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Development Strategy of the Faculty of Organization and Informatics of the University of Zagreb for the period 2018 – 2023

Impressum:

Development Strategy of the Faculty of Organization and Informatics,
of the University of Zagreb for the period 2018 - 2023

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Foreword

The Faculty of Organization and Informatics of the University of Zagreb (hereinafter: FOI) is a higher education institution with a tradition in the field of information and communication sciences that has, over the years, positioned itself as Croatian central higher education and research institution within the field of informatics. In recent years, FOI is also becoming a significant institution for the development of studies and research in the field of economics. The acting and the existing FOI status is based on the half-century work of generations of employees that have created the basis for our further development. Today, the generations of FOI students hold demanding and responsible positions all over the world. The current state and position of the Faculty within the Croatian higher education system is the result of a series of developmental perspectives that have been fostering the development of the Faculty. We have advanced in scientific research, teaching and the cooperation with the business which is unequivocally proven by various indicators. The Faculty's formalization process started with the 2010-2014 Development Strategy, which introduced indicators for the monitoring of impacts by specific areas of action. This Strategy was the elaboration of FOI's endeavours during this period, and although it was not systematically monitored on annual basis, it provided us with a clear insight into the desired and achieved within the period of its implementation. It was based on the developmental step forward made during the so-called Bologna reforms when the new curriculum has been updated as well as the overall opus of the Faculty's work. This strategy and the curriculum are still supportive pillars of the Faculty's work. However, in the meantime, the Faculty has grown considerably in terms of the number of employees, the social circumstances have changed and the information and communication science has become more advanced. In that sense, the conditions for a new development strategy and the mechanisms for its implementation have been acquired.

This document is the key document of the Faculty of Organization and Informatics of the University of Zagreb. It also includes a strategic plan for scientific research according to the Article 3, paragraph (1), indent 1 of the Ordinance on Conditions for Issuing License for Scientific Activity, Conditions for Re-Accreditation of Scientific Organizations and Content of License (NN 083/2010), as follows:

- The Purpose of Founding and work of a Scientific Organization - Chapter ***Mission and Vision of the Faculty of Organization and Informatics.***
- The analysis of the scientific potential of the research organization and its position in scientific and business contexts - chapter Abstract (very brief abstract), a detailed analysis presented in a separate document ***Elaborate for the Development Strategy of the Faculty of Organization and Informatics, University of Zagreb for the period 2018 - 2023***
- Strategic Goals of the Scientific Organization - Chapter Strategic map of the Faculty of Organization and Informatics regarding the goals related to the research work and the related activities.

- The expected Outcomes of the Strategic Program of scientific research - Chapter Strategic Map of the Faculty of Organization and Informatics regarding the objectives related to the scientific work and related Key Performance Indicators (KPIs) and the ***Priorities and Implementation Method*** chapter.
- Scientific topics that a research organization intends to develop with a detailed program of work and specific goals for each topic - chapter ***Future strategic areas of the Faculty of Organization and Informatics*** with all the relevant subchapters.
- The Organizational Development Plan of a research organization - Chapter ***Strategic Map of the Faculty of Organization and Informatics*** regarding the Goals and their related activities from the perspective of *Learning, Growth and Development.*
- Indicators of success of the strategic research program for a period of at least five years:
    - Applied and Developmental Scientific Research and Technology Transfer - Chapter ***Strategic Map of the Faculty of Organization and Informatics*** (objectives P07, U02 and related activities);
    - Provision of research, consultative and professional services - Chapter ***Strategic Map of the Faculty of Organization and Informatics*** (objectives P05, P06, P07, U02 and related activities);
    - Scientific and professional training and development of doctoral and postdoctoral students and other research and professional staff - Chapter ***Strategic Map of the Faculty of Organization and Informatics***, mainly the objectives within the Perspective Learning, Growth and Development and related activities.

Prof. dr. sc.
Neven Vrček

Dean

Starting points

FOI is dominant in two scientific fields - information and communication sciences and economics and, to a lesser extent, in other fields of science. The interdisciplinarity is embedded in every aspect of the Faculty, and this is the strength that gives a unique physiognomy to the Croatian higher education area.

At the undergraduate level, the Faculty has two study programs in the field of Information and Communication Sciences (*Information Systems and Business Systems*) and one in the field of Economics (*Economics of Entrepreneurship*). Also, FOI is conducting an undergraduate professional study program (*Information Technology in Business Application*). At the graduate level, FOI performs four study programs (in the field of Information and Communication Science - *Information and Software Engineering*, *Business Systems Organization, Databases and Knowledge Base, Informatics in Education*) and one in the scientific field of economics (*Economics of Entrepreneurship*). At the postgraduate level, FOI performs the PhD study program of *Information Science* and three postgraduate specialist studies. FOI also participates in several studies as a partner or as a co-holder (Undergraduate and Graduate Studies in Military Studies, University Specialist Postgraduate Study in E-Learning).

Scientific activity at the Faculty is growing in terms of a number of published papers in the prestigious journals, projects and the image of the Faculty as a recognisable scientific and research institution. The mobility of teachers and students to relevant universities has also increased, and doctoral studies are constantly attracting new doctoral students being one of the bigger institutions of the University according to the number of PhDs. At the moment of writing this strategy, the doctoral study has undergone a process of re-accreditation, and by most relevant elements it is assessed as a high level of quality.

Project activities at the Faculty are intensive and, on average, five projects are monthly submitted to different funds. At the time of writing this strategy, the Faculty participates in projects with a total budget of EUR 60 million and own contribution of EUR 3 million. Approximately, 70% of employees in scientific-teaching professions are involved in project activities. However, it should be noted that the number of applications to the most competitive funds is insufficient (primarily those submitted to Horizon 2020). No priorities were set for the selection of potential projects, resulting in a lack of joint focus of project activities of the Faculty, and the project portfolio of the Faculty. The project cooperation with the industrial IT sector is good, and specific projects often depend on the propositions of a particular funding programme.

The Faculty operates on two locations in Varaždin: in the building of the former Jesuit monastery several hundred years old (FOI 1), and in the building of the former music school (FOI 2). The Faculty also performs a professional study on the *application of Information technology in business* in leased premises in Sisak, Zabok and Križevci. We are particularly proud of the building from the 17th century on the main city square in Varaždin, where most of the classes are performed. The preservation of this facility and its cultural heritage represents one of the FOI values. However, our

functional space capacities do not meet the developmental needs and represent a limiting factor for strategic developments. FOI, therefore, has been striving, through its many years of efforts, to build a new facility that would match the spatial capacities and needs of modern standards in higher education. These efforts will be continued in the next strategic period.

At the moment of writing this Strategy, the social circumstances for the realization of development goals are not favourable. The consequences of the global financial crisis have not been overcome even though the IT sector is in strong swing and it can be said that it has become the most vibrant part of the Croatian economy. FOI feels it through the intensified cooperation with businesses and a strong dynamics in the labour market, resulting in about five hundred contracts with the companies for implementing student internships. FOI cannot respond adequately to this interest, primarily because of its own spatial and staff constraints. In terms of human resources, FOI is limited by the mechanisms of the University and its ministry (the so-called cumulative coefficient), and no significant recruitment can be expected in the next five years on the state budget, which will undoubtedly affect the old pyramid of the Faculty whose profile gets outdated. Certain increase in human resources can be expected through project mechanisms, however, labour market outcomes seriously jeopardize such efforts as the Faculty financially cannot compete with career offers from the business.

In financial terms, the Faculty shares the fate of the other institutions within Croatian higher education system funded through the insufficient and unstructured model of state program contracts. Such a regime destabilizes financial operations because the funds that the state allocates per student are not sufficient for daily business, and especially not for the development. The projects remain the basis for staff recruitment and potential development.

At the same time, the field of application of information technology has reached unaddressed proportions and information science is fully marked by a modern society that creates new business models and entrepreneurial initiatives. This is the challenge of higher education institutions because the speed of technological changes and innovative applications affects the obsolescence of cumulative knowledge, and the various forms of informal and non-formal education (which are more represented in the IT than in other professions) increase the demands on the quality of the overall activity of institutions operating in information sciences.

The described context of the Faculty's work defines the starting point for this strategy. Global social circumstances and financing mechanisms are not sufficient grounds for significant exploits and key development points are their own human resources, the propulsion of information science, the reputation of the Faculty in business and the networking with the partners within nurtured multi-annual relationships. These are the resources we will rely on over the next five years with the belief that we will achieve the ambitious strategic goals.

Strategic positioning of teaching and scientific activities of the Faculty of Organization and Informatics

The purpose of strategic positioning of scientific disciplines and study programs in the context of FOI development is to ***determine the desired area of science and curriculum***, i.e. to determine the areas of knowledge and skills and the learning outcomes that the scientific activity and the corresponding study program covers within a certain scientific field and profession.

The relevant sources were analysed and the tradition and available resources of the Faculty were taken into account.

During the development of the first generation of "Bologna" study programs at FOI, the curricula and the accompanying documents published by the most influential professional associations of IEEE[1] and ACM[2] were used as a model and framework for the strategic positioning of IT degree programs at the undergraduate and graduate levels of FOI. By promoting the profession and understanding the importance of quality and standardized study programs for the development of the profession, ACM and IEEE have developed reference models for study programs. It should not be further emphasized that these programs and projections, in addition to teaching, are an adequate basis for the reflection on the scientific development of a higher education institution.

After the adoption and many years of performance (with minor revisions) of these study programs, the following circumstances have occurred, which have an important impact on the current situation as well as on the future revisions:

The state of information and communication sciences has changed and the new developmental direction of the Faculty is to be defined as the purpose of this strategic document.

Scientific and teaching resources increased by increasing the number of employees and expanding the scientific interests of employees.

FOI has positioned itself as a relevant institution for conducting the programme within Economics of Entrepreneurship study, which has created the basis for growth in this field and has taken over the independent management of this study.

The Ministry of Science and Education initiated the drafting of the Croatian Qualifications Framework (CROQF) Act, which was adopted in 2013 (NN 22/13, 46/16).

[1] *Institute of Electrical and Electronics Engineers*

[2] *Association for Computing Machinery*

Pursuant to the Law on CROQF, the National Council for Human Resources Development was established and the Sectoral Council is in the process of establishment. These bodies will play an important role in the development and application of the CROQF.

Following the EU accession, a number of projects have been launched to develop standards of profession and qualifications. FOI, with its partners, (Uni Ri, TVZ and business partners) has submitted the project "Stand4INFO - Development of Higher Education Standards of Professional Interest, Qualification Standards and Study Programs based on the Croatian Qualifications Framework in the field of Informatics", and received funds from the European Union within the programme of the European Social Fund, the Human Resources Development Operational Programme.

The European Framework for e-Competence (e-CF), described in the Workshop Agreement of the European Committee for Standardization (CEN) European e-Competence Framework 3.0, A Common, was used as the basis for defining key jobs and required knowledge and skills for the occupations in the Stand4Info project. European Framework for ICT Professionals in all business sectors. CWA 16234: 2014 Part 1.

Resources and the starting points for the innovation of the existing or new curricula of IT studies at FOI are presented in Figure 1. The strategy represents the content of new study programs, and the CROQF is a kind of filter for checking ideas from reference curricula and other sources. It includes internal requirements and constraints, the existing curriculum, the available resources (primarily human), but also the value system and the existing relations with the Faculty.

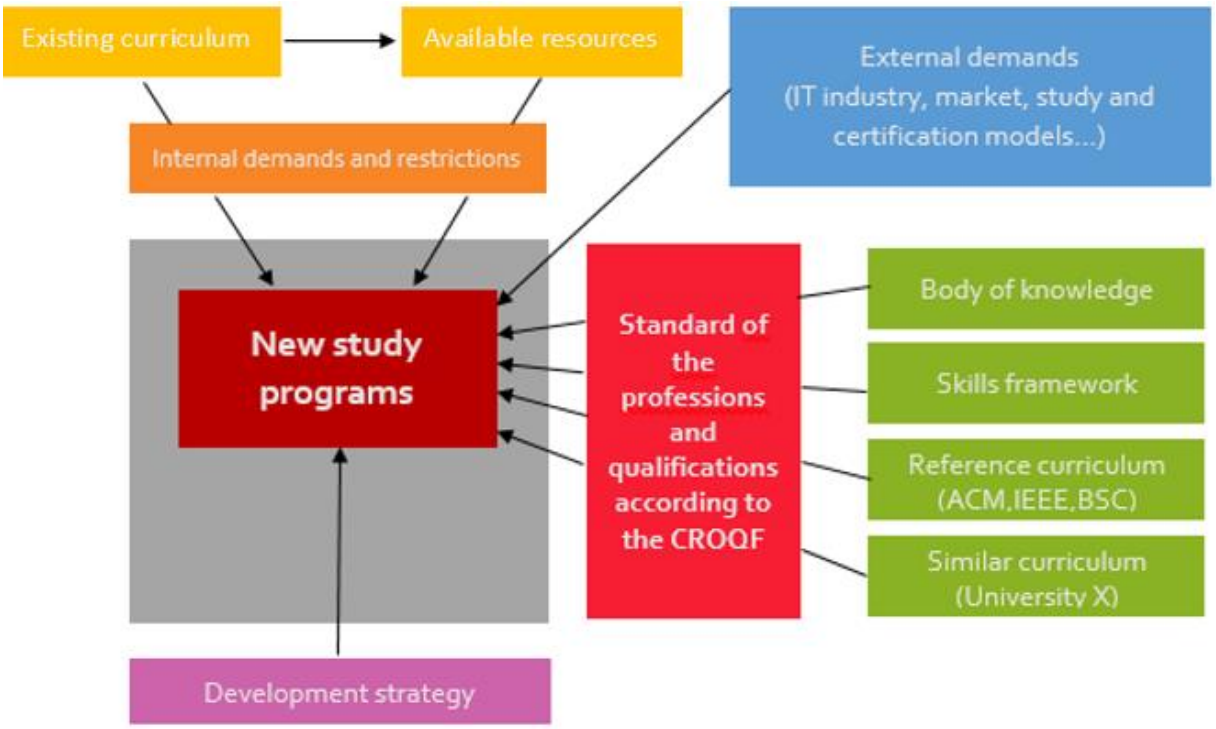

Figure 1. Innovation of the curriculum il line with the strategy, professional standards and qualifications according to the CROQF.

Computing Curricula 2005 Overview Report (September 2005), Association for Computing Machinery (ACM), Association for Information Systems (AIS) and IEEE Computer Society (IEEECS) was used as a framework for the strategic positioning of the Faculty in the context of scientific development and the development of the undergraduate and graduate IT programs at FOI up to 2025. All images, descriptions of computing and informatics, as well as the conclusions about their mutual relationship in this chapter are presented or formulated on the basis of this document.

Furthermore, the following important ACM and IEEE curricula were used[3]:

- Information Systems - IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems (and previous from 2002),
- Information Systems - MSIS 2016 Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems (and previous from 2006),
- Software Engineering - SE 2014 Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering (Feb. 2014) (and previous from 2004),
- Information Technology - IT 2017 Curriculum Guidelines for Baccalaureate Degree Programs in Information Technology (and previous from 2008),
- Computer Science - CS 2013 Curriculum Guidelines for Undergraduate Degree Programs in Computer Science (and previous from 2001. and 2008),
- Computer Engineering - CE 2016 Curriculum Guidelines for Undergraduate Degree Programs in Computer Engineering (and previous from 2004).

Computing Curricula 2005 Overview Report includes the analysis and the overview of the following fields:

- Information Systems - IS
- Information Technology - IT
- Software Engineering - SE
- Computer Engineering - CE
- Computer Science - CS

The Computing Curricula 2005 Overview Report includes a graphical representation of each of these areas. On the left side of the graphical representation is the area of the theory and on the right the application (Figure 2). The bottom layer represents the equipment and infrastructure, and the top layers are oriented to software, processes and organization.

FOI has its strategic positioning in a partial union of *Information Systems*, *Information Technology* and *Software Engineering*.

[3] *http://www.acm.org/education/curricula-recommendations*

Information Systems (IS) - is a discipline whose core subject is the relationship between the information system and the organization. It deals with theory and principles as well as the applications, development, the introduction of system and user training. Near the application domain, it penetrates to infrastructure because experts in this discipline participate in choosing and adapting the platform and infrastructure for a particular application, although they do not take responsibility for the technical part of the job. The Information systems cover the entire horizontal area at the top of the organization-related diagram. Theoretical and research contribution is expected in the area where the organization and information technology and applications overlap.

Information Systems have been a strategic orientation of FOI since the early 1990s. The area of information systems is concerned with the planning, development, application and maintenance of information systems. By nature, it is interdisciplinary field because it requires the knowledge and skills of other areas, such as economics, organization and management, both theoretical and applicable. At the application level, the information systems deal with the infrastructure and technical base.

Information Technology (IT) is a discipline focused on the implementation, deployment and use of information (and communication) technologies, including systems, applications, platforms and infrastructure.

Software Engineering (SE) covers the central part (Figure 2), which refers to the systematic development of the program, using advanced methods and reliable engineering design-based modelling techniques to achieve the required quality, price and deadlines. SE links the theory and practice. The SE is, on the one hand, tied to the goals and requirements of the organization, while, on the other hand, relies on technical infrastructure and platforms.

Software Engineering at FOI is primarily focused on the development of business systems and other systems with user-friendly interface. It is not about the development of software support for embedded systems, system software, control components of technical systems, etc., ie software that is a unit of the system infrastructure or computer equipment.

To conclude, the ***strategic positioning of the undergraduate and graduate IT programs at FOI*** until 2025. is shown in Figure 2.

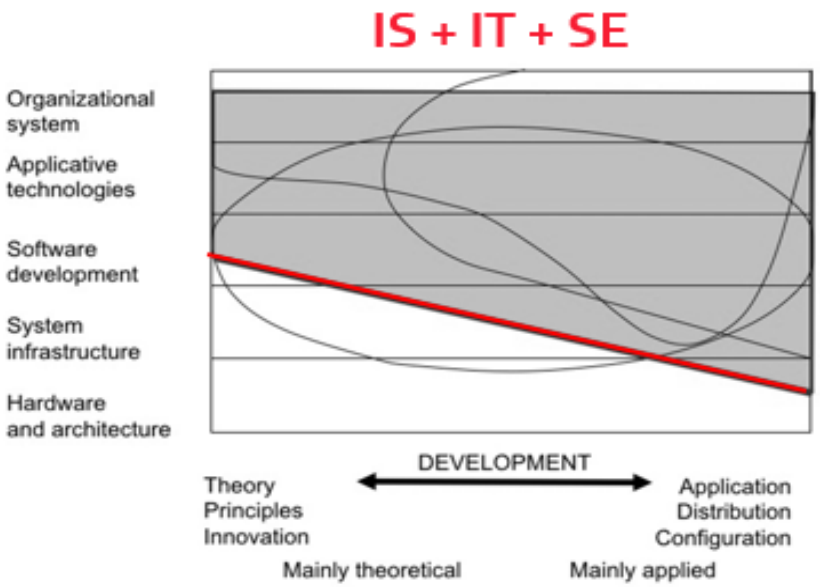

Figure 2. Strategic positioning of the undergraduate and graduate study programmes in the field of informatics at FOI.

It should be emphasized that the study programs and part of the FOI scientific work must include topics and links with related fields and professional disciplines, including:

- Cognitive and human factors,
- Computing,
- Computer engineering,
- Mathematics,
- Project management,
- Knowledge management,
- Entrepreneurship,
- Semiotics,
- Linguistics and other.

The interdisciplinarity, connectivity and overlapping of science, the professions and related study programs are desirable features.

The future development of FOI will be based on the described disciplines and the foreseeable development of information sciences under the influence of new technologies and developmental and business paradigms significantly deviated from the classic IS-IT-SE concepts. It will also use internal synergistic mechanisms based on performance in the fields of organization and economics, which gives the step ahead and expands the perspective of scientific and teaching work. In this sense, the know-how and the position will be used to enter new areas relevant to the long-term competitiveness of the Faculty and the development of modern society.

Future strategic of the Faculty of Organization and Informatics

In this development phase of the Faculty and based on the existing state in science it can be concluded that it is time for step forward towards new areas. FOI has, for the last 20 years, been developed on the paradigm of information systems and the accompanying technical and organizational disciplines as set out in the introduction of this document. All this is related to the economic disciplines that provide an additional research and teaching dimension to FOI, which also affects its strategic positioning. This will continue to be an important component of activities, taking into account the fact that new technologies have contributed to a new view on the development of information systems and that the whole area is at a very mature stage, both scientifically and professionally.

The future strategic development of the Faculty is determined/based and evaluated according to the following criteria:

- **The propulsive area**: that the area is relevant in a scientific and professional context or that there are at least 3 relevant global reports that point to this area as propulsive (e.g. "*Horizon Report*", Industrial Strategy (EU, HR, DE), ACM or IEEE projections);
- **The existing research group**: There are at least two members of the research group at FOI and several young researchers who have applied the relevant project applications and reached the review threshold;
- **Papers within this area in journals or leading conferences**: that there are a number of papers in the research group's work that document the scientific interest and the ability to contribute to the state of science.

In addition to these criteria, further consideration was given to:

- **Representation in Teaching**: there is a certain coverage in teaching courses that are already being performed at the Faculty;
- **Representation in Doctoral Study**: it implies that the field is represented in the topics of doctoral theses;
- **Organized conferences, summer schools, competitions and other events:** there are competencies at FOI that may be of interest to the professional public and this is expressed through appropriate public events;
- **Wider cooperation within or outside the institution:** there is project cooperation with the business or international research institutions.

Strategic areas will be reflected in the teaching and scientific development of the Faculty. Within teaching, the Faculty will open new study programs or upgrade the existing with new content. In the scientific sense, new labs and centres will be established with a mission of further scientific and professional activity in strategic areas. FOI does not have the same capacity for development in all proposed strategic areas and not all criteria could be equally applied in each of the strategic areas.

However, it is important that there is a recognized development potential, a certain recognised component of success in the previous period, and a research group capable of project and teaching contribution. Based on the mentioned criteria, the following strategic areas of the Faculty development were identified.

Information systems of the future, Internet of everything and relevant disciplines

Scientific relevance and scope

The technological cycle, that is, time of appearance, acceptance and finally saturation with a particular technology, has been multiplied in the last 10 years. The emergence of new technologies revives the market and demands on information systems and reopens new opportunities in all business domains. We are currently in the **mature phase** of the life cycle in the field of application and development of *mobile and supportive technologies*, and at the **beginning of the life cycle** of a number of new technologies, from which one should extract the Augmented reality, the Internet of Things (IoT) and the Internet of Everything (IoE). The changes and opportunities that this technology offers are so significant that they are commonly referred *Industry 4.0.*

Future information systems include but are not limited to:

- mobile and supportive technologies;
- mobile business and digital currencies;
- virtual, augmented, mixed and adaptable reality;
- internet of things and internet of everything;
- virtual assistants and smart robots;
- computer games;
- Industry 4.0.

The concept of *mobile technology* was initially related to the creation of applications for mobile phones that were an integral part of information systems. Today, the notion of mobile technology is far wider, and apart from the fact that it is often a mobile application as the basic platform for the entire information system, the information system also includes many other technologies and devices.

The *augmented reality* is a technological innovation that relates to the use of bearer and mobile devices that complement the user's information (text, image, sound, vibration, etc.) to the information he receives from the real world. *Virtual reality* represents a completely fictitious reality that is presented to the user through more senses, but primarily in view, and which makes the illusion that the user truly is in such an artificial (virtual) world. Mixed reality is the concept of intertwining virtual and extended reality, but as a third important component, it includes the user

himself. *Gartner's ''Hype Cycle'' Report for 2017*[4] *states that the concept of virtual reality is the nearest to the mature application stage, while the augmented reality has gone hype and is currently undergoing the disillusionment phase.*

Early at the beginning of the second decade of the new millennium, informatization of organizations globally gained an unstoppable momentum in the area of digitization of the entire value chain of all processes of production, organization and management. In Europe, this trend is so significant that it is titled *Industry 4.0* (primarily in German development strategies), due to its implications for the economy and potential that it could achieve on manufacturing organizations. In the world, this trend is still called the Internet of things, industrial internet and the Internet of everything. The basic aim of this trend is the creation of networked cyber-physical production systems, through four key disciplines. (1) *Vertical networking of smart production systems*, i.e. the creation of factories that respond very quickly to demand, stock levels or user needs. Such factories are extremely autonomous, and all production parameters are measured and controlled by smart sensors. (2) *Horizontal integration through a new generation of global value chains*, which will increase global productivity through organizational networks, thereby linking value chains between organizations in real time. The concept of product memory is introduced, where every step in the production process can be monitored. (3) *Thorough engineering of the production process and value chain* to enable the development and production of the product into the manufacturing process as an integral part of the agile value chain. (4) *The acceleration of production through new technologies*, the development of cognitive, high autonomous production control mechanisms, such as advanced robot systems, sensor networks, artificial intelligence in production systems management, and other.

The application and integration of these concepts and technologies in information systems requires thorough changes in the way of thinking about the design of organizational structures and value chains and are based on four key areas of research: *cyber-physical systems, internet of things, internet of services* and *smart factories.* All of this can be achieved using the following development principles: interoperability, virtualization, decentralization, real-time work, service orientation and modularity.

Although most of the technologies intended to underpin changes to the achievement of Industry 4.0 are already available, the research areas of great significance for further improvement are the following: computer security, smart sensor development, additive production and 3D printing, new materials development, big-data, development of green energy, autonomous systems, logistics, product customization.

[4] *http://www.gartner.com/smarterwithgartner/top-trends-in-the-gartner-hype-cycle-for-emerging-technologies-2017/*

Significance for FOI and capacity for research, teaching and application

One of the key areas of activity of the Faculty of Organization and Informatics is the research of the development of information systems and the interaction of business processes and information technology. This is the traditional point of reference for FOI development. Industry 4.0 with the accompanying discipline is of utmost importance for the Faculty as it unites the interaction of the organization and the information and communication technology in the conditions of full networking. Industry 4.0 and related disciplines study organizational and information structures, methods of development and architecture of software systems, and ways of thinking about modern information systems. Although at present most of the courses do not include the teaching content needed to create employees that will work in the Industry 4.0, there is definitely an interest to be stimulated.

Scientific and teaching disciplines in that sense can be roughly categorized into one of the following groups: (1) programming the circuit (conditional - *"solid" computing at a close circuit level)*, (2) program logic and data analysis (colloquially *"soft" computing, or development in higher programming languages)*, (3) *organization of business processes and business*, and (4) *core disciplines.* The solid information technology refers to disciplines that deal with the borderline of electrical engineering, computing and information technology, or communication with the sensor-computer, and by collecting, storing and processing data for later information and knowledge discovery. Below that level, there is a so-called. soft computing, and experts, scientists and teachers in this discipline primarily deal with machine-human interaction, computer system security, and data analysis. The disciplines of business process and business organization are concerned with re-engineering the existing value chain and reflecting on new added values, which are gained in organizations by improving and creating new internal and inter-organizational processes. Finally, all this would not be possible without the proper support of the core disciplines that cover the STEM knowledge required for the creative development of the Internet of things. Primarily, this includes mathematics (graph theory, multicriteria optimization methods, mathematical logic), electronics, statistics and probability, programming, database and operational research.

Although the Faculty's capacities work satisfactorily, they are not entirely geared towards Industry 4.0, the Internet of Everything, and the strategy of general digitalization of organizations. Therefore, it is necessary to increase certain capacities, and to focus on research related to Industry 4.0, and to create a curriculum for the education in such an environment, bearing in mind that some jobs for which the curriculum is being built are not yet available.

Interesting research topics within this strategic area for which FOI has capacities are: orchestration of fully autonomous systems, coordination of networked organizations in real-time, high product and service adaptability, and new business-based business models, analysis of large data sets, networked sensors, new methods of artificial intelligence and decision-making mechanisms, security of networked autonomous systems.

The area is significant for FOI because it has a business, organizational and IT component. In this respect, it represents a logical evolution of the existing information system paradigm. The German strategy known as Industry 4.0 includes four components: cyber-physical systems, Internet of Things, Internet services and smart factories. All four will strongly affect organizations, business processes, and business.

The Internet of Everything is a relatively young discipline and the area of strategic step forward for the Faculty. At FOI there is a research group of about ten researchers directly oriented to the Internet of Everything. It is about researchers who have been directly or indirectly involved in teaching and research activities for more than 5 years and involved issues related to the development of mobile technologies. In the area of development and integration of mobile and related technologies, this group has strong references, while in the field of the *Internet of Everything* all references are currently enabled through the research projects funded by the Croatian Science Foundation. Furthermore, a trial run of the Internet of Everything -related topics is done within several courses, and there is also a suitable circuit. Further project activities related to the Internet of Everything are expected. Over the next period, the number of researchers will increase because new employment is expected on project funds. However, far more researchers engage in close disciplines such as new aspects of security, data analysis and so on. This area will be developed according to the following guidelines:

TEACHING: Development of two new undergraduate study programs that should replace the existing Information Systems program. Development of at least two new degree programs at the graduate level that should replace the existing Information and Software Engineering program.

RESEARCH: Development of several centres and laboratories related to contemporary development paradigms and interaction between organization and technology.

TECHNOLOGY TRANSFER: (Re) positioning of the Faculty as the leading institution for future information systems and industry 4.0. Permanent project co-operation with relevant partners focused on capacity building in this strategic area.

Big data analytics and artificial intelligence

Scientific relevance and scope

Big data analytics / data science is a relatively new research and professional discipline that encompasses a wide area of computer application in the analysis of large amounts of heterogeneous and unstructured data with the aim of extracting information and knowledge. Analytics "discovers, interprets and communicates meaningful patterns in data" by applying "statistics, computer programming and operational research" to "data visualization". There is a lot of overlapping of the content of disciplines that this broadly interdisciplinary field encompasses - machine and/or statistical learning, data mining, knowledge extraction from data, computer

statistics, data visualization, text mining, operational research, mathematical modelling, and technologies such as heterogeneously distributed bases, warehouses and data lakes, extraction and transformation of data, and distributed computing.

Artificial intelligence consists of: machine supported learning, visualization of data and knowledge, automatic locking, robotics, intelligent agents, etc. Machine supported learning enables organizations the new business models and optimization of business processes while encouraging creative engagement of employees and increasing user satisfaction. Artificial intelligence and machine learning create added value to organizations in various ways: e.g. through personalization of services, improvement of loyalty and retention of users, the process of employee selection, etc. Deep learning, one of the machine learning sub-areas, has had impressive results lately, especially in the areas of facial recognition, speech recognition and computer games. Because of these successes, deep learning is often identified with artificial intelligence.

In addition to the general area of big data analysis, there is also a whole range of domain subdisciplines, for example, "web analytics", "business analytics", "predictive analytics", "health analytics", "learning analytics", etc.

Gartner defines predictive analytics as a data mining approach that puts emphasis on the prediction, is conducted faster than traditional data mining (in hours or days vs. months), expects the results to be commercially relevant and available to the business user in real time.

Goes (2014), in a preface to the special issue of the MIS Quarterly magazine, "Transformational Issues in Big Data Analytics" lists three perspective areas of research related to big data in information science:

1. Big data infrastructure,
2. Big data analytics and
3. Transformation and impact on business.

The first area is related to data sources, data storage, 4 V (volume, velocity, variety, veracity) database management (including the map - reduce technology), computing (high-performance computing), control (security, privacy, confidentiality, ownership) and archiving.

The second area is related to decision support and includes issues regarding decision-making time (in real time or other time granulation), analytics (visualization, explanatory and predictive methods) and analytical techniques (statistics, econometrics, machine learning, computational linguistics, optimization, simulation). On the line data => information => knowledge => intelligence, this part is placed in the upper level of the hierarchy - the creation of knowledge and intelligence supporting decision-making and strategic goals.

World leaders today use artificial intelligence-based tools to automate decision-making processes and start experimenting with the advanced use of artificial intelligence for digital transformation. Great public attention is provoked by the controversy over the impact of artificial intelligence on the job market. Certain extreme predictions go so far as to warn that robots and artificial intelligence will take over a large majority of jobs. McKinsey & Company argue that automation will lead to

complete abolition of jobs in the next decade and will affect, to a greater or lesser extent, almost all jobs (*http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/where-machines-could-replace-humans-and-where-they-cant-yet*), but Gartner's predictions are as follows: "AI will eventually replace many routine functions of the IT organization, particularly on the operations side." (*http://www.gartner.com/newsroom/id/3707317*).

Artificial intelligence systems today have impressive but still narrowed opportunities. Since the development of artificial intelligence needs to be monitored due to the potential to have a major impact on social processes and society as a whole.

Significance for FOI and capacity for research, teaching and application

At the Faculty, there are 20 courses related to this area either as direct relevant subjects or as prerequisites for acquiring the necessary competencies. With a minor content adjustment, there is a sufficient amount of subjects that could form the basis for a **new graduate study in the analysis of large datasets and artificial intelligence.**

The holders of these subjects have publications from certain disciplines that form a wider area of analysis of large datasets.

Research related to the wider field of analysis of large datasets is carried out in four departments within the Faculty of Organization and Informatics (Information Technologies and Computing, Quantitative Methods, Development of Information Systems, Fundamental Theoretical and Applied Information Science) and in two laboratories and one centre (Laboratory for Generic Programming and Machine Learning, Laboratory for Artificial Intelligence and Centre for Forensics, Biometrics and Privacy). There are also appropriate project references in the form of bilateral projects and work packages within major projects.

This area will develop according to the following guidelines:

TEACHING: Development of a new study program at the undergraduate level Development of at least two new study programs at the graduation level.

RESEARCH: The development of several centres and laboratories related to certain aspects of this wider area, i.e. specializing in specific domains (learning analytics, business data analytics...).

TECHNOLOGY TRANSFER: Capacity building and project cooperation with focused partner organizations in the domain of this strategic area. Gradual construction of recognition in this strategic area.

Economics of entrepreneurship and innovation management

Scientific relevance and scope

Entrepreneurship is a multidisciplinary area, which is indicated by the fact that one area (discipline) cannot define who the entrepreneur is, what he is doing, how entrepreneurial culture and skills are developed, or how to solve problems in a creative and innovative way. However, economics as a science and teaching discipline brings many different theories and methods by which entrepreneurship is studied. Therefore, the economics of entrepreneurship as a comprehensive concept, among other things, seeks to explain how the newly emerging economic conditions affect entrepreneurship, the development of entrepreneurial culture and initiatives, as well as how the activities of entrepreneurs reflect on the national and global economy, and socially responsible businesses.

Strategic documents related to entrepreneurship[5] can identify several areas of entrepreneurship development: corporate (internal) entrepreneurship, social entrepreneurship, green entrepreneurship and digital entrepreneurship. Each of these areas is represented in the research activities of teachers and researchers working at the Faculty and in the curriculum of Economics of Entrepreneurship, as well as of Informatics study programs.

More important research areas recognized within strategic documents that support the development of entrepreneurship, but also in line with research results and curriculum of the study program Economics of Entrepreneurship are lean methodology; social entrepreneurship; innovation management (innovation entrepreneurship); business analytics and planning; Entrepreneurial learning; business finances. To a certain degree, these areas are also studied within individual courses of the study of informatics. Interdisciplinarity is the fundamental idea of entrepreneurship, and the interweaving of entrepreneurship and information and communication technologies is an important basis for social development, which is the core of FOI's organizational competencies.

Significance for FOI and capacity for research, teaching and application

From the very beginning of the Faculty operation, this area is implicitly investigated and taught within the Department of Business and partly within the Department of Organization. Within the aforementioned departments, the areas of entrepreneurial economics and the related disciplines (Marketing, Business Planning, Organization, Business Economics, Company Finance, Accounting,

[5] *The Entrepreneurship 2020 Action Plan, Competitiveness reports, The Small Business Act for Europe, The Entrepreneurship Competence Framework (https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/entrecomp-entrepreneurship-competence-framework).*

etc.) are explored. It should be emphasized that teachers and researchers from other departments contribute to the development of the Economics of Entrepreneurship field through their research work and teaching engagement. These are primarily teachers from the Information Systems Development Department, the Department of Quantitative Methods and the Department of Information Technology and Computing.

Prior to starting the Economics of Entrepreneurship study, the entrepreneurship has developed on FOI and is still being thought, within Informatics study programs.

University undergraduate and graduate study the Economics of Entrepreneurship is based on the knowledge that there is a significant number of small and medium enterprises in the Republic of Croatia, and especially in the north-west (NW) part where large enterprises are situated, as well as classical family businesses for which the transfer of ownership to younger generations is typical. Daily changes caused by technological revolutions require new knowledge, the application of new methods and thinking, as well as educated entrepreneurs and managers who will be able to achieve global competitive goals. Graduates from this study find jobs in small and medium-sized enterprises, but also in large companies (all types of economic activity) because knowledge and skills from economic, entrepreneurial and IT disciplines are the basis for the professional development of modern entrepreneurs and managers, as well as high-level experts in public administration bodies.

As a complementary advantage and added value of the study program Economics of Entrepreneurship, it is emphasized the systematic use of modern information and communication technology as a generic organizational knowledge factor. The goal is to successfully conduct regular business activities in all segments of a company.

The realization of the Strategy involves the establishment of a Laboratory for Entrepreneurship and a stronger emphasis on entrepreneurship in information technology, which is a logical continuation of the previous project activities and issued publications resulting from the performed activities in the field. With the implementation of educational programs, monitoring and development of a start-up community, awareness of students about the importance of entrepreneurship development and fostering the entrepreneurial culture, the Laboratory will be responsible for developing and managing projects for entrepreneurial development.

This area will be developed according to the following guidelines:

TEACHING: Innovation of Graduate Studies in Economics of Entrepreneurship. Development of new study programs on undergraduate and graduate level (Informatics studies).

RESEARCH: Developing a Laboratory for Entrepreneurship.

TECHNOLOGY TRANSFER: Capacity building and project co-operation with small and medium-sized enterprises. Development of student and academic entrepreneurship. Gradually build recognizability in this strategic area..

Management of Organizations and Business Processes

Scientific relevance and scope

Organizational structures are the foundation of the modern economy and society and the basis for economic growth. The application of information technology is inextricably linked with organizational development, which is evident in numerous process paradigms that source from the re-engineering of business processes.

The area of management of organizations is closely related to the management of business processes, as well as to the area of information systems development. The design of organizations and their information systems is related to three approaches within business process management[6]:

- ***Top-down approach*** focuses on significant improvements and re-engineering in the pursuit of strategic goals and in the context of performance management. It covers the analysis of strategic goals, the analysis of user requirements, the analysis of key products and services of the organization and the way of generating output through a chain of adding new values taking into account the processes and their contribution to the value chain. This is a continuation of the classic paradigm of strategic planning within contemporary organizations.
- **Bottom-up approach** focuses on the improvement of individual activities of interest, and more and more areas are involved incrementally. It involves identifying specific problems, and then processes that are related to recognized problems at operational and tactical levels, after which it gradually expands to related processes to higher management levels. This approach is adapted to modern agile organizations with a lack of strategic capacity.
- ***IT - oriented approach*** is focused on the automation / digitalization of business processes. The emphasis is on analysing, modelling, improving and then designing business processes with the strong support of modern information and communication technology. This approach is related to the concept of Industry 4.0.

All three approaches are represented in the research and teaching activities of FOI, permeating through various topics within projects and courses.

Linking the knowledge about Management of Organizations and Business Processes, the application of the BPM(N) paradigm in ICT and related areas has been recognized in the trend estimates for future EU skills[7], according to which in 2014, 24% of ICT workplaces were related to management, architecture and analytics, or 1,823,000 out of 7,535,000, while for the period up to 2020, it is predicted an increase in the number of workplaces for *"ICT Management-related workplaces"* to 2,375,000, which is an increase of around 550,000 jobs.

[6] *The State of Business Process Management 2016, Paul Harmon.*

[7] *e-Skills Trends and Forecasts for the European ICT Professional and Digital Leadership Labour Markets (2015-2020).*

The needs of the labour market and the anticipation of new ICT-oriented jobs in various industries point to the fact that knowledge and skills related to organizational and managerial aspects and management of business processes are identified in projects related to educational strategies. According to the conducted analysis of the representation of the area of organization, business decision-making and business processes in the reference sources[8] the required knowledge and skills from various fields related to occupations and titles: IS Development Engineer, IS Architect, IS Analyst, Business Analyst, Business Analyst Processes, Business Systems Architect are the following: *Modelling Principles; Modelling and architecture of organizational systems; Implementation of the process approach; Risk management; Project management; Business decision making; Business Process Management; Engineering Design (Problem Definition, Alternative Solutions, Troubleshooting Techniques, Feasibility Analysis); Multi-criteria analysis; Evaluation of cost-effective solutions; Economic effects of ICT application; Organizational theory; Organizational design; Organizational behaviour; Analysis of organizational performance; Strategic management; Strategic IS planning; Analysis and quality control.*

Significance for FOI and capacity for research, teaching and application

FOI has been active in the field of organizational development and management of modern organizations for years. Scientists have published a number of papers with keywords organizations, business processes, decision-making (within Scopus and Inspec-2010-2015 databases). There is a significant number of doctoral theses including organizational themes, topics of strategic planning and decision making, and the topics of managing or modelling business processes, which points to the relevance of the area and the foundation of the future development of the Faculty in this area. In the area of organizational management, strategic planning, decision making and business processes, the Faculty conducted several scientific projects financed by the Ministry of Science and Education and the Croatian Science Foundation, several ESF (European Social Fund) projects and several commercial projects. The leaders of this area operate within the Department of Organization, as the Chairs for the Development of the IS, and the Chairs for Quantitative Methods. Research and teaching disciplines can be organized into several groups: (1) Theory and fundamentals of organization, (2) Organization management, (3) Business process management, (4) Business system design. The first group includes theoretical and methodological basics about systems, organizations, organizational structure, culture and management basics. The second group includes methods, approaches, paradigms, and effective organization management algorithms, relying on the descriptive decision making and normative approaches that include

[8] *Provedena je analiza relevantnih izvora: Software Engineering 2014, Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering, A Volume of the Computing Curricula Series (23 February 2015, IEEE Computer Society); IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems (Association for Computing Machinery (ACM), Association for Information Systems (AIS)); Guide to the Software Engineering Body of Knowledge - SWEBOK® 2004 Version - A project of the IEEE Computer Society; Professional Practices Committee; Projekt Stand4Info 2016, FOI.*

mathematical methods such as multicriteria, communication theory and application of information technology. The third group includes business process modelling, business process improvement, standards, and tools for BPM. The fourth group refers to the application of engineering and engineering disciplines and approaches to modern management, focused on organizational excellence.

In the perspective, it is the establishment of a Planning and Decision-making Laboratory and a Business Process Management Centre that will bring together interdisciplinary research teams that are naturally formed by working on a number of projects. They will be engaged in research and professional work in the field of management of organizations and business processes, with emphasis on strategic planning and application of strategic planning methods in profit and non-profit organizations, decision support from the aspect of normative and descriptive theories, including decision support systems and business process management with emphasis on modelling business processes.

This field will be developed according to the following guidelines:

TEACHING: Development of new study programs on undergraduate and graduate level (IT studies). Embedding new organizational content into other new study programs that will be developed at undergraduate and graduate level.

RESEARCH: Development of the Laboratory for Planning and Decision Making of the Business Process Management Centre.

TECHNOLOGY TRANSFER: Harmonizing activities with the strategic area **Information systems of the future, Internet of everything and relevant** disciplineand further positioning of the Faculty as a quality and reliable project partner.

Educational Technologies

Scientific relevance and scope

Educational Technology (EdTech) is a research discipline, but also a large area of application involving a wide range of tools and resources used to enhance learning, teaching and creative research.

The concept of educational technology here encompasses the concepts of e-learning or distance education, since the role of information and communication technologies in research and application is increasing.

According to Horizon Report 2016, we distinguish seven types of education technologies: user-focused technologies, digital strategies, auxiliary technology, internet technology, learning technology, social media/networks technology, visualization technologies.

The same source, being relevant for higher education institutions for the next 5-6 years, states the education technologies include online and mobile learning, open content and licenses, learning analytics and adaptive learning, digital badges, virtual and remote labs, while in digital strategies, particularly, it also includes the BYOD (Bring Your Own Device) and the Flipped Classroom concepts.

Horizon Report in 2016 - HE edition states: „*Bring Your Own Device (BYOD), along with learning analytics and adaptive learning, are expected to be increasingly adopted by higher education institutions in one year's time or less to make use of mobile learning and student data that can be gathered through online learning environments. The time to adoption for augmented and virtual reality, along with makerspaces, is estimated within two to three years, while affective computing and robotics are expected to be more prominent in colleges and universities within four to five years*."

Education technologies are highly propulsive scientific discipline due to their interdisciplinarity and high levels of application in the educational and business context.

The area of Learning Analytics is intersecting the areas of the Big Data, Data Science, which is also an interest of FOI for further development, so it is particularly important as a research domain.

Significance for FOI and capacity for research, teaching and application

Research on education technology is interdisciplinary and includes education, information, mathematics and economics, which enables the use of interdisciplinary FOI capacities.

At the time of the writing of this Strategy, three major e-learning projects are being conducted by FOI staff: **Horizon 2020 *CRISS - Certifcation of Digital Competences in Primary* and Secondary Schools,** HRZZ project titled HigherDecision with the theme of developing a methodological framework for strategic decision-making in higher education, two projects (ESF and ERDF), where FOI is the only academic partner with CARNET, and the goal of the project is to establish a system for the development of digitally mature schools in Croatia. FOI is currently involved in at least 7 international projects where it is anticipated to explore topics related to educational technology.

The estimate is that around 20% of all papers published by FOI researchers have a link to e-learning or educational technology.

Doctoral theses (20 credits) on e-learning and information technology topics have also been defended, which indicates the interest in the area and mentoring potential.

In addition, the courses from FOI received awards for the best e-courses at the University of Zagreb. FOI was the first university in Croatia to deliver the E-Learning Strategy and committed teachers to have all their e-version teaching materials in Moodle.

Four core research areas based on the competencies of FOI researchers having the potential to be internationally competitive are: learning analytics, design and quality of education technologies, student centred approaches and technologies, strategic management of educational technologies.

Unlike other strategic areas, the research of Educational technologies has an internal relevance for FOI in terms of improving the teaching process. In this respect, it can be stated that this area will be developed in three directions.

TEACHING: Encourage innovation and application of educational technologies in teaching at FOI through the establishment and operation of the Centre for Educational Technologies. The innovation of graduate studies Informatics in Education.

RESEARCH: Empowering and focusing research in the field of educational technologies by establishing a laboratory that would be the leader of FOI's participation in significant national and international projects. Establishment of the Centre for Educational Technologies.

TECHNOLOGY TRANSFER: Establish the leading role of FOI in Croatia and recognized role in Europe in the field of educational technology field through the technology transfer activities of the Centre for Educational Technologies.

Information security and open systems

Scientific relevance and scope

Contemporary development trends integrate information technology into almost all products and business systems as a key part of the system, where information technology traditionally had a supporting role some years ago. Such a concept is best seen through the development trend of "internet of things" where real-world objects, i.e. the world, have the ability to communicate, collect data and manage real-world systems. To provide these features, physical objects must have embedded miniature computers and related software and must be connected to a local network or the Internet. Future vehicles, which should be self-sufficient, are also complex systems with built-in computers and software that support the process of artificial intelligence and mutual communication between vehicles with a permanent connection to various services available through the Internet. A similar trend can be seen in the field of building management, the management of technological processes of production up to the level of management of entire cities where we talk about "smart cities".

There is also a change in financial business, where new digital currencies such as Bitcoin and Ethereum are increasingly being used in classical ways of paying. Classical contracts are replaced by “smart cleft” technology based on *blockchain* systems by which new financial and legal systems are created. As an organizational trend, more and smaller "start-up" companies are developing innovative, high-tech products and services that are marketed in extremely short terms.

The widespread implementation of computers and Internet connections also poses certain problems. Over the past five years, there has been a worrying number of attacks on power plant information systems, nuclear power plant and power supply systems aimed at disabling these facilities for realizing political interests through cyber-warfare.

The secrecy, integrity and availability of information is a fundamental feature of normal functioning and functioning of modern systems and organizations. The area of information security is wide-ranging and to cover all problem domains requires interdisciplinary knowledge. Ensuring normal operation and business continuity requires a very good knowledge of information technology, legal regulation, and methods of analysis and business process improvement. The management and processing of incidents require knowledge of legal regulations, preparation and training of incident processing procedures, computer forensics knowledge and collection and handling of evidence. Information security is also an informational problem where we want to identify, authenticate and authorize users using security protocols, cryptography applications, physical and logical access control and biometrics. The development of software products, i.e. desktop, web, or mobile applications requires developers who design software with embedded protection measures from the initial stages of design and development. The implementation of security measures is linked to the provision of network and Internet communications and implementation of security measures at the operating system and service level. It is more important to check the security deficiencies in organizations and products through security testing and ethical hacking methods. In the contemporary development of information security, there is an increasing trend of interdisciplinarity. Increasingly important is the development of open systems designed to ensure high availability and accessibility. The problematic domain of information security is suitable for the application of data collection and storage methods, application of artificial intelligence and machine learning, development of new algorithms in the areas of vulnerability identification and malicious code, identification of unauthorized access and user identities, development of new protocols and mechanisms for electronic business and development of new educational and organizational concepts aimed at improving the level of security in the organization. Part of this area is the protection of personal data influenced by relevant regulations (primarily the **G**eneral **D**ata **P**rotection **R**egulation) as an extremely important component of information systems development and business process management.

Significance for FOI and capacity for research, teaching and application

Organizations have the need for experts and knowledge from a wider area of information security and open systems. The aim of modern organizations operating in the IT sector is to develop products and services that have the desired level of security, as otherwise, the consequence of a possible security incident is a significant financial and reputation loss that can also result in a breakdown of business. In the Republic of Croatia and in the wider community there is a significant

interest of other faculties and companies in the development of education programs and work in the area of information security, which is encouraged by the interest of students and industry in the area of information security. FOI is to be the leader in teaching and research of information security and open systems. The Open Systems and Security Laboratory, the Forensic Centre, Biometrics and Privacy, and the Laboratory for Artificial Intelligence operate within FOI. The establishment of the Personal Data Protection Centre and several other related laboratories and centres are planned. The current field of specialization and competence at the Faculty provides a good starting point for a more powerful development of open system areas and a wider area of information security at the Faculty of Organization and Informatics.

This strategic area will be developed in the following ways:

TEACHING: Development of a new graduate study program from the information security domain.

RESEARCH: Development of existing capacities, the establishment of the Centre / Laboratory for the Protection of Personal Data and the Establishment of New Laboratories and Centres.

TRANSFER TECHNOLOGY: Continuation of existing project co-operation and capacity building for larger scale projects.

Values of the Faculty of Organization and Informatics

The core values of the Faculty derive from the tradition that has been nurtured for years, the general academic values and contemporary knowledge of the role of the academic community in society. These values are the guideline for the future and the point of reference for the realization of this strategy.

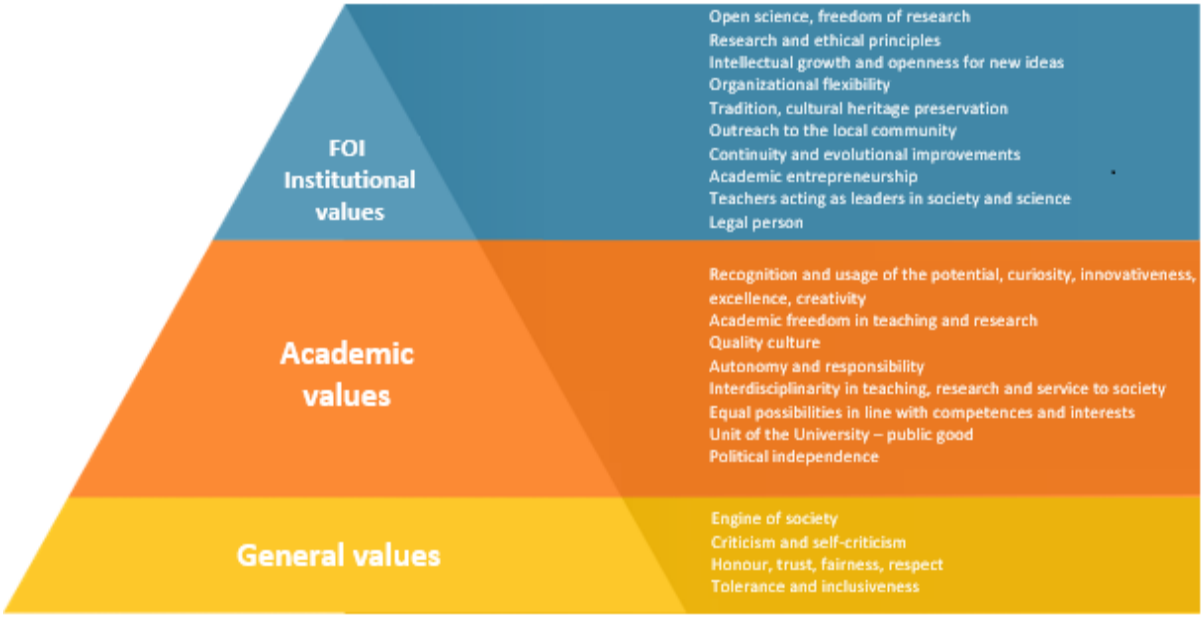

Figure 3. Pyramid of Values of the Faculty of Organization and Informatics.

The values of the Faculty are organized pyramidally, with the foundation being the general values of intellectuals operating in society. Next are the general academic values specific for institutions of higher education. At the top of the pyramid are specific values that the FOI considers to be the priority values in its operation. These values are indirectly included in the Faculty's strategic goals and are an important guideline for the future.

Mission and vision of the Faculty of Organization and Informatics

This strategic document defines the new Mission and Vision of the Faculty. They reflect the new development impulse that the strategy intends to spread and the fact that the Faculty has progressed significantly from the period defined by the previous strategy.

Mission Statement

The Faculty of Organization and Informatics of the University of Zagreb is a higher education institution which has been internationally recognized in the interdisciplinary field of informatics, organization and business, and is renowned for its excellence in student education, research synergy and its professional and teaching activities, educating students to remain competitive within the labour market so they can become the initiators of economic and social changes.

Vision

To be the leading institution within the Republic of Croatia, and amongst the top five institutions within the region providing education and carrying out research in the fields of informatics, organization and business, and to be recognized for its innovative approach to learning and teaching, the development of digital-era competences and its project activities and international partnerships.

Strategic Map of the Faculty of Organization and Informatics

The strategic vision mapping and mission implementation strategy has five perspectives and it is based on a balanced score system (Balanced Scorecard, BSC) method. The original perspective is developmental (***Learning, Growth and Development*** or Short Learning and Development) and the major challenge for some future administrations is to foster the development and mobilize the Faculty's capacities. At the implementation level (***Processes and Organizations***), a series of measures will be envisaged for turning development initiatives into regular practice. This will certainly require extensive organizational efforts. The strategy envisions the **establishment of new organizational units** as well as the corresponding changes in the management **system of the Faculty**. All this is done to satisfy the stakeholders within the higher education sector, which in this case relates to the labour market (especially the IT sector in the region), students, the public sector and the society as a whole. That is why ***stakeholder*** perspective is foreseen. Considering that higher education also has a wider social mission, a special perspective is devoted to ***public accountability***. On the top is the ***mission*** perspective what is common for public sector systems.

Although the structure of the strategic map seems complex, the essence of development efforts can be summarized in several important claims that will determine the priorities for implementing the strategy. The first is that **the revision of the curriculum should provide opportunity for the new strategic areas defined by this strategy.** This will bring **new knowledge, relevant to strategic teaching, to students and train them for future labour market challenges.** Another priority **is the grouping of research efforts in the form of laboratories and centres**, in relation to strategic areas. In addition to organizational change, the strategy also envisages **a range of complementary measures** (mobility support, improving competencies through workshops...) that should **boost academic work at the Faculty and increase visibility in strategic areas.** All other goals and activities have been integrated directly into these two main efforts.

In each perspective, the strategic map of each measure contributes to one of the top levels of higher education: teaching, research and social responsibility. It is symbolized by colours in a strategic map: blue-teaching, red-research, and green-social responsibility. Horizontal or support activities are presented unobtrusively and are spelt horizontally across the whole perspective. Because of the extraordinary networking of the measures and indicators on the strategic map, no causal link has been shown, but this is presented tabularly below. The strategy is elaborated at two levels: goals and activities. In the table, the objectives also include the following perspectives (**M**-mission, **PR**-public responsibility, **S**-stakeholder, **P**-process, **T**-teaching, growth and development) and the area covered by a particular goal (**T**-teaching, **R**-research, **A** -current activities, **X** -organizational horizontal activities and general capacity increase)[9]. The entire table breakdown

[9] *U ovoj razradi prikazana je pojednostavljena tablica ciljeva u kojoj se ne vidi povezanost pojedinih ciljeva. Detaljna tablica prikazana je u posebnom dokumentu i u njoj se vidi umreženost ciljeva tj. koji cilj niže razine doprinosi cilju više razine. U ovom dokumentu su samo pobrojani ciljevi po pojedinim perspektivama.*

contains goals and activities in each of the above-mentioned BSC perspectives. The goals were expressed in a way that the visible networking and linkage of the goals are ending with the mission of the Faculty that is at the top of the networked goal structure. The realization of the goals is envisaged through a series of activities whose implementation should achieve the stated goal. Therefore, each activity is assigned to a particular goal. Goals and activities are listed as a key success indicator and desired final value. The description of all perspectives is listed below starting from the perspective of learning, growth and development in the context of fulfilling the mission.

The Teaching Perspective (**T**) contains the goals related to the development of human resources in the research and teaching aspects of the work and the professional staff in supportive activities. No development in higher education can be considered without investing in the development of high-quality human resources. Of course, the recruitment and retention of young scientists at the Faculty is a special challenge, which is hampered by the conditions in the labour market. This perspective envisages a systematic staff development approach based on a series of workshops, encouraging scientific excellence and research mobility. The emphasis will be on strategic areas. The development of the teaching component is also planned through development of competencies for new methodical approaches and application of educational technologies. The development of human capacity in supporting activities is primarily aimed at acquiring knowledge from the project management domain. Within the perspective of teaching and development, the development of spatial and information infrastructure is envisaged, which is a precondition for numerous advances in teaching and science. The perspective of Teaching, Organizational Growth and Development will include more financial resources in the future, and significant investments will be needed to realize this prospect and lead to the strategic shift of the Faculty.

The Process Perspective (**P**) includes goals and their related activities regarding the application of developmental potential and the capacities achieved in the learning perspective. The important goals are related to the development and modernization of curriculum and teaching process. Fundamental support will be identified by strategic areas and the development of human resources built through activities that support goals in the teaching perspective. Scientific work will be supported through the organization of centres and laboratories and the consolidation of research efforts at the institution. In this sense, a number of activities related to mobility, publishing and the enhancement of the quality culture will be conducted. An important part of this perspective is a set of horizontal goals designed to build capacity for strategic management, the culture of tolerance and academic rectitude.

The Stakeholder Perspective (**S**) group goals that converge interests of stakeholders interested in the results of the Faculty. These are business entities, public administration, and the research and higher education institutions. In this respect, this perspective measures the output of the Faculty in terms of graduates' compliance with the needs of the labour market, the number of diplomas awarded and the efficiency of studying over the course through the study vertical. Furthermore, this perspective deals with the quality of project work, international recognition, academic entrepreneurship and the general relationship with the business sector and public administration.

Public responsibility perspective (**PR**) speaks of the general and long-term role of higher education institutions in a society that goes beyond the current labour market needs and technological fluctuation. It speaks of responsible business and resource management, social engagement, and equal opportunities. In this sense, the goals set by the Faculty in the anticipated strategic period of the validity of this strategy should be set out, whereby it should act as a socially responsible institution devoted to the general progress of society.

At the top of the strategic map is the mission perspective (**M**), whereby the mission of the Faculty is expressed in three objectives.

In all perspectives other than the mission, there are also indicators of success and their desired values that will be used to monitor the success of the strategy.

The strategic map and the related goals and activities are a balanced view of the development of the Faculty of Organization and Informatics of the University of Zagreb. Map includes all the aspects that a modern higher education institution must have and during the implementation process it should be kept in mind the importance that the balanced development set out in the strategic document should not be lost during the whole strategic period.

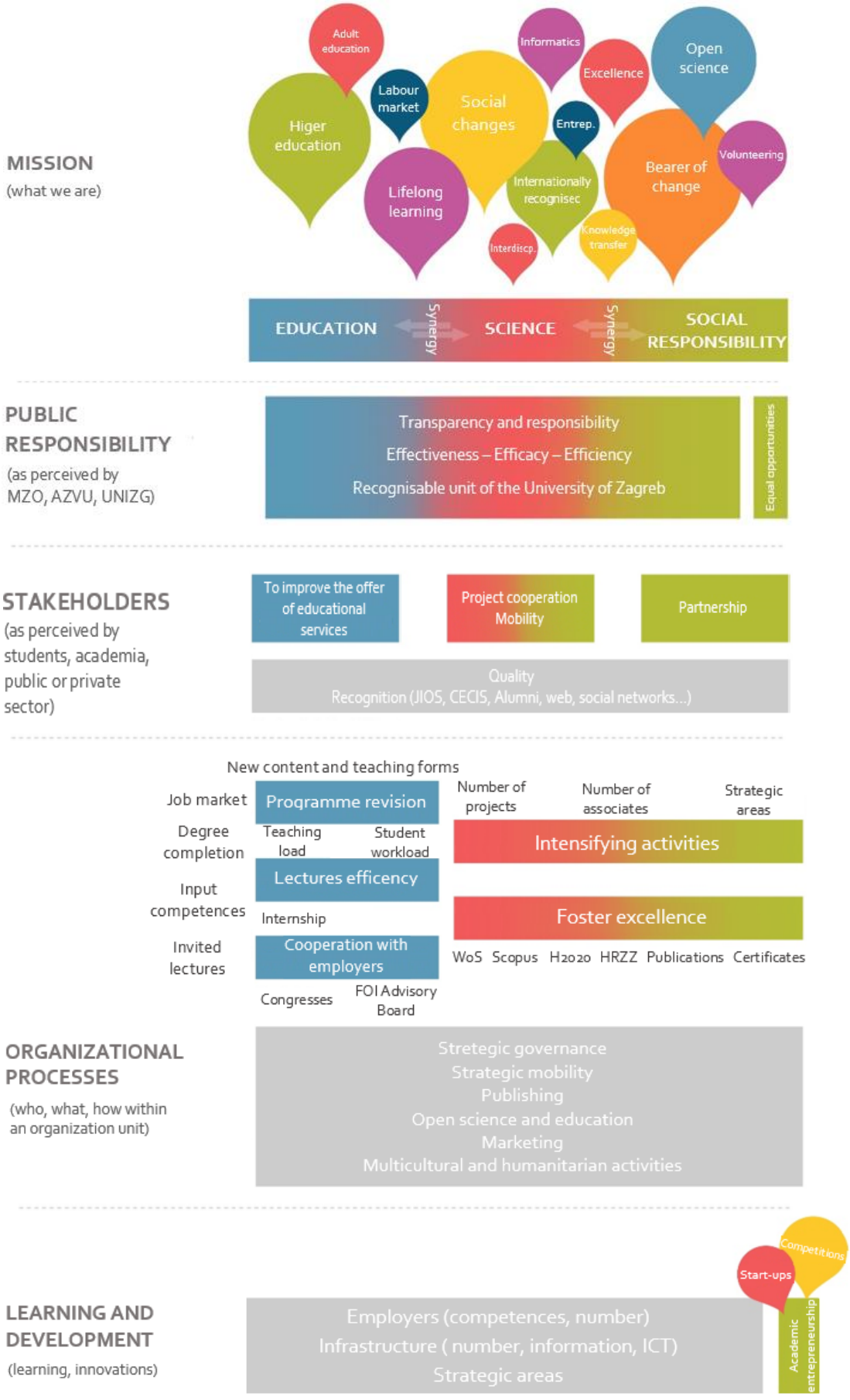

Figure 4. Strategic map of the Faculty of Organization and Informatics in the period 2018 - 2022

Table 1. Goals of the Faculty of Organization and Informatics in the period 2018 - 2022

ID goal	Perspektiva	Područje	Naziv cilja	KPI	Ciljana vrijednost KPI
M1	M	T	Educate students that could be competitive on the job market for a long period and become bearers of economic and social changes.		
M2	M	R	Be university unit internationally recognised within interdisciplinary field of informatics, organization and business.		
M3	M	X	Reach excellence and synergy of research, profession and teaching		
J1	PR	X	Foster transparency and responsibility in public asset governance	Statement of the state audit (periodically)	Unqualified opinion.
J2	PR	X	Increase efficacy, efficiency and economy in teaching, scientific and professional activities and business	Total revenue per area (annually)	Increase of total revenues of all projects (scientific and professional) in the strategic period for 20% compared to previous five-year period.
J3	PR	X	Be a proactive unit of the University in the field of planning, management, leadership and strategic guidance	Council sessions and thematic sessions of the Faculty Council (annually)	2 council sessions and 3 thematic sessions of the Faculty Council.
J4	PR	T	Pružati jednake mogućnosti za učenje i rad predstavnicima ranjivih i podzastupljenih društvenih skupina	Broj studenata iz ranjivih i podzastupljenih društvenih skupina kojima FOI pruža podršku (u strateškom razdoblju)	Increase the number of students from vulnerable and underrepresented groups using counselling services or the Office for Disabled Persons by 30% (20 and more students).
D1	S	T	Strengthen the teaching programs for lifelong learning and adult education aligned with labour market needs	Number of persons attending targeted programs (in the strategic period)	Maintain the attendance within professional studies at least at 80% / Open at least one new postgraduate professional study / Maintain existing postgraduate specialist studies / Increase the number of lifelong learning program participants by 5% compared to the previous five year period.
D2	S	T	Increase the efficiency of studying	The third quartile of studies (per year) and the percentage of students who regularly enrol in a higher year / Ratio of enrolled students completing the program/ Number of students completing undergraduate level (with an average grade higher than 3.0)/ Number of students completing graduate level (with an average grade higher than 3.0)	Duration of studies for all study programs equally prescribed by study length / Increase the number of students who regularly enrol for the senior year by 10%/ 70% undergraduate / 99% graduate in the strategic period.

D3	S	R	Strengthen national and international project-oriented cooperation in strategic fields	Number of partners within scientific or project cooperation (sub indicator - national, international, in strategic fields) – annually and cumulatively	Increase of the number of partners with whom a cooperation agreement has been signed for 30% in the strategic period.
D4	S	R	Foster the culture of entrepreneurship (making business studies, start-ups and academic entrepreneurship for employees and students)	The number of companies with which FOI has business cooperation with the aim of supporting academic entrepreneurship (start-ups, co-ownership, part-time employees, grants, joint projects) – annually	At least one new company per year.
D5	S	X	Encourage excellence, improve quality of teaching, scientific and professional activities	Statement of reaccreditation, external and internal Thematic Evaluation and External Evaluation of the Quality Improvement System (Periodic)	Mandatory positive, at least equal or better than the previous one.
D6	S	X	Improve national and international scientific recognition of FOI	Number of papers in WoS and Scopus/ Citations in WoS and Scopus	Increase in number of works by 10% / Increase in number of quotations by 5% annually.
P01	S	T	Revise the existing programs - align with labour market needs, introduce new content and teaching methods	Every 10 years major revision and every five years a minor revision of all plans and programs (KPI is the share of study programs that are updated according to our standard for periodic audits of 10 and 5 years) (yearly for the last five years)	100%
P02	P	T	Improve the quality of teaching process	Success rate in continuous monitoring (the indicator is monitored on an annual level, strategic period implementation)	For all subjects at least 40% / for 50% of subjects between 50% and 80% / For 90% the combination of subject-teacher results of the student survey are above 3.
P03	P	X	Increase the visibility and recognition of the Faculty (advertising the study enrolment, Faculty Day, social networks, website, souvenir design etc.)	The ratio of the entry quotas and the interested candidates to enrol (per year)	At least 4 interested candidates for a single place of entry.
P04	P	R	Foster internationally recognised excellence in research activities	Number of papers in WoS and Scopus, pondered by IF and SNIP (measured annually realisation of the goal value until the end of strategic period)	Annual sum of SNIP of journals that published papers at least 20.
P05	P	R	Intensify the research activities within strategic fields	The ratio of staff (scientific and associate professions in centres and laboratories) participating in at least one scientific project / sub indicator in the strategic area (per year)	Annual growth of the number of employees participating in the project (s) by 10%.
P06	P	X	Strengthen international mobility and recognizability	The ratio of staff participating in mobility programs (within strategic period)	Until 2022 ant least 30% of teachers will be included in mobility programs.
P07	P	R	Intensify the cooperation with business and general public focusing on strategic fields	The ratio of people included in professional projects (sub indicator in strategic fields); (annually)	In strategic period the 80% of teachers will be included in projects with business sector or general public focusing on strategic fields.

P08	P	X	Encourage the creation and use of open resources - open access to scientific information, use of open code	The ratio of teachers publishing in open access (measured annually, success of the indicator on the end of strategic period)	At least 30% of all published research papers available in open access.
P09	P	R	Intensify publishing activities (JIOS, monographs, textbooks, approval of publishing, sales, ...)	Scimago Journal Ranking (SJR) of JIOS (annual) Annual number of university textbooks	By 2022, it should have IF and be in Q3 by SCOPUS (for the Information Systems category). One university textbook annually.
P10	P	X	Foster the culture of tolerance, multiculturalism, humanitarian and volunteering	Number of students and staff included in volunteering activities	Increase by 50% until 2022 (70 and more volunteers)
P11	P	X	Strengthen the capacity for strategic management and decision-making at the Faculty level	Number of measured indicators (annual)	By 2022, systematic monitoring of all indicators in the strategy should be established.
P12	P	X	Foster the culture of academic rectitude	Number of students included in workshops on academic rectitude Number of researchers included in round table on academic rectitude (annually)	All senior-year students have to be included in workshops on academic rectitude. By the end of strategic period all teachers have to participate in activities regarding the academic rectitude.
P13	T	T	Foster student entrepreneurship	Call for student start-up conducted (annually)	At least two calls annually.
U01	T	T	Improve teaching competencies and potentials of staff	Ratio of teachers participating the workshop on teaching improvements (annually)	Minimum of two workshops in the area of teaching annually. Minimum of 15% of teachers participating the workshops annually.
U02	T	R	Improve professional competencies and potentials of staff	Ratio of researchers included in the educational programs regarding the research methodology, mentorships or strategic field (annually)	At least 15% of researchers annually.
U03	T	X	Improve competencies and potentials of supporting staff	Ratio of expert associates included in the education relevant for the operation of the Faculty (annually)	At least 20% of expert staff members annually.
U04	T	X	Improve spatial, information and computational infrastructure	Number of conducted infrastructural projects (annually))	1 larger infrastructure project conducted annually.
U05	T	X	Innovate the fields of interest and expand to new strategic fields	Number of new project activities (intern projects, cooperation with business, specialist studies, seminars, summer schools) in strategic fields (annually)	At least 1 per strategic field annually.
U07	T	T	Introduce new technological solutions and methodological approaches to teaching	Number of innovative subjects (annually)	At least 3 innovative subjects annually.
U08	P	X	Improve and innovate business processes continually	Number of improved business processes (annual process analysis, reach KPI by the end of strategic period)	In each perspective at least one improved business process annually.

Table 2. Activities of the Faculty of Organization and Informatics in the period 2018.-2022.

Activity ID	Activity	Monitoring Mechanisms / KPIs	KPI Target Value	Frequency of monitoring (or deadline for one-time activity)	Responsible person	Activity leader	Resources Needed	Goal ID	Goal title
A01	Constructively engage in the management of TPV and protect the interests of FOI	Number of joint activities with TPV (projects, start-ups, workshops, newsletters, joint events, etc.). Using incubation space.	2 joint activities of cooperation	annually	Vice-dean for Science and International Cooperation / Vice-dean for Business	CRPP, CMP, CPSRK, Public Relations Office	person/months	D4	Foster the culture of entrepreneurship (making business studies, start-ups and academic entrepreneurship for employees and students)
A02	Conduct a public discussion and align the proposal of the qualification standard with partners and other stakeholders	Enter the proposal of the qualification standard in the CROQF register	2 qualification standard proposals	end of 2020	Vice-dean for Teaching	Leaders of (CROQF) projects, leaders of working groups	person/months	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods
A03	Harmonize the proposal of standards of qualifications with the results of the public discussion and the sector councils	Standard qualifications entered in the register of CROQF	8 suggestions of occupational standards up to 2022	end of 2018	Vice-dean for Teaching	Leaders of the CROQF Project, leaders of the working groups	person/months	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods
A04	Revise the PDS (informatics studies) and align with the CROQF and strategic goals	Proposal of the revised program submitted for evaluation / Number of new subjects in strategic areas	1/10 in undergraduate and 20 in graduate	1/5/2018	Vice-dean for Teaching	Department Heads, Leaders (s) of study programs / working groups	person/months	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods
A05	Revise the DS (IT studies) and align with the CROQF and strategic goals / Revise DS EP and align with the CROQF and strategic goals	The proposal for the revised program is submitted for evaluation	1-4	to 1.5. 2019th	Vice-dean for Teaching	Department Heads, Leaders (s) of study programs / working groups	person/months	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods

A06	Develop a new online professional PDS compliant with the needs of the labour market	The program proposal is submitted for evaluation	1 online professional PDS study	1/05/2019	Vice-dean for Teaching	Department Heads, Leaders (s) of study programs / working groups	person/months / internal project - funded with own resources or via a project line	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods
A07	Consultations with stakeholders on the adaptation of study programs to the needs of the labour market	Number of consultations	1 event	annually	Vice-dean for Teaching	CPSRK	no additional resources required	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods
A08	Maintain a database of employers and external stakeholders	Number of contacts / update (average / max of last contact time)	Updated database and permanent contacts	permanently	Vice-dean for Teaching / Vice-dean for Business	CPSRK	no additional resources required	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods
A09	Link the topics of undergraduate and graduate works with employers and professional practice	Number of graduate / final works	Minimum 20%	annually	Vice-dean for Teaching	CPSRK	no additional resources required	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods
A10	Intensify project work in teaching	Number of project-oriented courses	At least two per semester	annually	Vice-dean for Teaching	Department Heads, Heads of courses	space, person/months of teachers	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods
A11	Open the possibility of enrolling elective subjects from both areas in study programs (INF and EP)	Number of offered courses	2 per study program	annually	Vice-dean for Teaching	Student Registry Office	no additional resources required	P01	Revise the existing programs - align with labour market needs, introduce new content and teaching methods
A12	Balance the Teaching Work	The proportion of teachers who realize more than 130% of teaching efforts (including all levels of education)	Less than 40%	annually	Vice-dean for Teaching	Dean's Office	no additional resources required	P02	Improve the quality of teaching process

A13	Keep track of the popularization of study programs at FOI	Advertising Costs / Number of students FOI is the first choice for enrolment	Minimum 170 000 HRK / Minimum 700.	annually (upon enrolment)	Vice-dean for Teaching / Head of Public Relations	Head of Public Relations	financial resources	D2	Increase the efficiency of studying
A14	Revise the curriculum and align the ECTS credits with real efforts and quality standards	Survey results	Availability of data for audit of each study program	once in every 5 years / or prior to the revision of the study program	Vice-dean for Teaching	Centre /Lab for Quality and Institutional Research	person/months / Financial resources	P02	Improve the quality of the teaching process
A15	Use communication channels (media, social networks) to disseminate the achievements of employees and students	Number of news / Posts of Results of FOI Employees and Students	Increase media visibility by 30-40%. (80 entries annually)	annually	Public Relations Officer	Public Relations Office	person/months	P03	Increase the visibility and recognition of the Faculty (advertising the study enrolment, Faculty Day, social networks, website, souvenir design etc.)
A16	Bring an internal Book of Rules (decision) on criteria for selection in scientific-teaching professions and recruitment	Develop Book of Rules(Include Number of Competitive Projects / Publication Number in WoS and Scopus)	Adopted Book of Rules at the Faculty Council	12/2018	Vice-dean for Science and International Cooperation	Vice-dean's office	person/months	P04	Foster internationally recognised excellence in research activities
A17	Motivate the participation in research projects	Ratio of research staff who successfully submitted a scientific project / Ratio of research staff participating in at least one scientific project (projects with a strong scientific research component) Number of ZIR projects	25% leadership, 75% participation	monitored annually (realisation at the end of the strategic period)	Vice-dean for Science and International Cooperation / Vice-dean for Business	CMP / Accounting Office	financial resources	P05	Intensify the research activities within strategic fields

A18	Administrative and managerial support for project applications and projects focusing on strategic areas	The percentage of project applications that were supported by CMP staff and Accounting Office	80% of projects	annually	Vice-dean for Science and International Cooperation / Vice-dean for Business	CMP / Accounting Office	no additional resources required	P05	Intensify the research activities within strategic fields
A19	Develop courses and teaching materials in English	Number of courses that are, in a given percentage, performed in English (part of a lecture, one group of exercises or seminars)	20% of subjects in undergraduate and graduate studies	monitored annually, the success indicator for the whole strategic period	Vice-dean for Teaching / Vice-dean for Science and International Cooperation	Office for International Cooperation, ECTS Coordinator, Chairs	person/months	P06	Strengthen international mobility and recognizability
A20	Continue to conduct activities presenting opportunities for incoming and outgoing mobility at our and partner institutions	Number of outgoing and incoming mobility	40% increase for outgoing student mobility. / 20% increase for incoming student mobility	monitored annually, the success indicator for the whole strategic period.	Vice-dean for Science and International Cooperation	Office for International Cooperation, ECTS Coordinator	no additional resources required	P06	Strengthen international mobility and recognizability
A21	Organize events related to science and international cooperation (Day of International Cooperation, Erasmus Info Day, CECIIS, Time4Science, Workshop for Mentors at Doctorial Study, etc.)	Number of events	At least five events per year	annually	Vice-dean for Science and International Cooperation	Dean's Office / Centre for International Cooperation / Public Relations Office	no additional resources required	P06	Strengthen international mobility and recognizability
A22	Enable the implementation of student mobility within the revision of study programs	Revised program with a predefined mobility semester	Adopted at FC	in the strategic period	Vice-dean for Teaching	NPP Revision Committee	no additional resources required	P06	Strengthen international mobility and recognizability

A23	Enabling teachers to participate in a mobility program (ERASMUS, mobility, project mobility, etc.)	The ratio of teachers included in the mobility program	By 2022, at least 30% of teachers participated in the mobility program.	annually	Vice-dean for Science and International Cooperation	Office for International Cooperation	Financial resources	P06	Strengthen international mobility and recognizability
A24	Organize invited lectures by private and public sector professionals on FOI (both within and outside of teaching schedule)	Number of hours of invited lectures	At least ten per year	annually	Vice-dean for Teaching / Vice-dean for Development	CPSRK	no additional resources required	P02	Improve the quality of teaching process
A25	Establish a Council/ maintain regular sessions	Number of sessions	2 sessions per year	annually	Dean	Dean's office	10 person/months for administrative support	P02	Improve the quality of teaching process
A26	Conduct professional projects (commercial and non-commercial)	The ratio of employees participating in an expert project	30% of employees	monitored annually, the success indicator refers to the whole strategic period	Vice-dean for Development	CMP / CZRPP	no additional resources required	P07	Intensify the cooperation with business and general public focusing on strategic fields
A27	Establish Centre for Quality and Institutional Research	Number of KPIs to be monitored	All listed in the strategy	in the strategic period	Vice-dean for Development	Dean's office	financial resources, space, furniture and equipment	U08	Improve and innovate business processes continually
A28	Monitor quality indicators	Number of reports annually	1 report at the end of the academic year on the status of all indicators	annually	Head of the Quality Committee	Centre / Lab for Quality and Institutional Research	material costs	U08	Improve and innovate business processes continually
A29	Strengthen the role of students in the decision-making process	Number of forums and consultations with students	Minimum 5	annually	Vice-dean for Teaching / Secretary of FOI	Vice-dean / CPSRK Office	No additional resources are needed	U08	Improve and innovate business processes continually

A30	Establish and improve organizational procedures as part of user specifications for information system development	Number of Processes Described / Number of Improved Processes	In each perspective, one new process is documented and one improved	monitored annually, the success indicator refers to the whole strategic period.	Vice-deans by the area of jurisdiction	Centre / Lab for BPM and BP analytics	financial resources / person/months	U08	Improve and innovate business processes continually
A31	Define the topics of final / graduate and postgraduate works in line with strategic areas for achieving strategic goals (development within new areas, business process improvements, information system development)	Number of works / offered topics referring to the strategic areas and achieving the strategic objectives of FOI	10/20 annually	annually	Vice-dean for Teaching + other Vice-deans by the area of jurisdiction	Chairs / mentor	Person/months	U08	Improve and innovate business processes continually
A32	Conduct Self-Evaluation of the Faculty and Quality Monitoring	The level of maturity according to the evaluation of the Agency for Quality in Science and Higher Education	The higher and better the previous one	by invitation	Head of the Quality Committee	Centre / Lab for Quality and Institutional Research	Person/month, financial resources	U08	Improve and innovate business processes continually
A33	Establish a system for monitoring and informing employees on project calls, the possibilities within EU and other funds and the project and scientific results of the Faculty	Updating project and portfolios portal projekti.hr//Regular publishing of InFOImator / Dissemination events on project possibilities and activities.	At least four online magazines annually. Weekly update the portal projekti.hr with news and new calls.	annually	Head of CMP Vice-dean for Science and International Cooperation	CMP	person/months	U08	Improve and innovate business processes continually
A34	Improve the Business Processes of Student Registry Office	Student Satisfaction / Number of Complaints on procedures of Student Registry Office	0 complaints / excellent ratings in the survey	annually	Vice-dean for Teaching	Student Registry Office	no additional resources are required	U08	Improve and innovate business processes continually
A35	Organize counselling, education and dissemination activities	Number of workshops / Number of new projects annually	2 workshops / 15 submissions / 5 new	annually	Head of CMP	CMP	person/months	U02	Improve professional competencies and potentials of staff

	on application and project management		contracted projects		Vice-dean for Science and International Cooperation				
A36	Establish a database of professional services that FOI offers (technology mapping)	Number of signed contracts / contracted funds / number of FTE associates involved in projects	Created database and established business site of the Faculty	annually	Vice-dean for Development	CMP	person/months	U08	Continually improve and innovate business processes
A38	Improve the financial business process	Number of remarks and suggestions to improve according to the revision remarks	Unqualified opinion in the revision report	periodically - when revisio is carried out	Vice-dean for Business	Accounting / Public Procurement Committee	Person/months, financial resources	U08	Improve and innovate business processes continually
A39	Encourage the use of open code in teaching (Add to the curriculum information on whether the course is performed with the use of software support and whether it is an open code - excluding Moodle)	The ratio of subjects using open source code support among programs that use program support at all	50%	End of the strategic period	Vice-dean for Teaching	Departments	no additional resources are required	P08	Encourage the creation and use of open resources - open access to scientific information, use of open code
A40	Increase the level of quality and recognition of JIOS	The ratio of foreign reviewers outside of the exYu / ratio of the accepted papers /SNIP influence indicators	min 50% < 30% >0.5	per volume	Editor-in-Chief JIOS	JIOS Editorial Board	person/months	P09	Intensify publishing activities (JIOS, monographs, textbooks, approval of publishing, sales, ...)
A41	Support the issue of university and faculty textbooks	Number of new university and faculty textbooks	At least 8 Faculty or university textbooks in the strategic period	in the strategic period	Vice-dean for Teaching / Vice-dean for Science and International Collaboration	Publishing Commission	financial resources	P09	Intensify publishing activities (JIOS, monographs, textbooks, approval of publishing, sales, ...)

A42	Involve in volunteering activities	Number of students and employees involved in volunteering	A 30% growth in the strategic period	annually	Head of Volunteering Centre	Volunteering centre	person/months, financial resources	P10	Foster the culture of tolerance, multiculturalism, humanitarian and volunteering
A43	Organize humanitarian events	Number of humanitarian events	At least 3 events annually	annually	Head of Volunteering Centre	Volunteer Centre / Student Council	no additional resources are required	P10	Foster the culture of tolerance, multiculturalism, humanitarian and volunteering
A44	Enable students with disabilities and those from vulnerable social groups to successfully participate in the learning process	Number of students from vulnerable and under-represented social groups enrolled in FOI / The share of subjects where the performance of teaching or knowledge assessment is tailored to students from under-represented social groups given the number of cases where justified; Enabled elements of institutional adjustment in the form of adaptation of space, teaching materials and modes of communication.	Increase the ratio of students from vulnerable and under-represented groups compared to the existing number of enrolled such students in by 2-3%; Provide 100% of teaching materials in digital format (adapted to blind and partially sighted students); Ensur e 100% of communication agents (depending on the need of deaf and partially deaf students) Remove architectural barriers (Library. FOI 2)	End of the strategic period	Vice-dean for Teaching	Office for Disabled Students	no additional resources are required	J4	Provide equal opportunities for learning and working for vulnerable and under-represented social groups

A45	Establish a system of monitoring and reporting on the scientific, professional and teaching activities and implementation of the strategy	The share of KPIs that are tracked over IS.	30%	annually, the success indicator refers to the whole strategic period	Dean	Centre / Lab for Quality and Institutional Research / Heads of Offices	person/months, computers, equipment ...	P11	Strengthen the capacity for strategic management and decision-making at the Faculty level
A46	Monitoring the implementation indicators of the Strategy	The KPI ratio regularly monitored	100%	monitored annually, the success indicator refers to the whole strategic period.	Vice-dean (s) / Heads of Departments / Heads of Offices	Centre / Lab for Quality and Institutional Research	person/months, material costs	P11	Strengthen the capacity for strategic management and decision-making at the Faculty level
A47	Establish regular planning and monitoring of work / reporting on the work of centres and laboratories	Number of submitted plans / work reports	equal to the number of centres and laboratories	annually	Dean	Heads of the centres / laboratories	person/months	P11	Strengthen the capacity for strategic management and decision-making at the Faculty level
A48	Establish a Human Resource Management System	A 3-year staff development plan / ratio of teachers with a teaching load of more than 130%	Developed plan	end of the strategic period	Board / Secretary of the FOI	Centre / Lab for Quality and Institutional Research	No additional resources needed	P11	Strengthen the capacity for strategic management and decision-making at the Faculty level
A49	Encourage scientific and teaching staff and students to participate in the activities of national and international bodies promoting science and the profession	Number of positions where FOI representatives are in national and international bodies	At least 10 employees in national and international bodies	monitored annually, the success indicator refers to the whole strategic period	Dean	FOI Board	person/months, financial resources	P11	Strengthen the capacity for strategic management and decision-making at the Faculty level
A50	Perform activities to raise awareness of academic rectitude and related topics	Number of students / teachers completing workshops / Number of activities	100% / minimum 2 workshops annually	monitored annually, the success indicator refers to the whole strategic period.	Vice-dean for Science and International Cooperation / Vice-dean for Teaching	CPSRK	person/months, financial resources	P12	Foster the culture of academic rectitude

A51	Encourage participation of teachers in lifelong learning programs in the field of teaching improvement	Number of person/months in educational programs / number of successful completion of a program	organize at least 2 workshops a year	annually	Vice-dean for Teaching	Centre / Lab for Quality and Institutional Research	financial resources	U01	Improve teaching competencies and potentials of staff
A52	Organize education on topics of scientific research work of scientific research methodology / mentoring / project management	Number of events annually	At least 8	annually	Vice-dean for Science and International Cooperation	Departments/Council of Doctoral Studies	financial resources	U02	Improve professional competencies and potentials of staff
A53	Provide human resources in accounting for project financial management within targeted programs	Number of employees	at least two people	annually	Vice-dean for Business / Vice-dean for Science and International Cooperation	Accounting Office	financial resources	U03	Improve professional competencies and potentials of supporting staff
A54	Conduct activities with the aim of obtaining building permits and achieving operational program changes and securing funding for Phase II project University Campus Varaždin	Approved funds	Signed contract and closed financial plan of the project according to the budget allocation plan	in the strategic period	Vice-dean	FOI Board	person/months, financial resources	U04	Improve spatial, information and computational infrastructure
A55	Improve preventive maintenance of IS, computing systems and networks	Number of server failures / Ratio of unavailability of IS, server, network services or network	0 breaks < 1% of time	monitored annually, the success indicator refers to the whole strategic period.	Head of CZRPP / Head of CIP	CZRPP/CIP	person/months	U04	Improve spatial, information and computational infrastructure
A56	Implement activities to improve the existing and develop new IS functionality	Number of upgraded / newly established information (sub) systems	1 new IS subsystem (i.e. a subsystem of the existing system)	annually	Vice-dean (s) / CZRPP Head	CZRPP	person/months	U04	Improve spatial, information and computational infrastructure

A57	Provide additional spatial capacity for FOI activities	Weekly number of teaching hours that takes place after 5 p.m. in forms of education not considered as lifelong learning and adult education	0 hours of regular classes held after 5 p.m.	annually	Vice-dean for Business / Vice-dean for Development	Dean's office	financial resources	U04	Improve spatial, information and computational infrastructure
A58	Establish new laboratories and centres according to strategic priorities	Number of laboratories and centres / Number of papers per centre annually	Minimum one per strategic area / Minimum 3 WoS papers per Laboratory annually	within the first year of Strategy adoption	Vice-dean for Science and International Cooperation	Dean's office	person/months	U05	Innovate the fields of interest and expand to new strategic fields
A59	Organize short-term intensive programs	Number of programs annually / number of students annually	2/50	annually	Vice-dean for Teaching	Department	person/months	U05	Innovate the fields of interest and expand to new strategic fields
A60	Develop MOOCs	Number of MOOCs	1 annually	annually	Vice-dean for Teaching	Chair / mentor	person/months, financial resources	U07	Introduce new technological solutions and methodological approaches to teaching
A61	Encourage mentors and students to participate in student competitions and similar activities	Number of students and mentors involved in such activities	At least 50 students a year at competitions	annually	Vice-dean for Teaching	Chair / Working Group - Committee	financial resources, person/months, establish a base and define an obligation of students to report such activities	D6	Improve national and international scientific recognition of FOI
A62	Develop a business model for the work of a company owned by FOI	Business model and proposal of governance structure	adopted business model	within 6 months of the adoption of the Strategy	Vice-dean for Business / Vice-dean for Development	Dean's office		D4	Foster the culture of entrepreneurship (making business studies, start-ups and academic entrepreneurship for employees and students)
A63	Keep the login system in Startup@FOI	Number of successful entries	1	annually	Vice-dean for Business / Vice-dean for Development	Dean's office	Time, members of the committee	P13	Foster student entrepreneurship

Priorities and Implementation Methods

Fundamental priorities of this strategy and the overall approach to implementation relate to scientific and teaching positioning in strategic areas. Access to implementation is described through a series of activities and their implementation will take place in due time through multiple dean mandates. The implementation dynamics will happen largely parallelly, but the starting point will be in two leading perspectives - the teaching perspectives (T) and process perspective (P), which are crucial to the realization of mission and vision.

In the research component, positioning in strategic areas will start with organizational changes and the establishment of centres and laboratories. The mechanisms of scientific productivity and appropriate incentives for scientific excellence will be established. A series of workshops, dissemination activities and exchange of knowledge will be implemented to raise overall organizational knowledge. Project activities will focus on strategic areas and competitive funding initiatives. The incoming and outgoing mobility of staff will be supported to increase networking and open new partnership possibilities. This will require additional investment in human resources and the development of organizational procedures to support and monitor project activities.

In the teaching perspective, the emphasis will be on the revision of the entire curriculum and all preparatory activities that precede it. The undergraduate studies will be reviewed so that the strategic areas become represented in undergraduate courses. This will ensure that the appropriate core of knowledge is shared with all the students of a particular study program (the so-called core of IT and business knowledge). The graduate study will be further profiled through strategic areas that will be incorporated into the new graduate degree program so that the number of graduate-level courses is expected to increase.

Parallel with this, the overall maturity of the institution will be raised in terms of capacity for strategic management and continuous monitoring of key indicators of strategy implementation success. This will require building an appropriate information system, but also organizational mechanisms for managing change, collecting and interpreting strategy implementation indicators.

Risks

The key risks associated with the success of the implementation of this strategic plan can be grouped into four groups.

Fundamental risks relate to maintaining the existing and developing the new staff structure motivated by the great organizational changes envisaged by this strategy. Namely, the key to successful realization are the employees and the biggest challenge is to attract and recruit the best students for own personnel growth, as well as to retain our young scientists. The Faculty will need to engage own financial resources and permanently challenge the University and the Ministry to develop stimulating mechanisms to keep quality people in the system. The strategy envisions the development of human resources and the increase of project activities that should partly eliminate the mentioned risk.

The second group of potential risks refers to an eventual failure in assessing the development potential of strategic areas. This risk is not significant because a thorough analysis of strategic areas and their future development has been carried out. FOI needs to engage resources to enter the areas that will mark the development of modern society over the next ten years.

The third group of risks refers to changes in the higher education financing system. FOI grants a large amount of dedicated teaching resources through the program contracts and additional resources are realized through project activities. Both sources of funding will be used for the implementation of the strategy, by taking into account the correct spending of dedicated resources. In the last strategic period, there was a decrease in the funding of the Faculty. The implementation of this strategy will not be possible if another negative change occurs, as project resources cannot be the exclusive source of funding for development, especially as these are dedicated project funds.

The last risk is related to the drop in the number of students and reaching the enrolment quotas. Reasons for this can be demographic and due to increased competition from similar programs. A smaller number of students influence finances, but it also questions the realization of a new plan and program that envisages an increase in study curricula. It is therefore important to invest efforts in the competitiveness of the Faculty in the higher education market, invest in promotional activities and increase internationalization efforts. Realizing the goals of this strategy is a step in that direction.

All these risks are taken into account when considering strategy and the appropriate implementation of their activities, their impact can be mitigated or discarded at least in the domain in which the Faculty can influence.

Conclusion

The realization of this strategy is an important step in the development of the Faculty of Organization and Informatics. The strategy is based on our real resources, takes into account trends in information sciences and the higher education system and opens up room for development in the next strategic period. We are confronted with changes in the environment and our own human resource structure that needs a proper step-forward and organizational adjustment. This document, through a series of harmonized activities, envisages this adjustment and provides goals and guidelines for future growth that guarantee the institution's development.

The challenges that will affect the realization of this strategy are primarily related to the human resource restraints and shortages, our spatial limitations, the increasing competition in the area and the new areas of information sciences. Funding science is becoming more competitive and structured mainly through European sources with a high level of competitiveness. We have to make significant efforts to continue to develop the fields of informatics and economics and to build human resources for their implementation. All this has to be achieved in the conditions of stagnating employments through the resources of the ministry, but also despite the fact that the IT industry is in a strong market swing, making it more difficult for staff recruitment. Information and communication sciences are and will remain the leading driver of numerous economic and social changes. The very fact that the Faculty of Organization and Informatics works in such a propulsive area puts us in the trend of change that we must actively monitor and shape in order to remain competitive in the years to come. This idea is the essence of the development strategy and the fundamental strength of the Faculty of Organization and Informatics entering into a new strategic period.