravni. Ta študija želi vzpostaviti to pomembno simulacijsko opazovanje kot teoretični rezultat s trdnimi temelji. Poleg tega, da obravnavamo, kdaj lahko celostni pojavi naravno izhajajo iz značilnosti mikro nivoja, ta študija raziskuje, kako in zakaj se zdi, da se številni subjekti na makro ravni odzivajo na tržne klice z organskim zbiranjem agentov na mikro ravni v enotno usmerjene operativne celote, čeprav imajo ti agenti nedosledne ali celo nasprotujoče si interese. Ta študija razvija zaključke, ki temeljijo na rezultatih sistemske znanosti, in določajo zadosten pogoj, pod katerimi lahko lastnosti agentov na mikro ravni naravno vodijo do pojava lastnosti makro nivoja sistemske celote, čeprav so prve heterogene in se obnašajo nepredvideno ter nekoordinirano. Ta študija predlaga, da se vsak teoretični rezultat ekonomije ukorenini na osnovnih dejstvih osebnih sistemov prepričanj in vrednot ter razširja metode omrežij in računalniških

simulacij na metode sistemske znanosti. Pojasnjuje, kdaj makro družbenoekonomski pojavi nastanejo zaradi nepredvidenih in nekoordiniranih dejanj ter interakcij ljudji na mikroekonomski ravni. Ponuja splošnejši pristop za oblikovanje zanesljivih zaključkov kot tisti, ki jih opazimo pri računalniških simulacijah. Dodatno določa pogoje, kdaj se lahko gospodarski subjekti na makro ravni odzivajo na tržne pozive, in kako se lahko posamezniki na mikro ravni z nepredvidenimi ali celo nasprotujočimi si interesi organsko združijo v operativne poslovne organizacije.

Ključne besede: konkurenca, nastanek, celostni pojavi, tržni signal, sistem, vrednost, jojo model

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Example 1 – Book: Gujarati, D. N. (1995). *Basic Econometrics*. New York: McGraw-Hill.

Example 2 – Journal article: Engle, R. F., & Granger, C. W. J. (1987). Co-integration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 55(2), 251-276.

Example 3 – Book chapter or article from conference proceedings: MacKinnon, J. (1991). Critical Values for Cointegration Tests. In R. F. Engle & C.W. J. Granger, (Eds.), *Long-Run Economic Relationships: Readings in Cointegration* (pp. 191-215). Oxford: University Press.

Example 4 – Web source: Esteves, J., Pastor, J. A., & Casanovas, J. (2002). *Using the Partial Least Square (PLS): Method to Establish Critical Success Factors Interdependence in ERP Implementation Projects*. Retrieved from http://erp.ittoolbox.com/doc.asp?i=2321

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