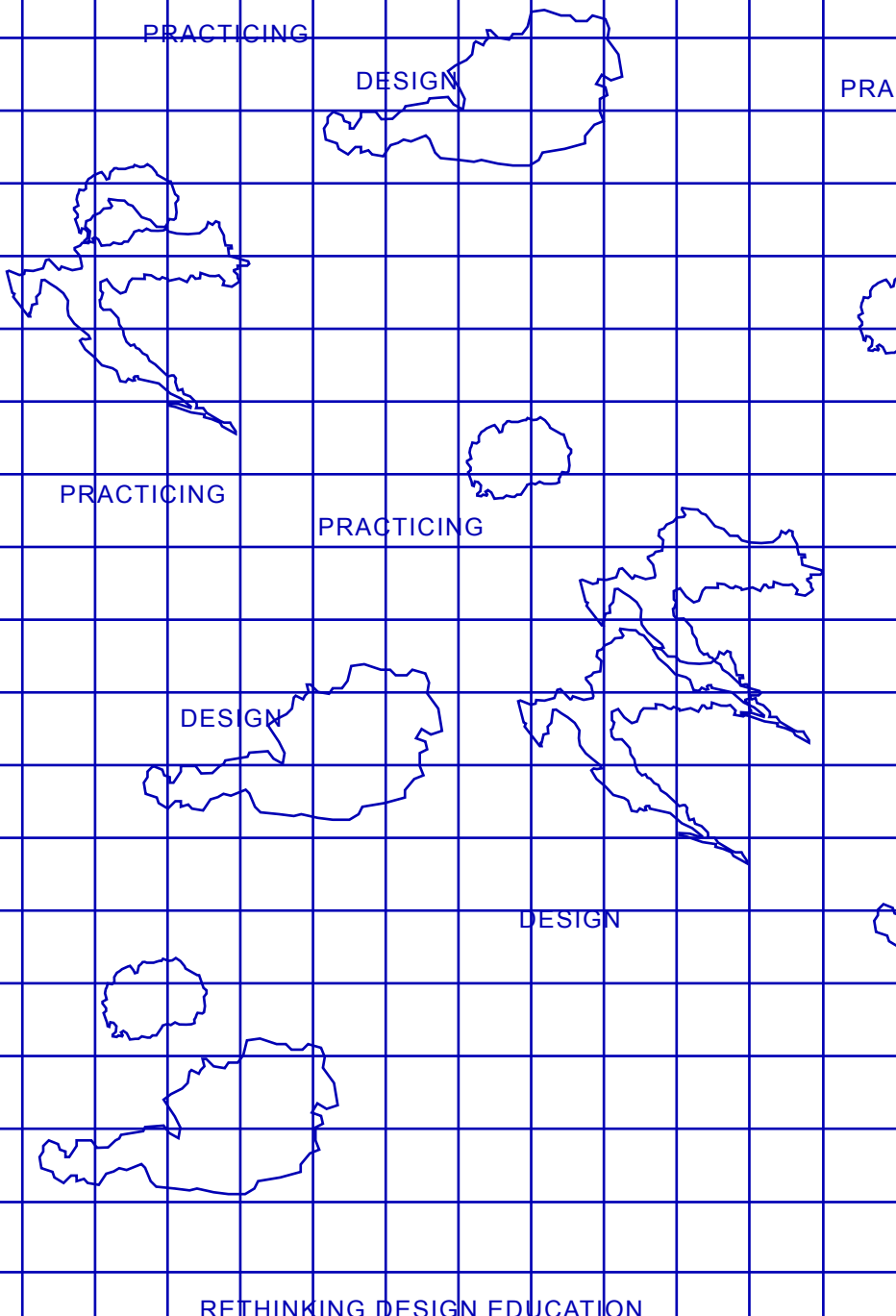
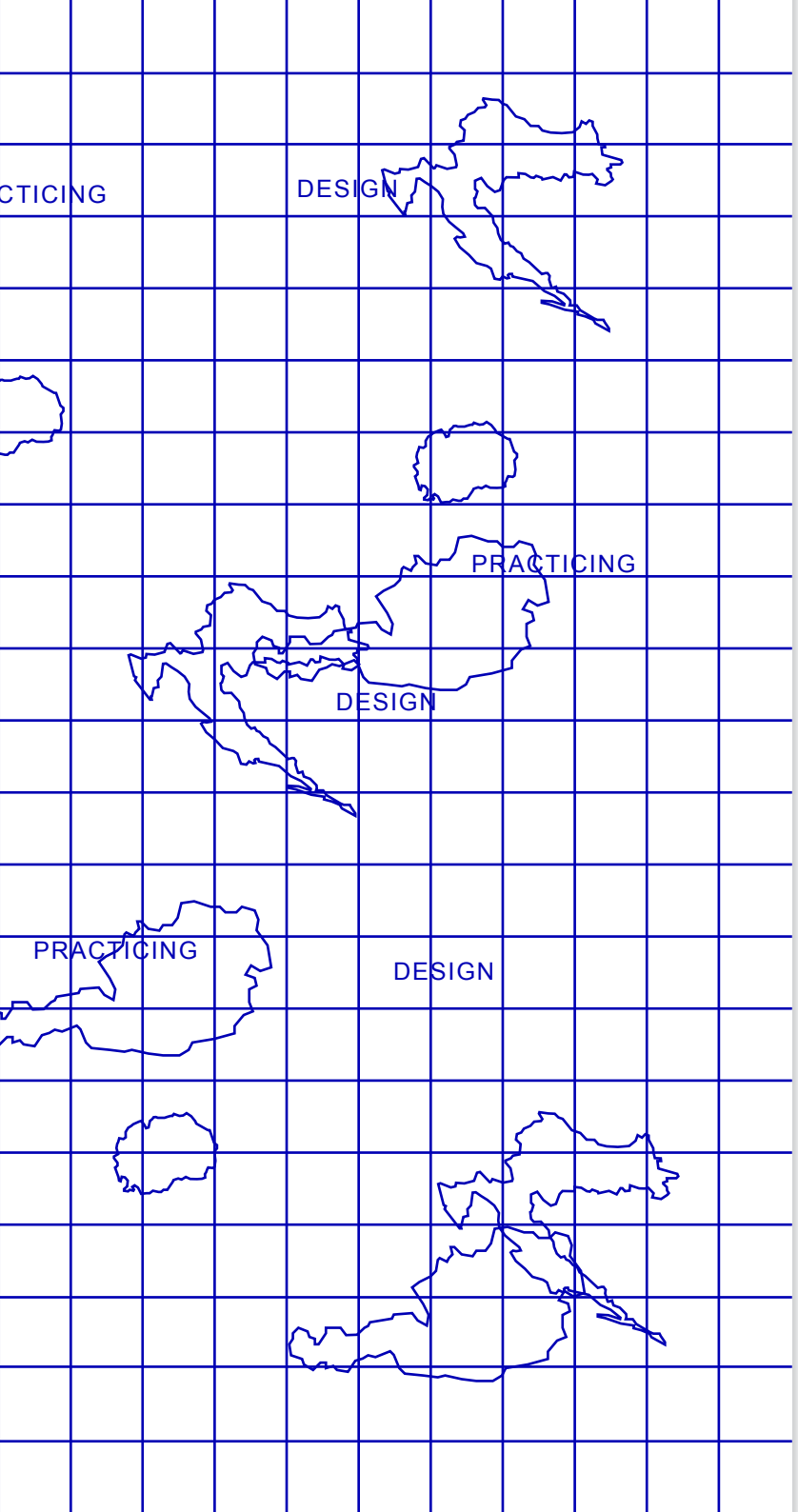


RETHINKING DESIGN EDUCATION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RETHINKING DESIGN EDUCATION

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A team of researchers participated in the preparation of this Study. Prof. Biserka Komnenić, PhD is the author of the first and the second part, which provide a theoretical framework for the Study. The empirical research presented in the third part of the Study represents the joint effort of the experts from three vocational design organizations, 2 educational design institutions and 2 design oriented companies from Austria, Croatia and Macedonia.

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PRACTICING DESIGN:
RETHINKING DESIGN EDUCATION

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ABSTRACT

This Study explores the extent to which the changes brought by new socio-economic paradigm shift and its influence on social and economic behaviour in the last 20 years are reflected in design education and practice. Furthermore, this Study attempts to identify the root causes of design education and design curriculum content maladjustment to the needs of contemporary era. It also identifies the current challenges design education is facing today. Theoretical and empirical research results, particularly in the form of knowledge, skills and competencies, served as the ground for proposing appropriate guidelines for the improvement of current design education and the content of the design curricula. The results of the Study reveal theoretical and empirical evidence that confirms the assumption about the current mismatch between knowledge and skills acquired in formal design education and skills needed in current and future design practices. This mismatch is mostly related to the managerial and social skills needed for solving problems and demands of real life design practice and to a smaller extent, to practical design knowledge and competencies. Therefore the Study argues that design education should be carried within a multidisciplinary context, which will embrace all necessary knowledge, skills and competencies needed for future successful professional design practice, and that design education should be more practice-based oriented, allowing students

to work on specific real life projects. Since the evidence suggests that educational institutions in their attempts to provide additional skills and competencies are faced with financial and bureaucratic constraints, which create a gap, or lack of professionals from other specialist disciplines, design education institutions should consider finding alternative sources for financing those specialist and alternative ways of training students in deficient disciplines or skills. Furthermore, the Study argues that there is a need for finding more effective way of transferring economic knowledge to design students and that the business sector and other interested parties need to better learn each other's *languages* in order to achieve more productive communication. Design educational institutions should present their students the importance of business management and raise awareness of the business sector about the value of design.

Key words: Design Education, Design Practice, Skills, Competencies, Challenge, Knowledge Society

CONTENTS

FOREWORD

Designers are increasingly trained to identify their clients' needs and requirements by observing and identifying social developments. Ideally using this knowledge and in cooperation with their clients as partners and team players they develop innovative products and services that meet these needs and requirements.

Design is more than just a product, a website, a flyer... Design achieves more: Design is strategy and process, i.e. a management task. In the future, design professions will increasingly include counseling functions with a strong tendency towards multidisciplinarity. In 2009, an Austrian survey showed that approximately two thirds of the interviewed designers use an interdisciplinary approach in their work and regard themselves as entrepreneurs rather than freelancers or artists.

For the design training it is necessary to overcome the outdated structure, because design will increasingly become an interdisciplinary matter. Utmost attention should be paid to economic aspects, as the clients regard the creative and visionary aspects as basic skills.

The challenge in remaining competitive on a global market is to increase the innovative capacity of employees, above all during training and also on the client side, as well as to consistently force up the innovative output. It is particularly important to promote all kinds of innovative growth in the SME sector, while keeping track of the necessary economic, social and ecological sustainability.

It is necessary to think of ways to contribute to design-driven, user-oriented innovation, e.g. by networking and research for developing interdisciplinary curricula (such as design in engineering, social sciences or medicine) and the required tools. Cooperation in the field of education and further training should help to remove barriers and use design as an innovative tool in a more efficient way. Even subjects such as basic principles of business management, cost accounting and contract law as well as argumentative techniques, conduct of negotiations and issues related to client cooperation must be improved in the design training. The cross-sectional fields mentioned above should be integrative elements to meet the requirements and be in line with *Zeitgeist*.

Consultation and power of persuasion are becoming increasingly important for professional designers. Advisory skills, broad knowledge, entrepreneurial thinking, argumentative skills and sales training as well as team leadership have become part of the work routine. Additional knowledge of materials and technologies, of societal and social aspects, of consumers and users, of marketing and product differentiation, of sustainability and preservation of resources, but also of human habits and needs such as emotion, safety and user friendliness is part of a successful production and innovation process. Designers act as guides in a frequently longer thought and development process – from the idea to its implementation. Creativity is taken for granted and visions are expected.

Prof. Severin Filek, MA

IMPLICATIONS FOR RESEARCHERS AND PRACTITIONERS AND RESEARCH LIMITATIONS

The research implications of the Study are multiple. First, theoretical and empirical evidence has been found to support the confirmation of a current mismatch between the skills acquired through formal design education and skills needed in current and future design practice. Second, the Study results can serve as yet another reference for future research on this topic. Furthermore, given that this is the first Study of this kind conducted in Austria, Croatia and Macedonia, it contributes to the increase of the design discipline scientific knowledge base and it may serve as a platform for conducting future research on the same problem in these countries. Regarding the practical implications, the results of this Study can influence the rising awareness of the significance of the integrative, multidisciplinary, practice-based learning approach to design education, which in time may result in recognizing the need for the implementation of some of the recommendations into formal design study curricula. This is of particular significance in the context of a general intention of all three countries to contribute to the current social and economic transition into knowledge-based ones. This Study can serve as a sort of a handbook for design professionals and design scholars that will provide them with a comprehensive framework for understanding and explanation of the current state of their profession and discipline, and give them some ideas regarding the possible ways and direction in adjusting to arising changes. Also, this Study can serve to

scholars from other fields, and to public policy and Business Actors to deepen their understanding of the design profession. This Study is not without its limitations. It is debatable whether the samples used for empirical research in this Study are large enough to draw valid and objective conclusions. Therefore, future research should be conducted on a larger sample, which may help in producing more objective results.

BACKGROUND OF THE STUDY

This Study is the result of the first phase of the *Practicing Design* project, which is a collaborative venture of three European vocational design organizations: Croatian Designers' Association (Croatia), designaustria (Austria), Public Room (Macedonia); two educational institutions: VERN' University of Applies Sciences (Croatia), Faculty of Art and Design, European University of Republic of Macedonia, Skopje; two business companies: Prostoria d.o.o. (Croatia) and Zavar d.o.o. (Macedonia). The aim of the project *Practicing Design* is to find new and innovative design education practice in order to bridge the gap between education and professional work and to upgrade designers' skills necessary for better socio-economic outcomes. To address these needs the project is developing activities to integrate development of cross disciplinary and entrepreneurship skills into an educational course, encourage collaboration projects between design students, and to make internships in the industry and design agencies part of the design course. The final task of the Study *Rethinking Design Education* is to detect skills and knowledge needed for employability and not provided by design curricula and create guidelines through identification of the main challenges facing the design practice and education in the 21st century and through empirical research of the existing skills mismatch in the design curricula in Croatia, Austria, and Macedonia, as a framework for the second output of the project – *Design Training Program*.

The project promotes rethinking and undertaking innovative practices in education and training on national, regional and international level thus raising the awareness among all stakeholders and the public about the needed enhancement of the quality and relevance of the current design education and training and the needed links with the world of practice.

EXPLANATION OF THE TERM "DESIGN" AND "INDUSTRIAL DESIGN"

For the purposes of this Study the terms "Design" and "Industrial Design" are used through the Study as synonyms which refer to the ICSID renewed definition of industrial design:

"Industrial Design is a strategic problem-solving process that drives innovation, builds business success and leads to a better quality of life through innovative products, systems, services and experiences. Industrial Design bridges the gap between what is and what's possible. It is a trans-disciplinary profession that harnesses creativity to resolve problems and co-create solutions with the intent of making a product, system, service, experience or a business, better. At its heart, Industrial Design provides a more optimistic way of looking at the future by reframing problems as opportunities. It links innovation, technology, research, business and customers to provide new value and competitive advantage across economic, social and environmental spheres. Industrial Designers place the human in the centre of the process. They acquire a deep understanding of user's needs through empathy and apply a pragmatic, user centric problem solving process to design products, systems, services and experiences. They are strategic stakeholders in the innovation process and are uniquely positioned to bridge varied professional disciplines and business interests. They value the economic, social and environmental impact of their work and their contribution towards co-creating a better quality of life."

PURPOSE, OBJECTIVES, METHODOLOGY APPROACH

PURPOSE AND OBJECTIVES

It seems that the fast changes brought by the new paradigm of the Society and Economy Intensively Based on Knowledge created increased pressure on design education and practice which caused current general disorientation in the design community. The design profession is changing rapidly as a result of its fast growth, it has expanded in all imaginable directions, but the world of design education did not have time to reflect on fast changes and new challenges, and find the right answers about possible ways of responding to the new situation created by those challenges. However, to date there has been no comprehensive Study in regard to the understanding of the main causes that influenced the current state of design education and practice. Therefore, the purpose of this Study is to investigate and identify the characteristics of contemporary design practice and design education, to portray the extent to which changes brought by new socio-economic paradigm shift and its influence on social and economic behaviour in the last 20 years are reflected in the design education and practice as well as to understand and determine the root causes of design education and design curriculum content maladjustment to the needs of the contemporary era. The final task of the Study is to identify the current challenges facing design education today and on the basis of theoretical and empirical research results, in the form of competencies, knowledge and skills, propose appropriate guidelines for the improvement of current design education and the content of the design curriculum. The secondary goal of this Study is to serve to design professionals, scholars and students as a sort of a handbook that will provide them with a comprehensive framework for understanding and explanation of the current state of their profession and

discipline, and give them some ideas regarding the possible ways and direction in adjusting to arising changes. Also, this Study can serve to scholars from other fields, and to public policy and Business Actors to deepen their understanding of the design profession.

METHODOLOGY APPROACH

The approach to the research for this Study relied on gathering information and data from a wide variety of sources that were drawn together during the analytical phase. Therefore, for the purpose of the theoretical part of the research which is presented in the first and the second part of the Study, literature review of relevant theoretical and empirical work is used: academic articles, books, working papers, consultancy reports, government publications, white papers, publications by relevant national and international institutions, and media articles. Online surveys of three stakeholders' groups: Design Professionals, Design Professors, and Business Actors were used for the purpose of the empirical research presented in the third part of the Study. Additional input from the stakeholders was secured through a series of semi-structured interviews conducted within the three Focus groups.

The Study is structured as follows:

Part I provides comprehensive insight regarding the changes brought by new social and economic paradigm shift, and how their influence on social and economic behaviour in the last 20 years was reflected in the microeconomic and macroeconomic perspective on the value of design, and on the design practice itself. On the basis of this insight, key challenges were identified and anticipated for the design sector in the 21st century. Accordingly, in the first chapter, the paradigm of the Economy and Society Based on Knowledge is briefly

explained, where creativity, innovation and intellectual capital of individuals, employees, companies and nation became a key factor of value creation. In the second chapter the relationship between design as an economic factor of production and economic theories, and the role and importance of the design sector from the microeconomic and macroeconomic perspective is analysed and the relevant quantitative research conducted on this subject was presented. In the last chapter, from the general social and economic trends and from the perspective of public policy and design practitioners, the most important current and future challenges facing the design sector and the design profession in the 21st century are articulated and identified.

Part II gives insight into possible direction of the design education in the future, detects the main challenges and main dilemmas facing the design education, and on the basis of the results of the existing empirical research, identifies a possible mismatch between competencies and skills provided in current design education and the ones needed in the market. In the first and second chapter, the contemporary general trends in higher education and their impact on the design education are presented. The third chapter deals with key dilemmas related to design education: What is the general purpose of design today? What theoretical framework should support the new model of the design curriculum? What should be the content of the design curriculum? And how should design be positioned within the arena of higher learning? The fourth chapter is dedicated to the question of design competencies and skills needed for the 21st century.

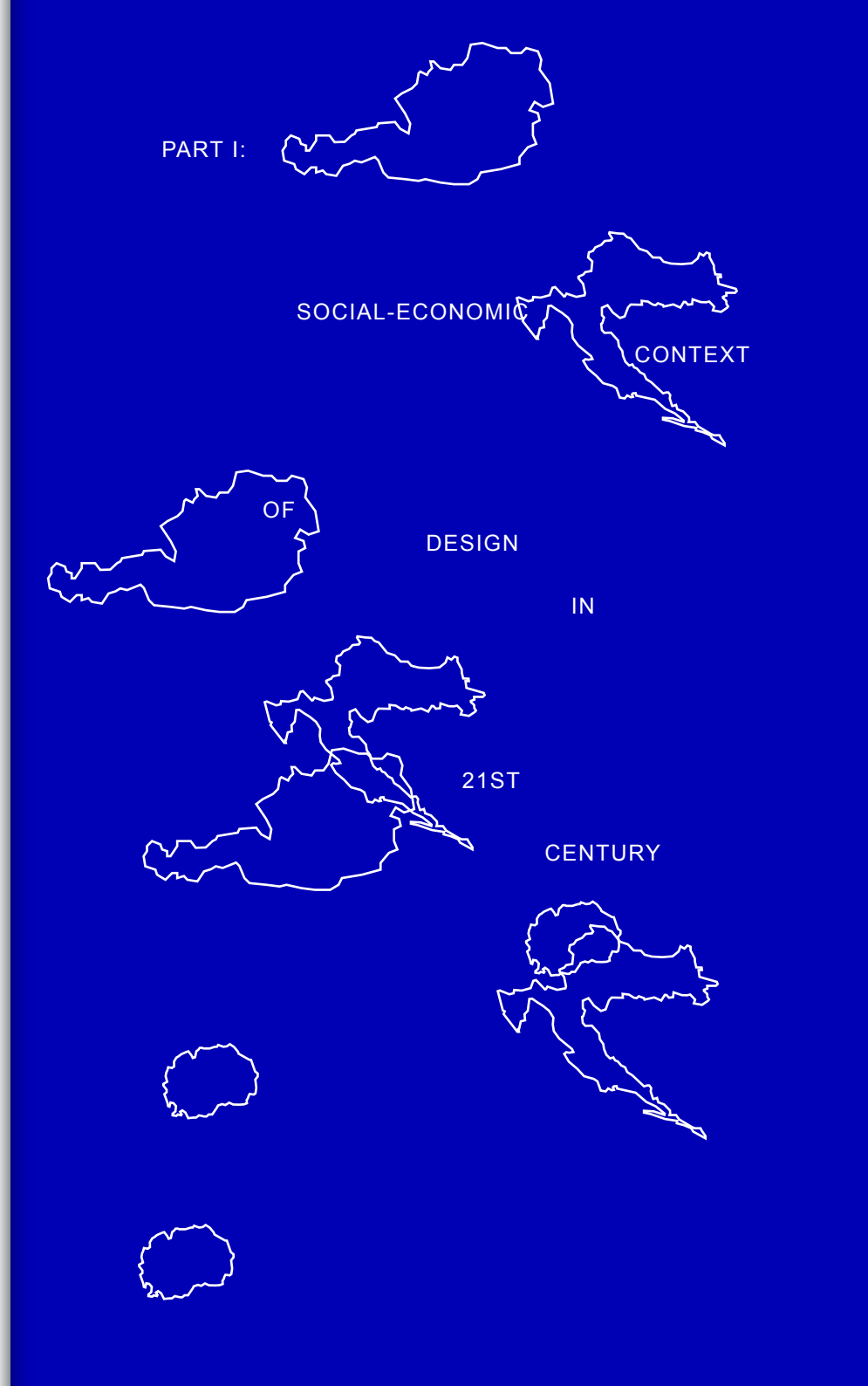
Part III In this part of the Study original empirical research regarding the mismatch of the skills which designers obtain in their formal education and skills needed in current and future practice from the perspective of Design Professionals, Design Professors and Business Actors is presented. The research was simultaneously conducted in three countries:

Austria, Croatia and Macedonia. The research was carried through online survey of three groups: Design Professionals, Design Professors, and Business Actors, and through series of semi-structured interviews within three stakeholders' Focus groups. In the first chapter, the purpose, methodology and data of the research are explained. In the second, third and fourth chapter, the results of the surveys and Focus groups regarding the designers' skills and competencies from the perspective of Design Professionals, Design Professors and Business Actors are presented. In the fifth chapter, the comparative analysis is conducted on four levels: comparison of the Design Professionals' surveys and Focus groups from all three countries, comparison of the Design Professors' survey and Focus groups from all three countries, comparison of Business Actors' Focus groups from all three countries and finally comparative analysis was conducted based on the results of the overall research.

At the end of the Study, relevant conclusions are presented on the basis of which specific guidelines regarding the possible direction of design education in the future, and bridging the gap between education and practice and designers' skills necessary enhancement are given.

PART I:

SOCIAL-ECONOMIC CONTEXT OF DESIGN IN 21ST CENTURY



The contemporary socio-economic context is articulated in the new paradigm of Society and Economy Based on Knowledge, which has a decisive influence on the present understanding of the socio-economic importance of the design practice, and its current and future challenges and trends. In order to understand the challenges of the 21st century which the higher education in the field of design is facing, the purpose of this part of the Study is to provide comprehensive insight regarding how changes brought by new social/economic paradigm shift, and their influence on social and economic behaviour in the last 20 years are reflected in the microeconomic and macroeconomic perspective regarding the value of design, and the design practice itself. On the basis of this insight the anticipated key challenges were identified for the design sector and the design profession in the 21st century. Accordingly, in the first chapter the paradigm of the Economy and Society Based on Knowledge is briefly explained, where creativity, innovation and intellectual capital of individuals, employees, companies and nation became a key factor for value creation. In the second chapter the relationship between the design as an economic value added activity and economic theories, and the role and importance of the design sector from the microeconomic and macroeconomic perspective is analysed and the relevant quantitative research conducted on this subject is presented. In the last chapter, on the basis of general social and economic trends and from the perspective of public policy and design practitioners, the most important current and future challenges facing the design sector and design profession in the 21st century were articulated and projected.

1 PARADIGM SHIFT TO SOCIETY AND ECONOMY BASED ON KNOWLEDGE

The concept of Society and Economy Based on Knowledge presents a framework term designed to define the changes that are the result of development and progress of industrial society in the late twentieth and early twenty-first century. Discussions on Knowledge Economy, its impact and consequences that it produces on the economy and society as a whole, are most prevalent in the political, economic and sociological discourse and are focused on trying to define the observed trends of economic and social life in post-industrial society and their characteristics.

Authors, who were among the first, advocated the idea that the emergence of Knowledge Society/Economy represent a historic discontinuity, new socio-economic paradigm and a qualitative leap in a number of dimensions in comparison to the earlier societies and economies (Merilyn Ferguson, Frifjof Capra and Willis Harman), in their books explained the need for paradigm change and explored the implications of a paradigm shift on the social and economic environment.[1] They argued that, unlike the Cartesian deterministic, binary and linear understanding of the world based on the principles of Newtonian physics (which dominated the Western way of understanding the world almost until the end of the twentieth century), contemporary understanding of the world is based on a dynamic, interactive, network, and holistic understanding of human behaviour, which corresponds to insights of quantum physics, complexity theory and behavioural and living

organisms science. This change of the basic picture of reality requires a long-term change in relation to the priorities and values. They anticipate that all institutions will go through a major change, which applies particularly to those in the field of economics and finance. At the beginning of the 1990s, Peter Drucker, and Bengt – Ake Lundvall, argued that western society entered a phase of historical discontinuity – a paradigm shift which they articulated in the notion of Society and Economy Based on Knowledge.[2] Historically observed, the emergence of Society and Economy Based on Knowledge did not occur at once, nor did it represent a revolutionary event. It represents an evolutionary, gradual process that intense over time and finally caused a brief but concise discontinuity in development during which the characteristic determinants of the economy and society have changed.

Modern society can be described as a society based on a deep and broad penetration of scientific and technological knowledge in all spheres of social life and its institutions. By the mid-twentieth century society and economy were primarily understood in the context of physical resources and physical labour. As such, these concepts have long been present in social, economic and political theories. However, in modern society there is a tendency of decreasing importance of physical resources and physical labour as the basic factors of production and sources of value creation. Today, the notion of property and labour is extended to intangible elements of their structure, or in other words, physical and labour factors of production more than ever before, have embedded in themselves the intangible component –knowledge and creativity. Therefore, the Knowledge Society phenomenon indicates the significant structural economic changes and the transition of the industrial economy to economy intensively based on knowledge. In the economic theory, knowledge (as a creative and productive capacity to act and think) is not a new concept.

Its fundamental importance for the economic growth had been recognized in most economic theories of the 18th and 19th century (Adam Smith, David Ricardo, John Stuart Mill, and Karl Marx). Works of Schumpeter, Hyek, Penrose, from the beginning and the middle of the 20th century pointed to its crucial role for economic growth.[3] In the later period of the 20th century science acquired the features of direct production force. The term direct implies that unlike the relationship between science and production in the 19th century, where scientific advances were incorporated through physical labour in the production assets (machinery, tools...); the relationship between science and production has become direct and immediate. Because of the scientific discoveries the machines had become "smarter" and as such they required less human intervention and human physical force in the final production process. As a result, in time the need for physical labour continuously declined, and the implementation of labour force moved from direct production to processes of preparing and organizing production. In other words, at the beginning of the industrial revolution knowledge was applied to tools, processes, and products. In the later stages, knowledge was applied to increase of productivity. Nowadays, knowledge is applied to knowledge itself. Therefore a large part of today's knowledge that is directly used in production is not embodied in machinery, and the effects of this are immense.

The concept of the Knowledge Economy starts to spread more widely at the beginning of 1980s. In this period the economies of developed countries were in recession, traditional industries had the problem with production overcapacity and with decreasing profitability, the states had the problem with the increasing fiscal deficit and decrease in real GDP. This period was also characterized by the emergences of new technologies, and there was talk of possible third industrial revolution based on computers and potentials brought by information

technology. In comparison to other post-industrial economic topics that were discussed during the 1970s, the concept of Knowledge-Based Economy was a more optimistic and intellectually more sustainable version of possible future outcomes. This version of the economic future relied on the fact that since the beginning of the 1980s, economists have begun to recognize that accumulation of knowledge can principally be analysed as the accumulation of other capital goods, that the economic principles of production and exchange can be applied on knowledge as on any other goods, and that knowledge represents an endogenous component and determinant of the social and economic growth. Again, Schumpeter's vision of capitalism as a process that was being renewed through the process of creative destruction became the centre of attention and inspired the emergence of new theories of growth. The so called *new theories of growth*, articulated by Romer (1990) and others (Lucas 1988; Helpman; 1992; Nelson 1994; Dosi and Nelson 1994) perceive knowledge (precisely existing stock of knowledge in the form of technological knowledge and know-how) as a factor of production and argue that since use of knowledge does not lead to its decrease but instead to its growth, knowledge represents a resource which does not fall under the law of diminishing returns but to the law of increasing returns. Also creativity, especially technological creativity, becomes an integral part of economic activity and a potential source of added value and it is seen as an evolutionary matrix of economic growth.[4] From the late 1980s to the middle 1990s, as the most popular alternative to the widely accepted concept of Post-Industrial Economy and Society, the concept of Knowledge Economy was adopted by the scientific community and political milieu, as an analytical framework that in most effective way articulates the essential characteristics of the new technologies and other forces which had the potential to change the trend of economic stagnation into economic

growth and development.[5] The vision of economic growth based on the creation of new knowledge and its innovative and creative application provided a much more optimistic view of the future. The transition to economic growth based on the creation of new knowledge and innovative applications of existing knowledge promised continuous growth of wealth based on the appearance of entirely new goods, new professions and new economic activities. The economy began to produce many examples of products that represented the pure products of knowledge like software, or products that are enriched with refined components of knowledge. Economic activities based on the production of knowledge, its distribution and consumption was not something which was entirely new for economic science in those days. Actually, what was really new was the vision that such activities can become a major, and perhaps the most important aspect of the overall economy. Soon, the authors who dealt with this issue started to reach a consensus about the fact that in today's economy, knowledge and creativity in terms of innovative capabilities of thinking and acting are the most valuable inputs and outputs. At the end of the 1990s, terms such as New Economy, Learning Economy, Information Economy, Network Society, Intangible Economy and Creative Economy appeared in the academic and political language.

As well as most of the other crucial, historical and social changes, Knowledge Society/Economy have evolved gradually, at an uneven pace, and it is possible, as this is a case with all other essential changes, that they will become totally recognized and visible when the transition is fully completed. Most of the leading theoreticians dealing with the Knowledge Economy agree that the perception of changes defined in that concept depends on the discipline that defines it. Most of them, therefore, advocate the need for a multidisciplinary approach in which economics, sociology, management and psychology will contribute to its clearer definition. However, regardless of

their mutual disagreement about what constitutes and defines the Knowledge Economy, they all agree that today's society and economy is characterized by the fact that the knowledge gained a role of the leading factor of production, source of value creation and economic growth, replacing the latter superior factors of production: natural resources, physical labour and capital.

1.1 PILLARS AND SOCIO-ECONOMIC TRENDS OF KNOWLEDGE BASED ECONOMY

Recognizing the constituent elements and socio-economic trends as a determinant of the Knowledge Economy is a complex task because the number of relevant endogenous and exogenous variables is too extensive. However, generally there are specifics separating the current economy from the concept of the industrial economy. Knowledge Based Economy, its growth and development, the laws of creation of profit and ways of value creation are based on four fundamental pillars: the growing importance of intellectual capital (knowledge as direct productive force), human capital, information technology and intensive and rapid innovations and externalities they produce.

GROWING IMPORTANCE OF INTELLECTUAL CAPITAL

In contemporary economy the predominant activity is no longer the production of material goods but the production of knowledge, which is then built into goods and services. This is the starting point of every further economic analysis. Professor Baruch Lev at Stern University, New York, conducted a research on investment patterns in the USA, which shows very different investment perspective since 1929. In the period between the late 1920s and late 1990s, approximately 70% of

the USA investments went into tangible goods and some 30% into intangibles. However, by 1990s this pattern was inverted, and today the dominant investments go into intangibles, such as R&D, training and education, software, brand creation, patents and trademarks. In the last 25 years, the share of the non-material sector in the USA gross domestic product has grown from 50% to 85%. In Europe, this share is around 70%. Essentially, together with the clear trend of the shrinking share of material production, today's production is more intensively based on knowledge, creation of relevant business models, innovation, sales strategies and intelligent solutions for clients.[6] Today, the largest share of total cost is in inputs such as competencies, corporate identity, innovative solutions, original sales techniques, developed customer relationships etc. For example, the share of intangible assets in the software industry is 95% and in the automotive industry it is 60%.[7] All these data consistently point to the fact that in the contemporary economy intangible assets began to gain a leading role in creating value.

Observing the growing importance of knowledge based resources, the economic science articulated terms such as non-material assets, intangible resources, and intellectual capital. Since intangible resources have some characteristics that differ substantially from physical resources, these differences implicate different economic principles and the matrix of value creation from those that are characteristic of physical resources. For example, the use of intangible resources does not lead to their decrease but on the contrary, to their enlargement, because using knowledge leads to its growth and spreading, which is why it is associated with the law of increasing returns and continuous growth opportunities. Because of its nature, the economic growth based on knowledge is possible to restrict only artificially, because knowledge is not familiar with any kind of physical limitations. This is contrary to the law of diminishing returns, which is characteristic of the physical

resources because their amount is limited by their physical nature.

Also, one more fact specifically resulting from the growing importance of intangible assets is the change in perception considering the notion of value term, providing a broader perspective of its concepts. Value can represent tangible and intangible goods or services, knowledge or benefit that is either desirable or useful for the recipient, for which he is ready to pay a fair price, or provide suitable replacement. Each of these three types of value operates as a separate and independent currency. So we can directly replace knowledge for knowledge, we can replace the knowledge for tangible goods, services or money, or we can replace knowledge for some intangible value or assets such as customer loyalty.[8]

In order to understand ways in which knowledge resources contribute to value creation and to gain insight in specific characteristics of the intangible assets and in the impact of these characteristics on the process of value creation, the economic science began to take a deeper and more precise research of the nature of these resources. This research is articulated in the most comprehensive way in the concept of Intellectual Capital. Regarding the definition of Intellectual Capital, as far as capital is concerned, economic thought defines quite precisely what that implies. Capital is only the money or assets – buildings, machinery, raw materials – that are used to create new value. The same kind of analogy can be done with economic context of knowledge. The power of knowledge refers to its manifestation in the business environment, and that is intellectual capital. In the contemporary economy the term intellectual capital is used as a synonym for that part of knowledge which is transformed into market value. Or in other words, transformation of valuable tacit knowledge to explicit or codified knowledge which has a market value, or in any other way contributes to economic value creation represents

Intellectual Capital. That opens up the question of what is understood by the term – Human Capital, from which Intellectual Capital is generated. Tacit knowledge refers to a vast range of procedures, a build-up of intrinsic knowledge and inherent skills, derived from practical experience. In other words, most of this knowledge cannot be codified or articulated in an explicit way. A commonplace example of tacit knowledge is the craftsman's skill. No set of instructions can give a recipe for the direct transfer of this kind of knowledge from one person to another. The only way is through the slow process of trial and error. This type of knowledge is a crucial element in innumerable skills vital to firms and particularly important for the design practice. The Drawing skills, for example, enable potential solutions to be probed in a variety of forms, without always having an exact rationale for each. Choices of materials and colours can also rely more on this experiential sense of the "rightness" of a solution that is not always prone to logical explanation since it is rooted in sensitivity based on substantial experience.[9] On the other hand, explicit knowledge is the one which is articulated and codified, and it comes in many forms such as documents, patents, licensing agreements, proprietary information, contracts, formulae, data and manuals, software, blueprints and other formats. As projects increase in scale and complexity so this other kind of knowledge also begins to assume greater importance in the design practice. In economic terms, this kind of coded knowledge could be commercialized and become available to anyone who wants to pay for it certain price. But, likewise there is a threat that those codified ides will be imitated by competition. Codification of new ideas requires high initial costs, but once ideas are coded, they can be possessed by numerous people at the same time, and be made available to any number of people with little or no additional cost. From an economic point of view, it is possible to conclude that such knowledge becomes an intellectual capital

that is transformed into value identified on the market, or in other words, into benefits for the customer.[10]

In order to create capability for long term value creation and achieve some stability, the firm should base its strategy on its key skills, competencies, innovation and knowledge. That is necessary because the intangible resources of the firm are based on its specific knowledge, their nature is idiosyncratic and generic, and that is why intangibles are difficult to imitate and substitute. Therefore, the inability or difficulties in imitation of intangible resources is the key reason why those resources represent the main source of value creation and foundation on which in the Knowledge Economy, the firm builds its competitive advantage. Presently, companies, practitioners and academics are experimenting with various ways of identifying, measuring, managing and reporting intangible assets within organizations.

THE CHANGING PATTERN OF INNOVATION

The modern innovation theory sees knowledge creation in a much more diffuse way. Firstly, innovation rests no more only on discovery but also on learning. Learning does not need to necessarily imply discovery of new technical or scientific principles, and can equally be based on activities which recombine or adapt existing forms of knowledge; this in turn implies that activities such as design or prototyping creation (which is a form of engineering experimentation) can be knowledge-generating activities.[11] The second key emphasis in modern innovation analysis is on the external environment of the firm. Firms interact with other institutions in a range of ways. Understanding of the contemporary innovation process is inseparable from the growing awareness that the development of technology and innovations points to the coexistence of social and technical processes and that innovation is the result of cooperation involving a large number of both internal and

external participants. This has led to greater attention to the ties and social relations between participants in the innovation process and the process of organizational learning. The interaction between the various participants and systems that influence or participate in the innovation process becomes the most important prerequisite for innovation. The basic idea behind the interactive mode of innovation is to connect different types of knowledge.[12] Another important feature of this model of innovation is its emphasis on cooperation, not on a competitive contest.[13]

HUMAN CAPITAL

With the rising importance of intellectual capital, simultaneously, labour market shows a growing need for higher qualification of workers. The rapid technological advancement in computational power and communication technologies are transforming the nature of knowledge, skills, talents and expertise of individuals in the workplace. Today's global market requires a different kind of worker, one with competencies, attitudes, intellectual agility, and creativity, conducive to systematic and critical thinking within a technologically oriented environment. The growing qualification of workforce is important for both, the intellectual and production occupations, since they are more and more dependent on knowledge inputs. Drucker states that the largest success of management in the 20th century was fifty-fold increase of productivity of manual labour, while the largest challenge of the 21st century will be increasing the productivity of knowledge workers.[14] The USA Ministry of Labour predicts that the most of the future work positions will be created by the sectors that are intensively based on knowledge and technology occupations. Furthermore, data shows that the percentage of highly qualified workers increased at expense of unqualified workers.[15]

INFORMATION TECHNOLOGIES

The tremendous development of information technology and myriads of possibilities this created, paved the way to Knowledge Based Economy. IT created an infrastructure for fast information exchange and accelerated globalization of world markets. It enabled creation of new organizational structures and new ways of communication and work. Progress in information and telecommunication technologies enabled processing, storing, exchange of information regardless of distance, time and quantity in any possible form and with decreased cost. This concept has increased capacity of human intelligence and has become a resource which transforms our ways of interaction and work. UN has concluded that the combination of human intelligence and IT has replaced accumulation of physical capital as leading factor of reproduction.

CHANGING NATURE OF COMPETITIVE ADVANTAGE

For creating competitive advantage, today's imperative is not the market position, size and power of companies in the past, but the inclusion of knowledge in all company activities. Many multinational companies that have been on the top 100 in the Forbes list, lost their positions. It happened because they did not have capability to recognize and react fast enough to changes resulting from new social and economic context. Due to the resulting changes, there is a need for change of the existing understanding of the productivity term. As Edvinsson has put it: "If productivity is the goal, efficient processes were a means to it. The efficient and "thin cost saving business processes" became known as the fastest path to profit-paradise. But this cost saving fixation can lead to the corporate equivalent of anorexia, an organization without people, experience, reputation, significance and value in all its manifestations. Extreme diet kills personality. However productivity still has its importance, but our understanding of productivity and methods for

achieving it should and will change".[16] The focus of Knowledge Based Economy is on enhancing productivity of knowledge workers and that cannot be done through traditional cost saving efficiency mechanisms. Adrian Slywotzky concluded that the last business revolution had been led by innovative companies that changed the key question for themselves. The question during the 1980s was: What business do you do? In the early 1990s, the question was turned into: What is your business model? Today they ask themselves: What is your thinking model? How do you process innovative thinking? In order to transform innovative thinking into added value and in the end into financial results, it is necessary to create conditions that will enable the constant development of innovative capabilities. The one which will contribute to the constant creation of new knowledge, its codification, growth, and commercialization. The nature of knowledge creation prefers network structure, imitation of organic systems that will enable unrestricted flow of knowledge within the organization. The free flow of ideas, knowledge and information and their transformation into additional value practically indicates the level of vitality and energy which the companies possess.

1.2 IMPORTANT FACTS AND GENERAL CHALLENGES RESULTING FROM KNOWLEDGE ECONOMY

From all the above, several specific challenges and facts can be extracted about what knowledge economy brought to individuals, companies and industries, especially to the design sector and product designers.

— *The disruptive impact of technology and shorter product life cycle* are the characteristics of today's competitive environment.

— *Production of data and operational programs becomes the immediate production process*, which tends to reproduce social structure of knowledge. The outcome of this development is that scientific knowledge, in terms of direct productive force, becomes a social resource with its function comparable to the function of the labour force.

— In addition to facilitating the implementation and the dissemination of knowledge, *technological development is characterized by a cumulative feedback loop between innovation and the use of innovation where knowledge is applied to knowledge*. Knowledge becomes the subject of work, working asset and workforce by itself. In addition, such uses of innovation improve the existing innovation or create new ones.

— *The role of knowledge in today's society is transformed in the way that knowledge gets all clear characteristic as any other goods*. The attitude of producers and users of knowledge which they sell or use is like the relationship that exists between manufacturers and consumers towards material goods that are produced or consumed. In other words, besides the used value of knowledge, its exchange value is also gaining in importance.

— *On one hand, knowledge is expanding and becoming more accessible to more people. As such, it does not constitute a limited resource. On the other hand, new knowledge gets the role of a strategic resource on which the competitive advantage of companies and national economies depends. Such knowledge in today's economy is a scarce resource*. Consequently the question of controlling ownership of new knowledge which gives the companies competitive advantage becomes the most important question.

— *The pace of production of new knowledge is becoming faster. Consequently applied knowledge rapidly becomes obsolete.* Therefore, the average time period for establishing competition advantage is getting shorter. Thus, the influence of those who produce, increase or transmit new knowledge is greater.

— *Knowledge Economy acts in network order*, driven by accelerating pace of change and learning, where the market is the space where individuals, businesses, academic institutions and industries have the opportunity to cooperate through the exchange and transformation of information and knowledge which are in that way transformed into a multitude of ideas, opportunities and solutions that create economic and social wealth. Therefore, the Knowledge Economy is also a Network Economy. This concept highlights the important role of dynamic relationships between individuals, groups, institutions and corporations. It also points out the advantage of the network structure of the organization, because of its characteristics of flexibility and adaptability.

Therefore, the 21st century brings with it a brand new challenge for nations, enterprises and individuals. It is becoming more essential to articulate and visualize the intellectual capital. The old market drivers may have been manufacturing, land and capital, but the driver of the new era is the creative and efficient use of intellectual capital. Consequently, the number one priority for politicians, business executives moving forward should be the recognition, identification, measurement, benchmarking, development and utilization of nation's and firms' Intellectual and Creative Capital.

2 DESIGN AS VALUE ADDED ECONOMIC ACTIVITY IN CONTEXT OF ECONOMIC THEORY AND PRACTICE

Since the design is the discipline which is intensively based on creativity, knowledge, skills and ability to innovate, putting it in economic context demands understanding the treatment of knowledge and innovation in microeconomic theory over time. Also to understand how the design sector started to be treated as one of the most important value and growth drivers for contemporary economy it is necessary to be familiar with the evolution of the macroeconomic theories' perspective regarding the importance and the role of knowledge and innovation and with the link of this evolution to the paradigm of Knowledge Economy.

2.1 DESIGN IN MICROECONOMIC THEORY

The phenomenon of Knowledge Economy is above all a phenomenon initiated from microeconomic level by the firms' new strategies and behaviour patterns. In the economic theory, there is a long tradition of interest for insight into ways of value creation. Marx claimed that human labour is the only one that is able to add value. Much earlier Ricardo suggested a fundamental idea of resource-based theory of the firm, which is that rare resources have a strategic nature.

Neoclassical economics perspective (until recently regarded as the mainstream economic thought) treats the firm as a "black box", so everything that happens within the firm for the neoclassical economic thought remains invisible. For example, Neoclassic school of thought assumes that each enterprise has at its disposal the same quantity and quality of knowledge which through the market price mechanism allows the enterprise to maximize the profit. This assumption excludes the possibility of existence of different levels of knowledge, and therefore a large part of tacit and explicit knowledge that cannot be evaluated through the price mechanism. Under the assumption of the unlimited rationality of economic agents and the constant tendency of the market to achieve a state of equilibrium, early neoclassical thought sees the innovation and knowledge as the product of rational choice between the existing technological and structural alternatives and knowledge which are in same time available to all enterprises. In other words, knowledge is seen as a fixed variable, exogenous and not endogenous to the firm, so neoclassic economics explain competitive strategy on the basis of external environmental factors.

Other theorists who did not agree with the neoclassical assumption, observed knowledge from a totally different perspective. Unlike the neoclassic, the Austrian School of Economics and its representatives Friedrich von Hayek and Joseph A. Schumpeter gave knowledge much greater significance. They argue that knowledge is subjective and therefore cannot be treated as fixed, and that precisely different levels of knowledge and its specificity, held by individual firms, represents the main cause of the dynamics of economic change[17]. During 1950s Edit Penrose, exploring the significance of the accumulated knowledge and experience within the organization, observed the firm as a reservoir of knowledge[18]. According to her, in the production process the inputs do not represent resources per se, but

the ways how resources are used. The Theory of Organizational Learning developed during the 1980s, is primarily focused on the organizational response to the rapid and on-going changes in the economic and technological environment. Senge P. M. has observed that a large number of organizations suffer from an inability to learn. For the treatment of this disease he gives a prescription in the form of a practical model of "learning organization".[19] Such an organization has the capacity for both modes of learning – generic and adaptive, which are its main source of value creation and sustainable competitive advantage. From the beginning of 1980s the economic literature starts to generate more and more empirical evidence that differentiates in profitability between firms stems from the specificity of their resource portfolio.[20] Resource-Based Theory of Firm starts to explore firms' strategic resources. Resources are defined as tangible and intangible assets that are in time related to the firm. The value is viewed in relation to the value of the firm's resources. [21] Intangible resources are valuable, rare, non-substitutable and hard to imitate, which is why they are treated as strategic assets capable of generating sustainable competitive advantage and superior financial performance.[22] In the beginning of the 1990s, this theory was further developed by Teece and Pisano in their concept of Dynamic and Key Capabilities. Also, Hamel and Prahalad developed the concept of Key Competencies.[23] Both concepts emphasize the behavioural aspect of the strategy, in other words, how a firm will compete instead where it will compete. Also, both concepts underline that the sources of competitive advantage must be sought within the firm in its resources based on knowledge, skills and innovation, and their specific matrix of value creation. Parallel with the development of a Resource-Based Theory the Evolutionary Theory of Firm emerged, which postulates that knowledge of the firm is stored in regular and predictable matrices of firm behaviour which Nelson and Winter call routines.[24] They

identify routine with genes and perceive innovation as the result of inherent, unpredictable mutation of routines. For this theory new knowledge is a result of a new way of combining existing routines, which is specific to each firm and leads to creation of unique strategies of value and profit creation. Thus, the specific resources and competencies of firms cannot be acquired by simple imitation, because they are the result of firm-specific processes through which they create knowledge and build their routines, competencies and skills.

At the end of the 1990s it was obvious that society and economy are in a period of transition to economy intensively based on knowledge, innovation and creativity. One more important theory which acknowledges the rising importance of knowledge resources was the Knowledge-Based Theory of Firm. This theory explores the firm from the perspective of its ability to integrate, create and manage knowledge.[25] The very process of knowledge creation is seen as an activity that due to its uniqueness and value becomes a source of abnormal profit. Therefore the firm's competitive advantage is in the very process of knowledge creation, rather than created knowledge. This theory treats knowledge as ability to act in productive and creative way, and insists on the importance of articulation of various forms of tacit knowledge as such can be converted into various forms of organizational activity based on knowledge. Also, this theory emphasizes that maintaining organizations' health depends on the firm's ability to see if there is a need for destroying the existing knowledge and finding new and better ways of thinking and doing.[26]

In the very beginning of the 21st century one more theory shaped its systematic form, the Theory of Intellectual Capital. The Resource and Knowledge Based views, Evolutionary Theory approach and concept of Dynamic and Key Capabilities all stress out that firms' most important strategic assets are those based on knowledge (intangible assets). Since the

identification and management of intangibles has not been satisfactorily addressed in these theories, this is where the intellectual capital perspective comes in. The Theory of Intellectual Capital expands on and elaborates the strategic and operative understanding of firms' key capabilities. The essence of this concept lies in the philosophy of value creation, instead of value appropriation. The approach to the purpose and function of the firm is holistic, where the firm is viewed as an organism in which the whole is greater than the sum of the parts, and in which the most valuable resource are the people, rather than corporate tangible and intangible assets, because these assets are also created by people. The potential of the firm to create value is treated as its key capability. Profit is therefore seen not as purpose for itself but just as a consequence of the realization of the main purpose of the firm, and that is building capability for long-term value creation which will satisfy all stakeholders and ensure long-term success. Therefore, for the strategic theory, the implication of this perspective is the shift of focus from the traditionally dominant theme of developing ways of value appropriation to aiming at the process of value creation.[27] The Theory of Intellectual Capital determines five resource categories, which can be used as a framework for facilitating the identification of all firms' strategic resources (Roos and Roos, 1997). These categories are human, organizational and relational resources on the intangible side and physical and monetary resources on the tangible side. The intellectual capital of the firm is not just knowledge. It consists of human, organizational and relational capital. Human capital involves not only tacit and explicit knowledge of employees. It also includes employees' competencies and capabilities in terms of structuring and applying knowledge and skills to perform certain activities. Organizational capital is the extension and manifestation of human capital in the form of codified knowledge, innovation, organizational structure, corporate culture, value

of brand, documented information, blueprints, intellectual property, business processes and physical and financial structure of a firm. Relational capital is the ability to build quality relationships with external stakeholders: customers, suppliers, investors, state and society in general. Therefore, the Theory of Intellectual Capital provides a basis for generating information necessary for making strategic and operative decisions concerning a firm's intangible resources. This theory stresses that organizations create value through a number of linkages and interactions between all relevant resources. Accordingly, external resources, in different forms of strong and intensive linkages with organizations' stakeholders, are equally important as internal resources. Stakeholders include shareholders, employees, customers, suppliers, lenders, the government and society, and they are treated as organizations' partners in the process of value creation.

In attempt to explain the relationship between design as economic value added activity and economic theories, John Heskett argues that "The greatest problem in considering what economic theory explains about design, specifically or by implication, is in the context of Neo-Classicism, which in the Anglo-American world dominates both academic theory and applied economic practice".[28] Considering the basic nature of design practice, which determinants are innovation and change, where designers' concepts become the products, communications, environments and systems of the future, Heskett argues that neoclassical assumption about the static nature of products and markets, and its assumption about the fixed choice of available knowledge, consequently reduces design to a trivial activity. He thinks that, at best, the Neoclassical Theory gives design a minor role in superficial differentiation of unchanging commodities, but generally it contradicts the whole validity of the design. The neoclassical obsession for short term maximization of profit is contradictory to the firm's

need for innovation, because innovation is a long term process, whose economic benefits cannot be immediately recognized in the financial reports. But, from the beginning of the 1980s, as it is already mentioned, the mainstream economic science started to introduce knowledge, innovation, skills, competencies and creativity as a key factor for business success and sustainable, long term competitiveness. Assigning greater importance to intangible assets in the economic theory corresponded with the recognition of a paradigm shift towards a Society/Economy Intensively Based on Knowledge. All earlier mentioned microeconomic theories (except the Neoclassical), consider knowledge, innovation, creativity, skills and competencies as strategic assets which generate the firm's competitive advantage and long term superior financial performance. They acknowledge the importance of their rarity, the fact that those resources are non-substitutable and hard to imitate and articulate the ways of preventing imitation of those resources. The concept of intellectual capital further concretized this problematic giving the taxonomy of intellectual capital assets, methods for their measurement, and models for their management. Since design activities generate elements of structural capital (products with copyright protection, patents, brand architecture, blueprints and technical solutions, trademarks, logo solutions, prototypes) and human capital (knowledge, creativity, innovative thinking, specific skills, competencies) it is certain that the design represents one of the activities which create intellectual capital. Therefore, design activities as one of the elements of intellectual capital represent the firm's strategic resource. And that is something which is nowadays widely recognized.

2.2 VALUE OF DESIGN FOR ENTERPRISES

Design practice is present in almost all economic sectors. From the firm's perspective, the design activities are part of the investment in research and development. Regarding the improvement of the firm's competitive advantage, the design of the whole product or its key components may be used to improve its basic technical performance, to provide new functions, to improve ease of use, to provide the styling that immediately attracts customers, to improve quality, reliability or durability, to reduce manufacturing, distribution or life cycle costs, and/or to unify or extend a product range.[29] Researches show that commercially successful product development projects require a broad, multidimensional approach to design of the whole product with a focus on product performance, features and quality and technical or design innovation. Lossmaking projects, even technically complex ones, tend to involve a narrow, often styling oriented approach to product design with more attention paid to the product range and cost reduction than to performance, quality and innovation.[30] Generally, from the firm's perspective, the role of design is in the creation of value added for products, services and firms.

Studies of the relationship between investing in design and a firm's performance all show positive relationship between these two variables and that investment in design increase the firms' revenue and market share. For example, Black and Baker's study shows that 95% of firms with a negative growth rate did not use professional design services, and that the ones with the high growth rate did.[31] Other study conducted by Walsh identified a generally positive relationship between design consciousness and the firm's performance.[32] The research "Value of Design 2007" gives the information that between 1995 and 2004, the share prices of design-conscious firms outperformed other firms by 200%. Furthermore, there is information that for

every £100 a design-alert business spends on design, turnover of firms increases by £22512.[33] The MADRID study found out that 89% of the firms which successfully use design increased their profit with an average return in the investment period of 15 months[34]. This indicates that investing in design should not be treated as an expense, but as a long-term investment.

Apart to contributing to the economic value of the product, design represents one of the most important factors which govern consumers when deciding to purchase a specific good. The goal is to create a product that, in its designed appearance and function, expresses a personality or tells a story. Products that carry such attributes are more likely to give off a stronger expression that will attract more consumers. On that note it is important to keep in mind that design expression does not only concern the appearance of a product, but also its function. If the product has an attractive appearance but its function does not follow through, most likely it will not be of interest for consumers.[35] Umberto Eco in his essay about the retrospection of Italian design gives a very clear example for a product missing the functional and practical dimension in favour of its aesthetics.[36] He cites an example about the attempt of Italian designers to create a super modern fork inspired by a Danish design. Italian designers produced beautiful fork with short spike. That fork was saying "I am one super modern beautiful fork". But since the forks were produced for the Italian market, Italians like to eat spaghetti a lot, unlike Danes who eat peas a lot. For Danish people, forks with short tines were used as some kind of spoons, to pick up the peas from one side and to catch the meat from the other. However, winding spaghetti on this fork is almost an impossible task. These forks were not functional for an Italian household and for Italian restaurants too. And of course, the sale of these forks in Italy failed and the project failed. In this sense, designers are like communicators, they have to use the right language of different elements in the

product to express what the product is about.

Still, the role of the design in a firm product differentiation competitive strategy is of crucial importance, especially when the product life cycle matures, because more competitors enter the market. In this context the key role of design is in product differentiation; through quality, appearance, performance, ease of use, reliability, reparability and so on.[37] Therefore, product design is one of the most important non-price factors which determine the success of a product. In practice, the purchaser's choice is also influenced by various other non-price factors such as the company image, the availability of a product, advertising. While product design is generally considered to be a non-price factor it is also important to consider the influence of a design upon product price. Product design affects the cost of production through the choice and use of materials and how the product is designed for manufacture. Design also influences after-sales maintenance and running costs (like dishwashers, furniture). Running costs are often calculated as being integral to the price of a product in purchaser's decisions.

Today there is more empirical research about why firms use design. The results of Gemser and Leenders' study about influence of design investment on firms' economic performance in two sectors in Netherlands: home furniture and precision instruments, shows that firms believed quite strongly that industrial design investment was associated with a range of improvements in business performance. The firms gave the design the highest score for improvement in product performance, improvement in the corporate image and improvement in user friendliness of the product in both sectors.[38] Researches in Spain showed that most firms considered design as an important part of their business strategy.[39] The percentage of firms that have invested in developing new products with a strong design component has increased, from 53% in 2005 to 59% in

2008. Results of this research showed that one of the main reasons why firms consider design as important for their business is its ability to improve the firm's image (63% of respondents), in the second place is the increase of sales (40.5%) and in the third place is its function regarding the development of new products and services (38%). The conclusion is that firms believe that the most important role of design is to improve the brand image and the reputation of the firm. Also, more than half of the firms felt that the design improved their customers' satisfaction, communication with customers, turnover, profit, employee motivation, business productivity and entering into new markets.

As part of Europe's Economic Study, in a survey of design-intensive companies, respondents were asked why design is important to their business.[40] More precisely, they were asked to indicate, on a scale of one to five, the importance of seven specified design related factors: design adds value to the product, creates competitive niche, enables entry into new markets, increases consumer loyalty, differentiates products from competitors, strengthens product marketing and improves access to finances. Firms in the field of professional, scientific and technical activities provided the highest ratings of importance across all seven factors, followed by manufacturing firms and trade or repair firms. These results indicate that, overall, design is considered to have a slightly more important influence on business success by respondents from the professional, scientific and technical activities sector than from other sectors. Firms in Northern EU Member States rate the importance of increased consumer loyalty more highly than firms from other regions, but these same firms rate the importance of differentiating products from competitors lower than any other group. For the majority of factors, firms from the Western EU Member States were the most pessimistic about their importance, while firms in the Northern EU Member States graded several factors

most highly. In terms of the single most important rationale for design, firms in the Central and Western EU Member States emphasize the differentiation of products from competitors, the Southern EU Member State firms stress the added value it brings to the product, and the Northern Member States highlight the strengthening of product marketing.

2.3 DESIGN IN MACROECONOMIC THEORY

Connection between design and macroeconomic growth perspective can be found in, the so called, *new theories of growth*, (Romer, 1990; Lucas, 1988; Helpman, 1992; Nelson, 1994; Dosi and Nelson, 1994) which focus on the role of knowledge, innovation and new technologies, for economic growth and development, and on the role of the state in that mater.[41] Romer points out that the development of modern society intensively based on knowledge is based on software matrix production, the so-called innovative recipes, innovation materialized in new technology solutions and products, and innovation realized in new types of services and ways of thinking regarding organization of economic activities. Given that the very nature of the design reflects the creativity, innovation, and innovative way of thinking, it is only natural that contemporary economy recognized the design sector as one with a high growth and income potential. However, until now, only few theories precisely mention design as a valuable factor for value creation and generation of competitive advantage. For example Heskett mentions "holistic nature of Friedrich List's (1841–4/1966) concept of the role of state policy in promoting productive powers that specifically acknowledges "the art of design" as one of the factors capable of profound influence in improving the manufacturing industry. The evolution of this idea has

informed the German industry and has been an integral element in its remarkably resilient performance despite political traumas and devastating military defeats".[42] Heskett quotes the Anton Jaumann's words about issues concerning Germany's competitive position in 1907. Jaumann states that, in the long run, Germany cannot compete in cheap mass-production and that it should specialize in production of excellent and quality goods which cannot be easily imitated. He emphasizes that nothing can harm commercial reputation of a nation as much as the label "cheap and nasty". Furthermore, Heskett gives the example of a Japan policy concerning design where the role of design was recognized as the integral part of future success of Japanese products in the international market "...the role of the state policy in initially establishing design competencies and encouraging their application in Japanese industry and commerce has been a remarkable example of how, indeed, a government can encourage the development of productive powers. Comparing a situation in the mid-1950s when there were virtually no formally trained professional designers in Japan, in 1992 as the result of policies introduced by the Ministry of International Trade and Industry, Japan had 21,000 industrial designers. Policies based on the Japanese model were also introduced in Korea and Taiwan and similarly have played an important role in their economic growth.[43]

Until the end of the 20th century the awareness of the importance of the design sector for the macroeconomic development has been recognized and included in the concepts of Creative Economy, and Creative Industries. In the middle of the 1990s along with the more evident social and economic transition towards Society/Economy Based on Knowledge and the growing importance of intellectual capital, the concept of creativity and its role at an individual level, and on the level of organization and nations, enters into the centre of attention of state public policies and academic research.

In the 1990s the international economies were influenced by increased "transition of the production-oriented economy to a consumption-oriented one, when cultural and symbolic goods, material and immaterial cultural products and creative services started to be perceived with greater importance for economic development".[44] This situation signifies the rising importance of creativity, creative capital and creative economy that generates wealth by harnessing intellectual labour, intangible goods and human creative capabilities. Consequently, there was an increasing research interests for creative capital as a specific form of intellectual capital. The term *creative capital* was greatly promoted by Richard Florida. He argued that from an economic perspective, a high level of human creativity potential may be considered a form of capital, in other words – a creative capital. According to him, a creative capital is a human ability to create new ideas, technologies, and business models, cultural and artistic forms[45]. The term *creative economy* is used to describe that the market demand is increasingly infused with cultural needs and creative content and that the cultural or creative sector is becoming an important factor of economic growth. John Howkins who introduced the term creative economy in the wider use points to the three main elements of creative economy: creativity as an idea that can be economically valorised; creative products that are the result of creative work and creative activity. According to him, a creative economy involves transactions with creative products, and it is equivalent to the value of creative products multiplied by the number of transactions.[46] He emphasizes that only creativity that can be economically valorised can be considered as a part of the creative economy, which is the same condition applied on the term and definition of the intellectual capital. At the heart of the creative economy are the cultural and creative industries that lie at the crossroads of arts, culture, business and technology. What unifies these activities is the fact that

they all trade with creative assets in the form of intellectual property (IP); the framework through which creativity translates into economic value.[47] Howkins gave an estimate that in the year 2000 the creative economy was worth US $2.2 trillion, and that it was growing at an annual rate of 5%.[48]

The UNCTAD definition of Creative Economy in 2008, which brought this term into popular use recognized the wider societal impact and defined Creative Economy as: "The interface between creativity, culture, economics and technology as expressed in the ability to create and circulate intellectual capital, with the potential to generate income, jobs and export earnings while at the same time promoting social inclusion, cultural diversity and human development".[49] Also in the UN Creative Economy Report of 2013, it is suggested that "Cultural and creative industries not only drive growth through the creation of value, but have also become key elements of the innovation system for the entire economy. According to this viewpoint, their primary significance stems not only from the contribution of creative industries to economic value, but also from the ways in which they stimulate the emergence of new ideas or technologies, and the processes of transformative change. The creative economy should be seen, therefore, "as a complex system that derives its 'economic value' from the facilitation of economic evolution – a system that manufactures attention, complexity, identity and adaptation though the primary resource of creativity."[50]

The concept of Creative Economy is closely linked to the Cultural/Creative Industries, whose largely intangible outputs are as 'real' and considerable as those of other industries. The term "Creative Industries" first appeared in 1994, in the strategic document of the Australian Government "Creative Nation". But the idea for analysing the economic potential and impact of the creative resources came from the International Intellectual Property Alliance (IIPA) in 1990 with the

research of economic potentials of copyright industries in the USA. The first definition of creative industries emerged in 1998, in the document of the British Government called "Creative Industries Mapping Document". According to this definition, creative industries are those industries which derive from individual creativity, skills and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property".[51] Under the British concept, the creative industries include 13 sectors: advertising, architecture, art and antiques market, crafts, design, designer fashion, film and video, interactive leisure software, music, the performing arts, publishing, software, television and radio. This classification can vary from country to country according to methodological differences and official classification of industrial activities.[52] Creative industries mapping documents as a tool for evaluation and measurement of the creative capital, try to identify and estimate the economic capitalization of artistic creativity potentials through creative industries concepts. Mapping studies can be of value to policy and industry as they provide core data about industries which are hard to classify and document statistically. In many cases they can be used as background justification for government support. The development of robust methodologies is critical to achieving the primary function of mapping studies. Both undervaluation and overvaluation carries dangers.[53]

2.4 VALUE OF DESIGN FROM MACROECONOMIC POLICY LEVEL

A huge step in the systemic inclusion of the design sector in the state's economic policy and competitive strategy was the foundation of National Design Councils. For example, the British

Design Council was founded in 1944 by Hugh Dalton, President of the Board of Trade in the wartime Government. At first it was named the Council of Industrial Design (COID), with objective to promote by all practicable means the improvement of design in the products of British industry. The UK Design Council has become a pioneer in mapping and measuring economic contribution of the design industry. Although the design policy and promotion differs from country to country, there is a consistent growth in government-backed local organizations as champions to underpin the cause. Many governments, until today, have been investing heavily in sponsoring and promoting design as a key route to stimulate innovation, jobs and exports and as a means to systematically address challenges. For example, China set the goal to move from "Made in China" to "Designed in China". Over the recent years China has driven the national and regional design policy, with investments in education and national promotions. Other Asian governments are strongly committed to the promotion of design, particularly those in Singapore, Korea and Malaysia. Similar drives are evident around the world and there is an enhanced focus in Europe, where the European Commission is leading new design policies at the heart of innovation that underpin "competitive advantage for European companies". Given the design's ability to find creative solutions to social and economic challenges, it has an increasingly important role in the future as complexity and pace increase. Will Hutton argues that design will be at the core of a strong Knowledge Economy of the future, one of the coping stones of an innovation system and the most important intangible investment for manufacturers.[54]

There have been various studies with the purpose to unveil the interrelationship between national competitiveness and design. Researches have consistently shown a link between the use of design and improved business performance across key measures including turnover, profit and market share. The

New Zealand Institute of Economic Research (NZIER) published a report which compared the national competitiveness index ranking and the use of design index ranking based on the Global Competitiveness Report 2001/2002. According to this report there were strong correlations between the use of design and national competitiveness. The report also indicated that countries with a high ranking in national competitiveness paid more attention to design.

In 2003, the Finish organization "Designium", studied 17 countries out of the top 25 from the NZIER report in order to identify the global context in the design policy and promotion programs. The main finding was that design policies and programs are quite similar in many countries and tend to emphasize design as a strategic tool for enhancing economic progress and improving competitiveness, while simultaneously emphasizing the national role of design in creating jobs and generating business opportunities. Furthermore, the report stated that design can be utilized in completely new areas, where its benefits have not yet been imagined or considered. This report demonstrated that countries leading in design are actively dealing with design promotion issues to enhance their design competitiveness.[55] In 2006, 2008, and 2010 "Designum" continued to produce reports about national design policies with an aim to lay a foundation for a long-term evaluation and analysis of the development of national design policy and design promotion programs. The data from the reports allow comparison of the effects of national design programs on national competitiveness in the design sector, and monitoring of the selected states design policies and their strategic content. The reports also produced design competitiveness rankings using selected indicators at intervals across a few years. The Designum report "Global Design Watch 2010", examines five different aspects of national design programs in selected countries: (1) scope of promotion, (2) funding design

policy and promotion programs, (3) main objectives, (4) implementation, (5) related facts and figures and (6) main actors' programs.[56] Although the design policy and promotion differ from country to country, the common strategic objective for all the examined programs is national design promotion strategies realized through diverse spectrum of initiatives and activities such as design awards, fairs, competitions, exhibitions, studies and workshops.

Regarding the design in the EU innovation policy, there is an increasing focus on Europe. In October 2007 the Office of European Designers' Association (Bureau of European-Designer's Associations BEDA) launched the discussion about the importance of design and its potential in the context of achieving the goals set by the Lisbon Agenda. At that time, on the level of the European Union, there was no coherent design development strategy. In relation to the total number of EU member states there is a smaller number of those who have set up design as a priority in their development policies. The European design industry is small and fragmented, and on the contrary, its role in the increase of competitiveness, improving business performance and generating EU wealth is more than evident. Therefore, representatives of BEDA pointed out the urgency of making an integral development program for the design industry on an EU level, which will facilitate management, development and strengthening of single European forces in the field of design. This program is called "Design Europe 2010". In May 2010, the Ministers in charge of competitiveness in the Council of the European Union, adopted conclusions on design as a driver of user-centered innovation and introduced a European Design Innovation Initiative. "The Commission and Member States were invited to give special attention to design considering its leverage effect on innovation performance, taking into account economic, social and environmental sustainability aspects and the need

to establish platforms for exchanging knowledge, experiences and best practices on design issues as a competitive advantage for European companies". Many individual European nations have design bodies that promote the use of design, notably Germany, France and the Scandinavian countries, and they have an increasing interest in non-technological forms of innovation.[57] Denmark, for example, has national design policies as part of their national economic growth and improvements in the public services.

Since 2010, when design was included in European innovation policy for the first time (Innovation Union), the design policy landscape in Europe has transformed. Not only there is an Action Plan for design-driven innovation at the European level, but a number of European Member States, including Denmark, Estonia, Finland, France and Latvia, have also developed design action plans. In addition, 15 out of the 28 European Member States (EUMS) have design explicitly included in their national innovation policy. Furthermore, there is a growing awareness of design as a factor for innovation at regional and local levels with a number of regions integrating design into policy, including Flanders (Belgium), South Bohemia (Czech Republic), Central Finland, Central Macedonia (Greece) and Wales (UK) among others as well as an increasing number of design managers in local public authorities, including, for example, Lahti (Finland), St Etienne (France), Dublin (Ireland), Katowice (Poland) and Kent, Monmouth and Shropshire (UK).[58]

2.5 FACTS AND FIGURES OF THE DESIGN INDUSTRY

Since information from most international and national researches regarding design sector size and its economic contribution are non-comparable and comprehensive, it is impossible to know exactly the value and size of the design industry on a global level. It is estimated that the global design market is worth about 140 billion dollars, of which the markets in America, Japan and Germany account for about 60%.[59] Regarding the figures of the European design industry, crucial data are still lacking such as the total employment in the design sector, the gross value added, the number of designers with tertiary education and the types of design expertise offered. The only way to gain reliable figures for those indicators is through a comparative European benchmarking study using the same methodological parameters.[60] According to the European Commission's Action Plan for design-driven innovation, there are approximately 410,000 professionally-trained designers working in Europe, generating an annual turnover of €36 billion. The majority of design consulting companies in Europe are micro-companies or SMEs.[61] There is a large body of trained European designers working as in-house designers principally in medium and large companies. European designers are leaders in their field, often working for both European and non-European global brands. In the study called "Design Policy Monitor 2015", there is information about current and future trends in Europe's Design Innovation Ecosystem.[62] For example, from the studies about companies using design in a strategic way conducted in six countries (Austria, Denmark, Estonia, France, Ireland and Sweden), averagely 33% of enterprises do not use design, 22% use design as styling, 30% use design as a process and 15% use design strategically. Danish and Swedish enterprises use design most strategically (23% and 22% respectively), while Austria and Estonia have the least

proportion of businesses using design in a strategic way (9% and 7% respectively). Consequently, Denmark and Sweden can be considered to be design leaders, while France and Ireland could be categorized as design followers and Austria and Estonia would be considered as moderate design users. Also the results from this study show that designers make up approximately 16% of people employed in the creative industries in Denmark, Estonia, Finland and the UK. According to figures from the UK Department of Culture, Media and Sport (DCMS) 2015 report, employment in the design sector grew by 17.7% (or 27,000 jobs) in two years and the gross value added of the design sector increased by 23.8% over three years compared with 4.2% for the UK economy as a whole, implying that growth of this sector was faster than the growth of any traditionally fast growing sectors such as the financial sector. Furthermore, the value of exported design services was £190m (an increase of £59m since 2011).[63] One more interesting study, "EU: Intellectual property rights intensive industries: contribution to economic performance and employment in the European Union", was conducted as a joint effort of the Office for Harmonization in the Internal Market (OHIM) and the European Patent Office (EPO). Intellectual Property Rights (IPR)-intensive industries are addressed by differentiating patent, trade mark, design, and copyright-intensive industries as well as according to geographical indications.[64] The results of this study show that in regard to the contribution of IPR intensive industries to total EU Gross Domestic Product (GDP), design intensive industries in the EU create 1,569 billion and contribute to 12.8% of the total EU GDP. Also the results show that the largest industry found to be in the top 20 most design-intensive industries is wholesale of clothing and footwear, which employs nearly 400.000 people.

In the study "The Economic Review of Industrial Design in Europe 2015" we can find comprehensive information about the size, value end economic contribution of the EU members

states to the industrial design sector.[65] Among the first on the list of design intensive enterprises were the firms from manufacture sub sectors such as manufacture of watches, leasing of intellectual property, manufacture of cutlery, manufacture of ceramic household and ornamental articles, manufacture of lighting equipment. Regarding the export potential, the study reference to research conducted in 2012 by the "Big Innovation Centre" which found that design-intensive sectors contribute 35% of the entire EU export. This report identifies six sectors which are particularly design-intensive: 1) design services, dominated by small firms but with a high propensity to export; 2) architectural and engineering services, one of the most design-intensive sectors and one in which the UK has a substantial trade surplus; 3) computer and telecommunications services, a highly productive sector featuring high wages and often selling services to other businesses; 4) printing and publishing, another sector in which the UK has a substantial trade surplus; 5) fashion and craft, where core designers enjoy a substantial wage premium over others in the sector who earn below average incomes; and 6) advanced manufacturing, a sector which is export intensive. Regarding employment, the European Economics study finds that approximately 11.3 million workers were employed in industries which were design, patent and trademark intensive. In the same study there is analysis about how attractive member states are to design industry (European and non-European). Also results show that the top five countries with the largest number of design applications were: Germany, UK, France, Spain, Italy, and Poland. Austria had 841 applications, and Croatia 483.

The study also provides analysis of the total number of design applications that originated in Europe (and filed anywhere) by Locarno class as per 2012.[66] The results showed that out of the 33 classes, the top seven classes: Furnishing; Articles of Clothing and Haberdashery; Packages and Containers for

the Transportation or Handling of Goods; Lighting Apparatus; Household Goods, not elsewhere specified; Graphic Symbols and Logos, Surface Patterns, Ornamentation; and Fluid Distribution Equipment, Sanitary, Heating, Air Conditioning Equipment, account for 53% of all designs applications within the EU, and the top two classes (i.e. Furnishing and Articles of Clothing and Haberdashery), account for 25% of the total. Regarding geographical specializations in the design activity, "furnishing" as a top class for design applications originated in Scandinavian countries (Denmark), Baltic countries (Lithuania), Eastern European countries (Poland), middle European countries (Germany), and Southern European countries (Italy). Articles of clothing and haberdashery, is popular in South-west Europe (Luxembourg, France, Spain, and Portugal). Packages and containers for the transport or handling of goods is the primary class of destination for designs originated primarily in the Eastern European/newer Member States (Bulgaria, Croatia, and Romania). With regards to the "furnishing" class, Germany is the country that in 2012 filed the largest number of design applications (design applications from Germany account for 41 of all design applications filed in the furnishing class). In the same class, Italy accounted for 17 of all filings and also considerable number of applications for the furniture class came from France, UK, Spain, Poland and the Netherlands. With regard to Articles of Clothing and Haberdashery, the applications from France (25), Italy, (18), and Germany (17), accounted for 60 of all applications in this class.

3 DESIGN CHALLENGES IN THE 21ST CENTURY

In the context of all the above mentioned, it is clear that the design sector in the 21st century faces significant challenges. In this sector, as well as in all the other sectors, the social and economic changes that have become more visible and intense in the previous twenty years are strongly reflected. Scientific discoveries, the evolution of the individuals, social and economic organizations and systems have led to a change in ways of behaviour, thinking and acting at all levels of human life. So far it is clear that those changes with their consequences, point to the need and aspiration for a more integrated-holistic approach to thinking and acting, especially in the context of solving problems and facing challenges. Challenges for the design sector at the beginning of the 21st century, brought by socio economic paradigm shift could be explained from three perspectives: Knowledge Economy challenges, public policy expectations, and design professionals' perspective.

3.1 CHALLENGES BROUGHT BY KNOWLEDGE ECONOMY

The paradigm of Society/Economy Based on Knowledge is reflected in a number of specific changes whose consequences represent very specific challenges for the design community and design as a discipline itself.

For example *the changing understanding of what constitutes innovation, changing pattern of innovation, disruptive impact of technology and shorter product life cycle* are the characteristics of today's competitive environment. This implies that design activities such as brand or visual identity design, and product design, are considered knowledge-generating activities. Therefore, design is recognized as an intangible asset which can be one of the key factors for building firm innovation potential and therefore competitiveness. At the same time, intense innovation pace has powerful disruptive effect. This is because the speed and intensity of innovation, which is unprecedented in human history, results in artificially conditioned shorter life cycle of the product where literally what we set out to produce today is already obsolete. For the design this phenomenon has at least two connotations. Firstly, the continuous scientific discoveries are faster and more diversely applied in all areas of life, particularly in the context of creating new or improving existing products. Since the design, especially product design is perceived as innovative activity, and one of the key intangible assets for building competitive advantage for firms, designers are under increasing pressure from expectations to continuously innovate. In other words, they are expected to invent a lot in a very short period. Secondly, designers have to possess the ability to understand technological opportunity and to act upon it; otherwise they will remain as visualizers of others' ideas or incremental improvers of existing products. Their work must be efficient through innovation on multiple levels of contributing to creating new economic value for a firm.[67] Consequently, in order to be able to cope with constant technological changes, it is necessary for the designers to constantly improve their knowledge with opportunities that bring new discoveries and technologies, through both theory and practice.

There is also another phenomenon that knowledge economy brings as a pattern of knowledge creation and precondition

for innovation and that is that *Knowledge Economy acts in a network order*. This trend highlights the important role of dynamic relationships between individuals, groups, institutions and corporations; emphasizes the advantage of flexible and adaptable network structure of the organizations and changing pattern of innovation where the capacity to innovate depends on the level of communication between different actors, companies, research laboratories, academic institutions and consumers and on the feedback between the scientific community, engineers, and designers. In the context of challenges for design, designers must function within institutional structures of various kinds that enable and constrain their endeavours. In other words, they are not independent spirits, but dependent on the view of design held by the management or the cultural imperatives of an organization. Also designers are nowadays confronted with virtual explosion in the amount of raw data available to them, where knowledge is critical in order to go through this data and make sense of it. In addition, the need to cope with the trend of shrinkage of the product life cycle and stay competitive, designers also have to shrink product development time through the use of simultaneous and collaborative design processes, which depend on effective transfer of knowledge between all relevant actors. Finally, the awareness that decisions made in the beginning of design process have a higher impact in terms of energy, cost, and sustainability, has resulted in the necessity to develop knowledge typically required in the later stages of design in the earlier stages of design.[68] In this context, in order to build their own capacity for innovation, apply new methods of product development and gain access to relevant information and knowledge, it is expected from the designers to possess excellent communication skills, multidisciplinary attitude and knowledge, and willingness to cooperate and continuously learn from all relevant stakeholders important for their projects.

Furthermore, one of the most impressive phenomena of Knowledge Society which has great impact on design processes and product development is that t*he production of data and operational programs become the immediate production process, which tends to reproduce social structure of knowledge*. The outcome of this development is that scientific knowledge, in terms of direct productive force, becomes a social resource with its function comparable to the function of the labour force. This phenomenon is most visible in the open source and crowding concept of the creation of knowledge and innovation.

Finally there is a question of efficient protection of value of design. In the contemporary world, new knowledge gains the role of strategic resource on which the competitive advantage of firms and national economies depends. Such knowledge in today's economy is a scarce resource. Translated in the context of design this means that design, as a unique intangible resource, has great value for firms and national economic competitiveness, and therefore it must be adequately protected, through legislative mechanism of industrial design or copyright protection. But the forthcoming and new technologies such as 3D printing, bring great challenges in regard to efficient protection of intellectual property rights relating to design.

3.2. PUBLIC POLICY EXPECTATIONS FROM THE DESIGN SECTOR

The level and types of expectation from the design sector are best seen from national design policies and development strategies, whereby these expectations turn into practical challenges for designers. What is common to all the countries is that they expect from the design sector to become one of the main levers for future growth and development of national economies. From earlier presented research regarding the place of the

design in macroeconomic development and national design strategies, the following challenges can be extracted:

In educational context, design education institutions are expected to implement commercially and internationally orientated approach in their further design study programs. Such programs should give students commercially oriented and international design competencies, which should lead to improved competitiveness of businesses and to the improvement of the quality of life. Also the focus is on the development of collaborations between design, business and other schools or disciplines to advance the understanding of design through multidisciplinary courses. Furthermore, the challenge for education is to improve the capability of design research and product development and to foster interaction between design managers, organizational executives and managers, educators, and public policy makers.

In economical context the main challenges for the design sector is to build the capacity to innovate and deliver world-class brands, products and services, to strength competitive positions of national economies, and to improve the understanding of firms regarding design methods and their utilization. Also there are challenges considering expanding design awareness of corporate management, design professionals and the public sector through education and training, challenges concerning the use of design as a strategic tool for innovation, and challenges regarding articulation of the value of design, and its importance to social and economic success.

In social context challenges are addressed to issues such as practicing sustainable 'good' design, development of new solutions with regard to national social and economic challenges, practicing user centric design and involvement of communities in designing local services, development of design communication skills and collaboration capacities.

3.3 CHALLENGES FROM DESIGNERS' PERSPECTIVE

Prof. Mugendi K. M'Rithaa, President of the International Council of Societies of Industrial Design (ICSID) said "If the rhythm of the drumbeat changes, the dance steps must adapt accordingly. Ours is certainly a very different world from when our organization was formed 58 years ago".[69] Recently at the 29th General Assembly in Gwangju, South Korea, ICSID renewed definition of industrial design which is fully presented at the beginning of this study.

This definition tells us a lot about the expectations from design in the 21st century. The design community perceptions of the main challenges that their profession is facing in the 21st century can be reduced to a few general themes: Challenges brought by new technologies, challenges related to the multidisciplinary approach and knowledge; challenges regarding the cooperation and strategic conversation with multidisciplinary project teams, challenges related to the role of design in a sustainable development, challenges related to mutual understanding of the design and business community, challenges related to the social role of design and the examination of the very purpose of the design.

TECHNOLOGICAL CHALLENGES

From designers' point of view, technological challenges are perceived from different perspectives. For example, according to Fernd Van Engelen, *continuous development of new technologies demands continuous development of new skills.* Van Engelen believes that in the context of the enormous potential of new technologies, the key design challenge is to find those moments where technology can enhance or simplify our lives without ever distracting us from here and now, and to communicate those important or interesting bits of information

without ever getting in the way.[70] Dr. Mark Evans, leader of the Design Research Group at Loughborough Design School, at Loughborough University (UK), states that the *use of digital tools and associated methods has changed the way in which product form is generated and communicated.*[71] For example, 3D CAD model and 3D printing can produce parts with great complexity. Using engineering materials for the 3D printing, these parts can have the mechanical properties of off-tool components to enable prototype testing. But, he emphasizes that *technologies cannot replace the need for core skills and knowledge required to be a great industrial designer.* According to Dr. Evans, the challenges and capabilities required to produce beautiful, ingenious and charismatic products for the start of the 21st century are in reality not that fundamentally different from core skills and knowledge of the pioneers of the profession back in the 1930s. What is changed are the ways how things are done. On the other side, Lucas Verweij[72] professor at the Kunsthochschile Weißensee and the Design Academy Eindhoven points out that in contrast to twenty years ago when designers were able to weave and print by hand or understand simple industrial processes, such as injection moulding or extrusion, *today conceptualization of the discipline combined with the use of new technologies have resulted that most designers have little grasp on true craftsmanship*, or in other words many designers do not know how to make stuff. The main question arising from this situation is about future quality of designers' work. Professor Lucas thinks that the quality of designer's work depends on designer knowledge of specific materials, crafts or production methods needed to create products. He argues that if the designer does not possess this knowledge he cannot be connected throughout the whole cycle of product development. Also, he said that the visual presentation of the projects and consumer trend to increasingly buy products online based on their two-dimensional qualities, has resulted in the fact that

design has become strongly image-oriented. Professor Lucas emphasizes that long texts and literature about projects are becoming rare, that sections, plans or sketches are also rarely published and that models and physical 3D-prototypes play an ever-smaller role, because you cannot email or publish them.

The problem of educating and training designers about production cycle is not new. In 1955s Gulio Carlo Argan insisted on stronger inclusion of designers in the production practice. He stated that *large number of designers don't have adequate education which could allow them to work on projects instead work on drawings*. For him, in the industrial production process, the project represents a kind of a Platonic idea. Since the machine can only print the idea in a thousand copies, the task of a designer is that his project includes awareness of all technical conditions necessary for its implementation so that the production process can proceed without any changes and adjustments. Also, the project should assume that the object meets all practical requirements, and it should anticipate and solve all characteristics of the material. Finally through intuitive and inventive process infused with an inherent aesthetic hallmark of the designer, the designer should give the product the final aesthetic seal.[73] Argan points out the problem which is still actual today and that is that designers have to possess ability to understand technological opportunity and act upon it. Otherwise they will remain to be visualizers of other people's ideas or incremental improvers of existing products.

Besides the above mentioned, information technologies brought other new challenges such as visual artefacts that will help people to better understand information about certain themes of their interest. Besides, there are *challenges posed by nanotechnology* which cannot be fully foreseen. But what it is now already significant and already visible for the design profession are new material performances. Fernd Van Engelen believes that the palette of Nano technology

options that designers today have on their disposal explodes with possibilities. He stated that shrinking technology can become increasingly discrete, allowing designers to conceive new devices, or make previously "dumb" products smart. But as devices get smaller and the screen disappears, designers also need to reimagine how to interact with them. He notes that this presents great challenges and opportunities for the designer who can embrace the new medium and can think more broadly about interaction. As many other devices can be made smart with embedded sensors in them, the challenge for 21st century designers is to decide when it makes sense to do so.[74] In the context of the 'Internet of Things', Dr. Mark Evans thinks that these products generally require some form of *interaction design solution*. Interaction design may not become core business for industrial designers, but evidence suggests that a natural flair for graphic design and embedded awareness of how to effectively understand user wants/needs means that the profession is increasingly operating in this area.[75] As technologies advance and products become more sophisticated, designer ability to predict and prescribe how people will use the product becomes much more difficult. In the past we thought about how people use a product, today we should also be thinking about new ways people can make the product on their own or designing to facilitate collaborative consumption rather than individual ownership.[76]

MULTIDISCIPLINARY KNOWLEDGE AND PROBLEM SOLVING APPROACH

Generally, designers understand that contemporary age demands multidisciplinary approach and knowledge, but design as discipline has always been multidisciplinary. Today, what the design profession needs more than anything is people who move easily and fearlessly across boundaries. Designers must be able to connect to, collaborate with and be inspired by different disciplines – fashion, architecture, material science,

business, marketing, ethnography and more. Only in that way a designer will be able to create the great user experiences they aim for.[77] So the design industry should demonstrate that it is able to create communication strategy with different stakeholders, to induce concrete initiatives, and to encourage cross-disciplinary and cross-institutional dialogue as well as synergies from joint research, educational modules and development projects.

MERGING DESIGN AND BUSINESS

Although it seems that the business sector is now more aware of the importance of design and that designers themselves better understand social relations and business environment in which they work, Helen Walters believes that really not much has changed at all compared to 50 years ago.[78] She believes that despite the fact that there is quantitatively more design and that design has been democratized, in reality that did not lead to a wider understanding of the discipline or the hiring of designers throughout the enterprise. Enterprises still value design just about as much as they always did, or in other words, they might appreciate it, but they do not really understand it. Therefore, she advocates spreading and further *advancement of the design thinking concept*, which is now still very rarely successfully used by companies such as Procter & Gamble and General Electric. But those two are one of the few organizations which successfully integrated this innovation concept, because the lack of consensus, common purpose and mission about this concept hinders the application of this concept. She emphasizes that when designers finish their formal education, they are not educated well enough to understand the business environment with which they are going to work and cooperate in future. Design graduates emerge from schools without the skills necessary to thrive in the real world. Unlike artists, *designers have to be able to articulate ideas and their value to*

clients. Before they finish their education they have to understand the main terms and principals concerning the business world. They have to know how to articulate the value of their ideas and work to the client, and to truly understand the needs of their clients. She emphasizes that if designers want to be seen as more than stylists, and that is still a common complaint, then they need to step up to drive the projects, not merely be co-opted to make them look good.[79] In other words, designers need to learn how to communicate with those untrained in their discipline in a way that is inclusive and productive. One thing which can help them to realize productive communication is to use relevant data. Designers need to figure out a way to make the entrepreneurs and technologists believe in investing in their talents, and they should use their years of training and learning and insights in conjunction with the data in order to create better outcomes for all. They must prove that they are prepared to speak a different language in order to get their point across. That is the only way for design to prove itself within a corporate context because this is the context in which industrial designers work. Designers should move beyond the realm of the creative department itself, and prove that design is much more than a glossy product and that it can indeed be used to determine the definitions and domain of innovation, of systems, and business models.[80]

But there is also another perspective coming from designers about this issue. In the designers community there is a large number of those who fear that, due to the intense quantitative growth of the design industry, growth of the public policy perception of design as a key factor of the national economies competitiveness and due to the opportunities provided by new technologies, design will become a superficially artificial discipline, estranged from its primary purpose and skills. Lucas Verweij, professor at the Kunsthochschile Weißensee and the Design Academy Eindhoven, states that since the definition

of design has expanded, the design discipline has become a more conceptual, mental and strategic profession.[81] In his opinion, unfortunately this holistic profession that touches on all skills and senses is being reduced to image making. From one side, the expectations from the public about what design can accomplish have certainly never been higher, and designers are increasingly perceived as problem solvers. But, for Professor Lucas the main issue from designer's perspective is does design besides growing quantitatively, grows qualitatively as well? Can designers really do what the public and the commissioners think they are capable of? He acknowledges that the profession is changing rapidly as a result of its growth, but he thinks that it is struggling with some serious issues, for which only the designers themselves – researchers, practitioners, students and scientists can give proper answers. Also in regard to the increased emphasis on the need for designers to acquire strategic leadership and conversation skills, especially in context of product development, with persons coming from different disciplines, (particularly those from the business world) Lucas says that design is now an on-going strategic conversation where various disciplines are involved. There is a lot of talking and, although there is a broader acknowledgment of design, its position has not become significantly stronger. In fact, the freedom for a designer to explore, innovate and research has been reduced. Regarding the same issue, Dr. Mark Evans believes that despite the signs that the profession is slowly changing, the fact remains that to be a capable industrial designer, it takes at least three years of intensive undergraduate education and those with passion and capability to create beautiful, desirable and cool things have little interest in spending the majority of their working week on 'touch-points' and 'meaningful connections' with services.[82]

Terms such as: *user friendly design, production friendly design, environmental friendly design, community friendly design, design for all*, *universal design*, tell us that the design community attaches great importance to the user centre approach, or in other words, meeting the real needs of people and society as whole represents an important challenge for the designers community.

Danish designers expressed their vision of the future of Danish design in their manifesto and clearly articulated this trend with one term "Design for People".[83] According to them, the most immediate and intuitive adoption of any solution seems to occur when human factor interests are given the same weight and priority as the economical, and for a number of good reasons. For them, design is also a means of promoting involvement, inclusion and coherence by offering access to products and services that are often – and rightly so – perceived exclusive and prohibited by many because of their physical or mental impairment, or simply because they are different from the vast majority. They emphasize that sometimes products or services need to be designed specifically to such – often marginal – groups, but more often than we think, a more inclusive approach to designing products and services – taking into consideration the needs of both able–bodied and disabled users in the development process would benefit all. This concept, as one obligatory design industry contemporary and future task, is being adopted by more and more sectors and product and service categories, because such demands of inclusion are currently being fronted by the European Council and are also specifically articulated in the UN's Convention on the rights of persons with disabilities. Also, designers believe that more attention in the future will be paid to the interactive, more human use of design in the public sector, in the sense of reduction or elimination of barriers between the individual

citizen and the system that design has proved to offer. Confidence and tolerance presents fundamental preconditions for a meaningful dialogue between the two parties – achieved through adding familiarity and relevance, by involving the user in the development or customization of the service and by creating a physical and communicative environment, which resonates with the user's feeling of comfort. All of which are key elements in the design approach.[84]

ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT CHALLENGES

Since the forecasts show that by 2050, human population will achieve the number of 9.5 billion people, this will lead to dramatic environmental problems, since our planet does not possess the capacity to withstand the expected level of exploitation of natural resources. In addition, modern industry produces large surpluses of food and all other type of products, encouraging excessive consumption, causing increasing problems regarding health of all life forms and storage of waste. The destruction of the ecosystem will have a huge negative feedback effects on the increase of the poverty and social and political conflicts. Science and industries have the potential to develop technological solutions that are productive and able to reduce the use of resources and to preserve biodiversity. However, in order to avoid excessive exploitation of resources there is an urgent need for change in the mind-set and behaviour of people and organizations, as well as structural changes in the production and supply chain of goods. Since the lifetime of most products is shortened to an average of two years, a huge amount of discarded old products represents a growing problem for the ecosystem of our planet. The responsibility of the design in this context is extremely great, since the designers are in a position to control or partially control the selection of materials and methods of product creation and their production.

Victor Papanek who already at the end of the 1960s strongly insisted on environmentally responsible design believes that if design is to be environmentally responsible, it must be independent of concerns about its contribution to the gross domestic product. He argues that designers bear a special responsibility for preservation of the planet ecosystems and the health of all life species, since their share in activities that may lead to unsustainable use of natural resources is quite large. As he says, designers are trained to analyse facts, problems and systems, and on this basis to at least try to guess what might happen due to excessive and non-intelligent exploitation of natural resources and use of materials that nature cannot absorb. In this context he gives two different examples about the designers' perspective concerning environmental issues. One as a negative, concerning innovation of beer cans made of aluminium which slowly dissolve in earth, and another positive one, related to the Swedish experiment with the production of beer bottles made from bio degradable plastic material.[85] In comparison to the 1960s, there is obviously no need for deeper interpretation of how big the role of design in sustainable development is today, and how this should be reflected through the formal design education and designer's professional attitude.

One of the most effective ways of advocating sustainable design is to create products that are more meaningful to the individual and that are kept and cherished rather than being disposed of and replaced long before their functional lifetime has come to an end. Designers can also work on decreasing the complexity of products and use fewer raw materials which will reduce energy consumption in manufacturing process. Designers are in position to set new trends and standards and they should do that by creating innovative solutions, use better material choices and insist on smarter manufacturing processes. Since the crucial factors for more sustainable production is the choice of materials and suppliers, the designer's choice of

suppliers and demands of both environmentally and socially responsible behaviour is of the greatest importance for setting the trend of responsible production of goods. Also there are other issues such as taking into consideration the living conditions of the workers and their families and the overall environmental consequences.[86]

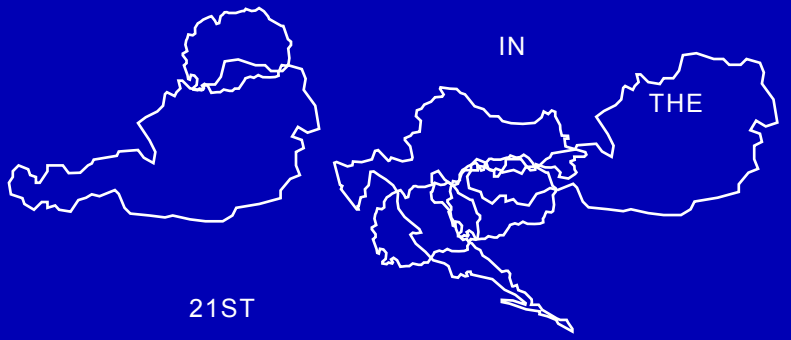
ICSID President Prof. Mugendi K. M'Rithaa, thinks that the main future challenge for the industrial design is to prove itself as problem solving discipline in the so called *solution economy*.[87] He especially emphasizes that there is a large opportunity for the design profession to be a part of solution for challenges presented in the newly inaugurated 17 Sustainable Development Goals. He believes that new trans-disciplinary opportunities are now open to designers, including a myriad of 'wicked' developmental challenges impacting the majority of the world's people. For him, these challenges include the quest for social equity and cohesion with respect to sustainability, the need to promote renewable energy as well as designed interventions for mitigating climate change. For professor Mugendi, one of the main mechanism through which designers will be able to respond to those challenges in future is to tailor the design education accordingly to the needs of the future. He said that for the past 10 years many have been advocating, developing, and calling for industrial design curricula to address the future by engaging a platform of ethics and focusing education toward social ecology and service to humanity. He stresses that for the industrial design education to remain viable, it needs to teach collaborative skills toward universal design agendas within a context that promotes sustainability. Design education must be enhanced with new knowledge that embraces diversity, multiculturalism, and collaboration. This is now lucidly apparent as the whole world struggles its way through a move from selfishness to global cooperation. Designers have a choice of participating as members of a greater human family, to create

new possibilities for social and planetary survival or risk being side-lined in the grand enterprise of creating the future.

Since the design education represents the main mechanism through which designers should gain knowledge, skills and competence which will enable them to cope with challenges of the 21st century, the second part of the Study is entirely dedicated to the research of current challenges facing contemporary design education system.

PART II:

CHALLENGES FOR DESIGN EDUCATION IN THE 21ST CENTURY



As a response to the pressures and challenges of the new socio-economic paradigm, the higher design education is currently undergoing some substantial realignment. In principle, this adjustment has to do with the most basic characteristics of the paradigm of Society and Economy Based on Knowledge, with the preconditions and ways in which this paradigm evolves and operates and those are: more pronounced complexity of functioning of the system; intensive communication between the actors of the system; openness to receiving and sharing information and knowledge; the network (not a linear) matrix of learning and innovation with intensive collaboration in knowledge production; multidisciplinary and comprehensive way in observing and problem solving; integration of thinking and acting; taking into account the needs and expectations of all interested parties for certain outcomes of the activities of the system; integration of theory and practice; the need for both specialization and generalization. In regard to the changes, possibilities and expectations which the contemporary age has brought to design education, the design community leads intensive discussions concerning the future direction of design education. Therefore, in the second part of the Study possible direction of design education in future and the main challenges and main dilemmas facing the design education were detected, and possible mismatch between competencies and skills provided in current design education and ones needed in the market were identified. The first and second chapter address the contemporary general trends in higher education and their impact on design education. The third chapter deals with the key dilemmas related to design education: What is the general purpose of design today? What theoretical framework should support the new model of design curriculum? What should be the content of the design curriculum? And how should design be positioned within the arena of higher learning? The last, fourth chapter is dedicated to the question of design competencies and skills needed for the 21st century.

1 CONTEMPORARY GENERAL TRENDS IN HIGHER EDUCATION

Generally and globally, in the last 20 years, the higher education system is going through the process of transition from traditionally academic structured systems in which dominate academic approach of valuation of the system towards systems in which dominate managerial and entrepreneurial approach of system valuation. Slaughter and Rhoades define this second approach as "Academic capitalism" that is, according to them, a regime in which colleges and universities engage in market and market-like behaviours with the objective to generate revenue from their core educational, research and service functions, ranging from the production of knowledge (such as research leading to patents) created by the faculty to the faculty's curriculum and copyrighted teaching materials.[88]

The necessity to respond to the changing needs of the markets and individuals, together with shrinking national budgets for education purposes resulted with serious revision of higher education systems in almost all countries in the world. The European systems of higher education are moving towards the American model and the Bologna agreements manifests this. The commitment to a fixed-term first degree, the transferability of credits, and common criteria for access are only the most visible of the tendencies toward convergence of the American model. European higher education systems probably moved toward the American model because it is better adapted, normatively and structurally, to the requirements of the age of "Knowledge Based Society" which puts a great emphasis on the creation and wide distribution of knowledge and skills.[89]

In Europe, higher education institutions are currently facing challenges such as: massification, diversification, and expansion. The consequence of massification or overcrowding of universities, faculties and colleges is that they are becoming entities which are hard to manage, too complicated for study and to teach. The "logic" of massification is that it includes an overall lowering of academic standards, greater social mobility for a growing segment of the population, new patterns of funding higher education, increasingly diversified higher education systems in most countries, and other.[90] Regarding the diversification challenge, the state policies of most European countries insist on more diverse options for higher education, which could serve to a wider interests and preferences of potential students. Concretely this means offering a wider choice of educational levels and types such as academic and vocational studies. For example Germany, France, or the Netherlands have a binary system of higher and vocational education, which translates into different types of institutions for different target groups. Switzerland is in the process of introducing *Fachhochschulen* (i.e. vocational training institutions) to its system of higher education.[91] Expansion refers to the large increases in student numbers in most European countries in response to public policies providing education to a large portion of the population, often under the banner "education for all".

Those trends together with the results of public educational policies brought specific challenges for European higher education institutions, forcing them to deal with issues regarding the new ways of funding, ensuring equal access and diversity of student population, ensuring relevance of studies in line of the labour market requirements, adopting new approach of the government to the educational institutions, and building international reputation and high mobility potential for attracting students and strengthening academic potential of the teaching staff.

Internationalization of higher education is very relevant for continental Europe. Internationalization gives higher education institutions in developed countries opportunities to be more market oriented in a global world economy, in terms of knowledge transfer and manpower development, IT, increased mobility for students, faculty, programs, and providers. Besides the commercial advantage, motivations for internationalization include brand building, knowledge and language acquisition, enhancing the curriculum with international content, higher visibility and many others.[92] Mobility has played a key role in this process. Students in European exchange programs (e.g., Socrates, Tempus, ERASMUS) make choices based on their perception of the best campuses and the most supportive faculties, thereby increasing competition among universities. Research through international collaboration and exchanges has to meet certain standards as well. Accordingly, many European universities try to encourage their junior faculties to move to other countries and work with international colleagues—in expectation that when they return to their home institutions, their research productivity, teaching quality, and hence reputation will increase.[93]

Of course the issue of funding national systems of higher education has been a major trigger for restructuring higher education in Europe. The higher education institutions were expected to develop their own management structure, set up and revise programs independently, serve society and students as "customers", attract additional resources and fight for their position on the educational market. Consequently, the funding pattern has changed from personnel, libraries, or maintenance parameters, towards output-oriented indicators and formalized planning procedures according to the institutions particular preferences and strategies. Also from the higher education institutions it is expected to provide relevant study programs which will provide students with relevant skills and knowledge

which are in line with real demand in the job market. Furthermore, in order to meet the constantly changing needs of the job market, educational institutions need to provide relevant and lifelong learning opportunities to society. All those challenges force higher education institutions to organize themselves as enterprise systems. As Barbara Sporn argues: state-run public universities autonomy in budgets, personnel, and programmatic matters increased the need for institutions to learn to manage the enterprise by applying business techniques. This social and economic role of universities still needs to develop into a system capable of actually fulfilling the far-reaching expectations of ministries and the general public. She thinks that future priorities for higher education institutions will be firstly to "think global and act local" in order to enhance internationalization, while taking regional needs and differences into consideration. She also emphasized the need for development of efficient techniques for staying informed about the labour market, the economy, and other important external variables. Also, according to her, international exchange and mobility will be critical for graduates to strengthen their qualifications and enhance the sophistication of "soft skills" like intercultural sensitivity, languages, and adaptability. Furthermore, Sporn believes that expansion and diversification of higher education systems will lead to a push for an even greater division of labour in teaching and research. The old Humboldt model of the unity of teaching and research will most probably be abandoned in exchange for building core competencies in applied and basic research and in undergraduate and graduate training.[94] Thus, it is very clear that the contemporary world of higher education is increasingly dominated by economic imperatives. It is expected from higher education institutions to intensify collaboration with the industry and to focus on commercialization of researches. Therefore, universities are no longer expected to work in isolation; rather, they are perceived

to be interactive players who work closely not only with the industry but with the community and the government. They are considered to be an integral part of national or regional innovation systems and a critical component of the evolving triple helix in which universities, government, and industry change their roles through interaction.

Mobility stimulated by education appears to be evidently low in Central and Eastern Europe. International influence, exchanges, and partnerships may have a certain role in identity creation as the structures and institutions of higher education—disciplinary, vertical, and horizontal—will be pressed to follow international trends. Under these conditions, Peter Darvas thinks that for regional higher educational institutions, international partnership represents more than just an opportunity, because it could be a mechanism for alternative funding in form of international funding, international projects, exchanges, and partnerships. According to him, the main challenges for higher educational systems in Central and Eastern Europe, will be: the emerging need for short-cycle programs, postsecondary forms, shorter first-degree programs based on the credit system and student choice, non-PhD. advanced (second degree) programs, and new forms of adult training and retraining—all of which need to be designed and promoted in response to local demand and by using local resources.[95]

2 IMPACT OF GENERAL TRENDS IN HIGHER EDUCATION ON DESIGN EDUCATION

General trends in the higher education sector have their impact on design education which has its own specifics. Regarding the trend of massification, it leads to questioning the traditional design education based on the apprentice master model. The universally preferred face-to-face nature of the classroom still exists, but the one to one relationship with the student is no longer always possible.[96] Research regarding UK higher education reveals that the Design and Creative Arts, for example, had a Student-Staff Ratio of 1:15 in 1994/1995, which increased to 1:20 by 2003/2004 for programs taught at an undergraduate level.[97] Although the context for higher education has changed considerably in comparison to a decade ago, design education still aspires to distinct values and pedagogies that emphasize the need for low student – staff ratios, such as project-based enquiry, one-to-one tutorials, small group critiques, and significant quantities of individual formative feedback and guidance.[98] However, to continue as an "elitist" type of study may not be economically sustainable. Only a privileged few will be able to survive as stand-alone educational entities, not affected by market forces and developments in higher education.[99] Therefore the design education has to become more explicit and formal. Given this overall trend, educational design institutions are challenged to choose between the paths of university higher education or remain a traditional, practice-driven design school. Both directions carry consequences in terms of type of the student intake, funding, academic activities of faculty, etc.[100]

Regarding the globalization challenges, the first consequence is that globalization has prompted international competition which resulted with movement of academic programs and institutions across borders, and design programs in form of franchise have been offered in other countries. The extraordinary impact of technology, including the emergence of courses that exploit the power of web based delivery, had an immediate, initial impact at a design education postgraduate level. Recently, changing demands in the workplace, driven by European integration, global market forces and technological advancement, have triggered universities to compete in one more aspect, offering the international dimension of their research and educational frameworks.[101] Also globalization brought the sensitive issue in regard to cultural differences of students who study abroad. Since the multicultural make-up of the student population is often seen as a criterion for quality, the question arises if learning in a class with lots of nationalities really is better? Design academic community is not convinced that it is. It is because there are too many cultural differences which are not, and cannot be covered in study programs, but which are very important for foreign students. For example, something else is expected of designers in Dubai than in Paris. Also, it is necessary to consider that the world is characterized with vast differences in levels of professional freedom, in the role of clients, in how critical a design can be. According to Lucas Verweij, the consequence of this behaviour is the globalization of master courses, which are churning out jetlag designers who lack cultural framework.[102]

Regarding the issue of the need for intensive collaboration between designers and industry, currently, both companies and design communities are expressing the need for intensive collaborative work practices and user-centered approaches. Through the process of product development designers are confronted with the need for professional communication

which should encompass different competencies, interests, responsibilities and professional languages of all stakeholders included in the project. Moreover, as it is emphasized earlier, the innovation pattern has changed into cross disciplinary, networking, simultaneous and application driven knowledge production for which the main precondition is intensive collaboration off all relevant actors. Translating this to design education context means that research and development collaboration with industry is the key factor for methodological exercise in design studies. Therefore, if design faculties want to engage in industrial collaboration, design education should also have science based approach, which will enable students to link problem-solving processes with effective methods for design development.[103] For example, design education programs should offer students possibility to experience solving a real, industrial design problem, working as a part of an engineering design team, and communicating their work in written and oral form.[104] Also, the design education should introduce effective methods of integration, with purpose to adequately prepare students for a world in which collaboration, negotiation, and compromise are valuable skills.[105] In this context, “Social Learning”, should be extrapolated as a social activity, complementary to interdisciplinary teamwork in design projects and research, affecting different social groups and stakeholders.[106]

Regarding the challenges for design research, the intensive pressure on design discipline to became more scientifically based carries the risk for discipline to became confused in search for new or improved identity. The search of many professions for a higher status by branding themselves as scientific has resulted into a quasi-scientific treatment of theory, when modelled on a positivist conception of natural science. This is most likely with the design discipline, causing detrimental effects to the identity of the individual profession.[107]

As a review of the literature in this Study shows, there is no consensus on the definition and scope of design research. The main dilemma is should design research follow the model of traditional academic disciplines, or should it seek a new model, based on the intimate connection among theory, practice, and production, which is the hallmark of design?[108] As Charles Owen states, the path to the present state of design education is not unlike that travelled by many other disciplines. It is a young discipline which just recently matured to an extent that the last two stages of formal education: formal research and doctoral programs can now be contemplated. Only in the last fifteen years some higher education institutions, started to offer doctoral studies in design.[109]

According to Cross, design research can be classified into three main categories: 1) The study of designer behaviour, including theoretical deliberation and reflection on the nature of design ability; 2) The study of the processes of design, and the development and application of techniques, which aid the designer; 3) The study of the form and configuration of artefacts, which is recently complemented with studies on the design of services and systems.[110] Also, an emphasis should be placed on the study of design processes, methods, behaviours referenced to social, economic and cultural contexts.

3 CURRENT KEY DILEMMAS IN DESIGN EDUCATION

Taking into account all those complex issues facing the contemporary design education and design practice, adapting design education and research to the challenges of new world paradigm is certainly not an easy task. New dynamic, interactive and holistic conditions of knowledge creation, where thinking and acting are not separate but unified – one activity, and where human communication and collaboration are based on more complex and multidisciplinary patterns, demand a new model of design curriculum. This is because the traditional, instrumental, linear, causal, model of design curriculum is no longer adequate to describe the complexity of the contemporary design process. Balanced and integrative approach is needed.

3.1 CONTEMPORARY PURPOSE OF DESIGN PRACTICE AND EDUCATION

With every significant change introduced in certain fields of education, the first question that arises is: what is the purpose of that field, and which values and essential structural elements is it based on? Every discipline must continue to develop in accordance with the challenges of its time, where the once traditional premises it was based on, gets to be rejected or reconstructed in favour of new ones. Contemporary approaches to the purpose and role of design are very diverse and complex,

as are reflections resulting from them. What remains the same as in the period when design originated as an independent discipline is the fact that contemporary reconsiderations of the purpose of design are also focused on the relationship between art and industry, culture and production, and the many resulting contradictions. There is also the eternally controversial question, if design has the same purpose as pure art. The answer to this question, or the view one takes on it, determines the social expectations placed on this discipline. The unresolved question of purpose of contemporary design results in contradictions within the design community itself, as well as a lack of understanding about the real potential of design on the part of the corporate sector, which seems to have been, from the very beginning, the entity in relation to which design has generated its ideology, views on its social function, and even its very purpose. This lack of understanding results in the opinion, more and more entrenched that designers are not capable of adequately communicating and respecting the needs of their environment, and that their insistence on their purpose only in terms of visual and technical creativity has simply left them still alienated from the needs and the culture of the society for whose well-being they are creating. Having in mind that the purpose of this Study is to research and determine current challenges facing design education, and to propose, on the basis of research results, in terms of additional competencies, knowledge and skills, appropriate guidelines for improvement of this area of education, it is of utmost importance to determine the root causes of the lack or deficiency of educational aspects of designers. In this respect it is necessary to start with the very purpose of design.

In order to acquire vital understanding of contemporary approaches to the purpose of design, and the range of current issues which arise from deliberation on this topic, the views on the purpose and role of design that have been defined since

design originated as a separate discipline must be considered. An insight into the genesis of thinking about this issue offers the possibility to reflect on all the contradictions which are nowadays continuing to arise, in the same or different form, in relation to this very important topic. Also, it is important to bear in mind that contemporary views on the purpose and role of design also determine the directions of future development of this discipline.

The beginning of development of design as educational discipline is connected to the Industrial Revolution and the foundations of the Bauhaus school. The 1920s and 1930s were the period when the production system, threatened by the possibility of collapsing due to excessive production, introduced the concept of mass consumption. Mass consumption became the comprehensive element of expanded reproduction. Consumption was imposed as the individual and collective ideal, being a matter of bare survival for the capitalist production. Design originated from this amalgam, from the need to combine production with mass consumption. Objects started to represent social goals and the vital environment, something that was, at the time, historically unprecedented. Considering the fact that objects and spaces came into focus of the industrial society, they became the function of the political economy – the economy of symbols. At that moment, everything became design, and architecture and design gained a therapeutic social mission of sorts, which allowed them to create coherence in a divided society. With this new phase of controlled consumption, the system of commercial values entered all spheres of social life.[111] In those times, characterized by significant changes in the way of looking at the world and the mechanisms by which it works, the establishment of design as an autonomous discipline started to cause a split in the foundations of the amalgam of the material and spiritual culture, which has been more or less homogeneous up to that point. Marc Le Bot pointed out that

the birth of industrial society caused the historic moment of splitting those aspects of artistic functions relating to the logical arrangement of social space and its symbolic signs. That split and its consequences may be explained most clearly through the then trend of using the word "technical" as an abstract noun instead of an adjective, with a view to emphasizing the contradiction between art and technology, which had not existed before. He believed that the 20th century art, with a clear political intent, in the beginning made design its side-product, where establishment of design as a separate discipline turned the meaning of that objective on its head.[112]

Bauhaus had an undeniable role in that split and in the establishment of design as a separate discipline, as well as in defining its purpose and role. The Bauhaus of Gropius was not just a place for studying the methodology of designing, but the model of school-society, i.e. a society which, by designing its own environment, designed its reform. Gropius himself, as the main protagonist of Bauhaus, was constantly making efforts to imbue industry with a cultural tone. He knew that the Industrial Revolution would happen with or without culture and art, and thus he tried to introduce art and culture into mass production, as much as it was objectively possible at the time. Therefore, for instance, when expressing his ideas (which he wanted to make more approachable for industry), he intentionally avoided using the rhetoric of culture, but quite the opposite, he used a rough, harsh language, sounding like someone who wanted to convince an industrialist tycoon.[113] He made it very clear that he accepted the idea of industrial rationalization and standardization, emphasizing that the idea of industrialization joined the artistic work of an architect or designer and the economic work of an entrepreneur. Gropius believed that "an artist possesses the ability to breathe life into a product created by a machine; the creative power of the artist continues to live through that object, and the role of art in production should not be a luxury

nor an intentional and rare contribution of individual artists; artistic work should, instead, become a basic and essential part of the general process of modern industry".[114] By 1925, Gropius rejected research of new forms at all costs, unless they were derived from the matter itself. He also rejected the addition of purely decorative elements, whether historical or imaginary. In his eyes, creation of templates for objects for everyday use was a social necessity, which Bauhaus production was supposed to fulfil. According to him, a machine for serial production of objects is an efficient instrument for liberating people from hard manual labour, and allows creation of objects more diverse, more beautiful and less expensive than those made manually. He thought that there was no room for fear that standardization would destroy individuality, any more than one should fear that a fashion trend could result in utter uniformity of clothing.[115]

As the establishment of design as a separate discipline has resulted in the historic moment of splitting those aspects of the artistic function relating to logical arrangement of the social space and its symbolic signs, the design criticism and theory literature, as well as opinions of practicing designers, have reflected efforts to wrench the practice and the discipline of design, which are by their very nature intrinsically linked to respective social and economic conditions, from the pressure of technical operational and market conditions imposed by the capitalist free market. All this for the purpose of preserving the concept of creativity as one of the most important determinants of the nature of design. Within the philosophy of Bauhaus' school and its views on the purpose of design, and under the influence of De Stijl's movement and the Russian avant-garde, design, together with architecture, urban planning, and visual arts themselves, became a component of the Enlightenment premise of rational social organization, and in addition to its practical uses, played the role of an ideological

argument in the general debate. It was not about making the notion of design equal to the notion of art, or replacing art by design. It was about striving to imbue design with the power to influence the very behaviour of users, where this influence would result in a new awareness of circumstances which shaped the entire social and physical environment. It should be emphasized that concepts and types of questions which served as a basis for judgement on contradictions and possible reconciliation between production of aesthetic and industrial objects, were elaborated and formulated within the avant-garde art, namely movements such as the Italian Futurism, French Cubism, Soviet Constructivism, and neoplasticists of De Stijl, and that the same set of issues is still crucial, at the academic and practical level, for determination of purpose and role of design as a discipline and practice. In Marc Le Bot's opinion, the originally ambivalent attitude of the artistic avant-garde toward the industrial society – i.e. radical criticism of that society for its, at that time, choice of academic cultural policy of excluding art from production activities, on one hand, and on the other hand, flirting and negotiating with the system due to the awareness that instruments of possible change were in the hands of its repressive forces – gave design the role of argument used to dispute the academic tradition of fine arts of the past, as well as the one-dimensionality of the technocratic optimism of the present and the future. According to Le Bot, due to this original ambivalence, avant-garde art is a focal point of sorts, where all contradictions in the area of design are intersecting even today.[116] This is, as a matter of fact, the root of conceiving design as an important social activity, which inevitably results in the demand for politicizing this practice. Maldonado points out that Bauhaus and the artistic avant-garde are nowadays regarded as interrupted or unrealized initiatives, which gives them an aura of utopian ideas. However, these movements, in their beginnings, truly made great efforts to

reconstruct the human environment, especially in terms of their demands, which originated from the civilizational and social circumstances of their times. According to Maldonado, the activity of Bauhaus brought about a new humanist perspective on the technical civilization. In spite of its complicated internal organization during several mutually contradictory stages, the Bauhaus school was an active engine which found ways to check its didactic and designing assumptions in practice.[117]

However, historical events stifled all these starting aspirations, or at least the intensity of their momentum, which, on one hand, reduced design to a functional lever within the dominant social and economic mechanisms, while on the other hand, gave it an utopian aura, with the potential to activate these ideas in circumstances where the need to advocate them may arise. One such circumstance arose in the late 1960s, when, in the context of a wider rebellion against the existing political, socio-economic and cultural situation, design seemed like an area of intersection of a range of viewpoints which went far beyond the practical task of the profession itself. As a critical response to the politically unaware production of design objects, and to the split between thought and action, the phenomenon of anti-design emerged, with its radical aspiration for temporary or even permanent suspension of activity in this area, i.e. the end of the design as a discipline which strives to put a certain ideological pressure on the multitude of insufficiently conscious users. Forces which, on the other hand, wanted to consolidate design profession and reconcile the long-term confrontation between the aesthetic and the functional modelling practice, were not in favour of these radical proposals. Instead, like Maldonado, they proposed focusing on a new praxeology of designing, in terms of general effective action which, by establishing a close connection between the critical consciousness and the designing consciousness, might present a way out of the crisis situation in which design as a discipline had found itself.[118]

The split between design and art, which happened during the 1960s in circumstances of dominant market economy, was reflected in movements such as Pop Art, New Figuration, and Optical and Programmed Art. Menna thinks that the difference between these two creative areas lies in the circumstances which place the practice of design into the scientific technical sphere, rather than the aesthetic technical one. This crucial differentiation of design from art requires design to be included in the context of another discipline, and Menna sees one such possibility in bringing design closer to the media sphere, or even changing the nature of design into that of one of the mass media. According to him, design has been acquiring a clear physiognomy and function of an inter-media communicator on the cultural level, which is the place of contact and conflict between quality and aestheticism on one side, and quantity and bad taste on the other. Design is thus permanently in contact with mass media, and even becomes a mass medium itself. Depending on the way it acts on that level, design may prove that the contemporary consumption civilization is not necessarily doomed to be a civilization of the low-brow and the kitsch.[119] Baudrillard points out the fact that an object is not soul or a material thing, but, in its essence, a social relationship, and that it thereby opens the space for debate on the sociology of design in the light of the crisis it was undergoing in terms of its practice and ideology at the time.[120] Argan believes that the permanent confrontation between the aesthetic and the functional modelling practice may only be overcome when the nature of design is no more compared to art, but with other areas, similar to design in their constitution, whose task is spatial modelling, such as architecture and urban planning. Design is, in itself, a phenomenon which combines elements of technology and science, on one hand, and culture on the other, and therefore it is an interdisciplinary area. During 1970s and 1980s, there were more and more demands for a

strong scientification of design, as a basic precondition of its operationality in contemporary living conditions, together with continued insistence on the conceptual strength of design[121].

Doubts in the purposefulness of existing practice and ideology of design, which have been the subject of constant intense questioning to this day, have not, as we can ascertain, arisen from insufficiencies of theoretical elaborations on this issue, but have resulted from specific continued crises of the very foundations of the philosophy of the capitalist system, which design originally emerged from. The paradigm shift that the capitalist system is facing today is an interim where the transition process is taking place, and this period is characterized by constant dramatic disturbances. Among contemporary denials of constructive factors of the existing form of the capitalist system, there is an opinion that design actually helps strengthen the foundations of the consumer society, and that design objects are status symbols of the inequality of social hierarchy, rather than objects intended to assist in the everyday life of the widest range of users. Of course, this allegation is too simplified, but certain trends in the practice of design, the practice that is fully market-oriented, leave room for this type of discussion. Victor Papanek claims that design is nowadays mostly failing to deal with real needs, not just those of individuals, but also entire communities and environments which constitute the largest part of population today. He counteracted this situation with the premise of “Design for the Real World”, and many authors went even further than Papenek, demanding a thorough revision of the very purpose of design, and proposing new terms such as “Free Design” (Jacques Famery), “Design for All”, “Design for People”, etc. Papanek claimed that the purpose of design nowadays must be to continuously observe achievements as well as problems of the contemporary society, and to accordingly try to contribute to finding solutions to these problems. He says that the

contemporary society is starting to understand that production of goods is not a problem anymore. There are more goods, in quantitative terms, than the humankind needs. Instead of the question: "How much is there?" one should ask the question: "How good is it?" However, changes have been happening so fast in the last half of the century that our main skill has become to define the changes themselves. Moral, aesthetic and ethical values will evolve, in parallel with things they will be applied to. He thus believes that designers should become aware, as soon as possible, that the gap between design and technology on one side, and religion, sex, morality or, for instance, medical research (extension of life expectancy and consequently population ageing), extensive agricultural production, and environmental situation of the planet on the other side, is rapidly decreasing; and that all these aspects are what design as a multidisciplinary area and a part of a multidisciplinary team should consider and respond to in its own way.

Filiberto Menna claims that, after World War Two, design relinquished the task of interpreting its activity, as well as its responsibility in the context of total designing of the human environment and itself as an instrument of social awakening and revival. This relinquishment brought about the risk of turning designers into marketing agents of the industry, and design into a cosmetic activity. Nevertheless, Menna believes that this relinquishment may be interpreted as a result of new awareness of the existence of complex problems inherent in the social economic context today, especially in terms of the realistic attitude of designers towards the possibility of their work affecting the fate of the collective life.[122] The paradox which has been reflected throughout the history of development of design is that democratization of design, i.e. its integration into the mass culture, has not considerably contributed to raising awareness of the mass population in regard to high cultural values. For instance, in the Gropius Bauhaus' studio,

the goal was to create objects whose value would not depend on the materials they were made from but on their form, and which would be available to economically disadvantaged layers of society. However, back then, at the beginning of the process of enlightening the wider population with regard to aesthetics of high culture, the biggest obstacle was the lack of susceptibility of the masses, and thus the need for their education was constantly emphasized. Nowadays, in the situation of mass democratization of design, we are still facing the same obstacle – in spite of the fact that it is not necessary to be particularly financially wealthy in order to own beautiful, quality products; it still requires a high cultural level. Thus, the main boundaries of the problem remain and will probably remain the same, except that the culture required for the function of the new design is no more class culture, but mass culture, and design is expected to show a high level of responsibility in shaping this culture. Jean Baudrillard wonders why, in the light of the lack of affinity of wider audiences for the aesthetics that design is aiming to impose, nobody has concluded that the cause may be their sociological defensive reaction to a certain privileged subculture that modern design belongs to. He believes that the alienation of design from the common man is an integral part of the contemporary design philosophy. Also, he believes that design will be left to its own mystification until it becomes aware of culture's latent discourse. Offering someone something they cannot assimilate, is the worst kind of aggression. If design is confronting people with their own inability to understand it, it turns culture it wants to give them, in a way, into a living proof of their lack of culture. Thus, with the excuse of improving the masses, design puts them in their place. This explains the objective fate of masses, leading them to kitsch as the only available choice for them to show their resistance.[123] In other words, design must be based to a larger degree on wishes and capabilities of others, in order to shape its

cultural standards in such a manner to make them acceptable to the majority of potential users.

It may be concluded that designers are still very alienated from the society in which and for which they are creating. This alienation is manifested in the lack of competencies of designers in the field of multidisciplinary communication, lack of knowledge about the basic terms and processes of production, lack of focus on needs of design users, lack of ability to truly cooperate with all stakeholders included in the project, etc. It is a fact that a great number of designers, after finishing their formal education and entering the world of practice, do not have the ability to conduct productive multidisciplinary communication with their clients, or the ability of comprehensive understanding of needs of their clients and end users of their design solutions. For instance, designers may be hired by various clients: enterprises, state institutions, non-profit and social institutions, non-governmental organizations. Each of these clients has a different motive regarding design, and different users who will evaluate the provided design solution. For instance, it is constantly pointed out that contemporary designers do not have the ability to understand which problem a firm wants to resolve through design, nor to explain to the firm, using basic business terminology, how their solution will contribute to the resolution of the problem. Also, the alienation of designers is often manifested in their lack of interest for final outcomes of their work, not in terms of their design product and satisfaction of the client, but in terms of the response of end users to their product, or the way that their product affects the living environment. For that reason, attention is nowadays being strongly called to the growing maladjustment of formal designer education with the real needs and problems of the world of today.

After observing that professional code of ethics in design practice is not adapted to the contemporary conditions, and

that a new code had become necessary, the School of Design of the University of Montreal conducted research on the issue of design ethics and the responsibility of the designer. The main conclusions of this research were that in order to be able to define professional responsibility, not just competence, a discussion on the purpose of design is necessary. Also the conclusion was that the priority should be given to the reform of design education. Furthermore, one of the most important conclusions was that there can be no responsible design without a responsible designer, or in other words, education should be directed to the development of an individualistic ethics. Authors of this research emphasize that the individual ethic is of particular importance because, without it, any general discussion about ethics, moral, ethical theory, etc., becomes almost meaningless. Also the results of the research show that aesthetics and moral dilemmas or decisions are structurally congruent. Therefore, aesthetic education could contribute to moral literacy.[124]

Alain Findeli underlines that highly critical aspect, a factor without which no curriculum can be as filled with theoretical courses, workshops, seminars, and studio work as possible, will ever find its coherence, is the overall purpose of design education and practice. The questions to be asked are: To which meta-project (anthropological, social, cosmological, etc.) does a design project and a design curriculum contribute? For what end is design a means? Can design find its *raison d'être* within its own field and remain autarkical? How autonomous can design be? All these questions are related to the ethical dimension and purpose of design. He recalls that the general purpose of design has evolved within the Bauhaus tradition and that the major themes within the three periods of Bauhaus were "A new world", "A new man", and "A new culture". He points out that in the Bauhaus period, the way to achieve these goals is viewed as a technical issue, or in

other words it was believed that if the necessary means, tools, actions, and decisions were put together, these goals could be attained. But, he believes that in the new perspective, the purpose of design must be considered as a horizon, as a guiding set of wide range of values to which one always must refer when taking a decision or evaluating a proposition within the design project, and not as an ideal goal to be reached in the more or less near future. From his opinion, the new adequate purpose of design for the coming generations certainly should encompass the environmental issue as a central concern. But since today we witness degradation of the social and cultural (symbolic) environments, human dimension should also be included in the design purpose in the context of contributing to the overall balance between humankind and natural world. In that way, as the two polar complementariness, anthropology and cosmology should be topics around which the content of a design curriculum will be defined. That can be done only through holistic understanding of design project inputs and its outcomes. This implies that the making of an artefact, which is usually considered as the normal outcome of a design project, is no longer taken for granted. Findeli thinks that designers today should act rather than make. Making must be considered a case of acting (praxis), to the extent that even "not making" is still "acting".

Findeli underlines that his standpoint has three dimensions. The first one is philosophical and it implies that design pertains to practical, not to instrumental, reason, and that the frame of the design project is ethics, not technology. The second one is the existential dimension, which implies that design responsibility means that designers should always be conscious of the fact that, each time they engage themselves in a design project, they somehow recreate the world. The third is about individualistic ethics, implying that some kind of moral education must be included in the design curriculum,

so that the moral consciousness of every student is increased. This is of course a very sensitive issue not only in design, but in general education.

Hence it is obvious that the answers to the question of the purpose of design must come from design discipline itself. As Lucas Verweij said in regard to the purpose and future challenges for design discipline: "We are under pressure, and believe that we lack the time to find fundamental answers to uncomfortable questions. But the answers have to come from designers themselves – from researchers, practitioners, students and scientists".[125]

3.2 DESIGN CURRICULUM FOR THE 21ST CENTURY

Design as a young discipline, in the context of formal levels of higher education, has only recently evolved to a level of master and doctoral studies. On that journey the educational design program has reflected its own evolution, also induced by changes brought by the social and technological paradigm shift. This evolution is clearly seen through the historic observation of the content and structure of design curricula. During the time, the basic elements of design curriculum – art, science, and technology have lost or gained their educational importance. According to the results of the research of the relevant literature on this issue conclusion is that there is a consensus among scholars, researchers and professionals, on the need for an integrative approach to design education, if design education wants to empower students with the necessary knowledge and skills for the 21st century. Design is not art. It is also not engineering, and it is not science or a number of other less likely candidates for association. Design is not separative, it is integrative, and one of the *hallmarks* of design is its integrative

nature.[126] As Charles Owen said: "Although it is not fashionable to think that generalism can any longer be taught in our complex society, it is just this generalism that makes a good designer so valuable". The argument behind this attitude is that a designer has to be able to reach across disciplines to bring in information, to extract ideas, and to think critically from different viewpoints. Owen stresses out that a good liberal arts education, as general preparation, was sought out by those who hoped to lead in the business and the professions. With the increasing specialization, this is now a very rare case. Of course, liberal arts preparation in itself is not sufficient for today's complex world, but Owen believes that for a career in design, general knowledge is now more important than ever, and that it should be required as a foundation for those entrusted to design the communications and artefacts of a society. For him, good design education is good general education supported with special education for problem solving, conceptualization, visualization and communication. Because design is integrative, design education needs firm grounding in the subject matter of the arts, sciences, technology and the humanities.

For the purpose of the presentation of the fundamental starting points in defining contemporary integrative approach in design curriculum and new logical framework which should support this new approach in the context of the design thinking and acting process, (the new way of acquiring and implementation of knowledge), among the many high-quality works on this subject, the work of Alain Findeli's theoretical article which embodies all essential elements necessary for a concise explanation of these topics is chosen.[127] In his paper "Rethinking Design Education for the 21st Century: "Theoretical, Methodological, and Ethical Discussion" Alain Findeli states that the problem of designers' alienation from the real world, from the environment in which they work and live, absence of the ability of a comprehensive and multidisciplinary approach to

project development, and lack of the ethical awareness that each designer's work affects the environment through several dimensions, must be solved through reform of outdated design curricula. This is because a large number of existing design curricula do not possess the potential to train students for the increasingly complex challenges of the contemporary age and provide them with the way of thinking necessary to solve those challenges. Findeli starts from the first design educational program created in the Bauhaus school. In the original education program articulated in Bauhaus founding manifesto in 1919, it was written that: "Instruction at the Bauhaus includes all practical and scientific areas of creative work, students are trained in a craft as well as in drawing and painting, science and theory". This program has a threefold structure consisting of art, technology and science, which were originally planned to support the curriculum. In 1923 Gropius launched the phrase "Art and Technology: A New Unity". And this became the theoretical model in which the philosophy of the Bauhaus was grounded. The threefold structure was transformed into a polarity of art and technology. The distinction between *Formlehre* and *Werklehre* in the curriculum is the most visible personification of this model. In Dessau, a new curriculum had been printed, which as "areas of instruction" mentioned the following: practical instruction, form instruction (practical and theoretical), and supplementary areas of instruction. Here, the structure of curriculum again reflects a polarity, in this case the practice and theory. In 1937 when Moholy-Nagy founded the new Bauhaus in Chicago, some changes were introduced, particularly regarding the structure of curriculum which relied heavily on the vision of the philosopher Charles Morris. At the New Bauhaus Morris taught a course in "intellectual integration" in which he attempted to articulate what he believed to be the three main dimensions of design: art, science, and technology. Morris considered the design act

to be a kind of semiosis, and he drew a parallel between the syntactic, the semantic, and the pragmatic dimensions of a sign and, respectively, the artistic, the scientific, and the technological dimensions of design.[128] In the early 1958 in the Ulm school – the Hochschule für Gestaltung, Tomás Maldonado launched a new education philosophy founded on scientific operationalism, which represented the unity of science and technology. As a consequence, the artistic dimension of the original curriculum became less and less important, whereas its scientific content was increased and emphasized, especially with contributions from the human and social sciences. The idea that design was applied aesthetics had been replaced by a new theoretical model, which considered design as applied (human and social) science, but the underlying dualistic epistemological structure remained the same in Weimar/Dessau and in Ulm.

Findeli is convinced that for the contemporary complex world, the optimal, archetypal, structure of a design curriculum would be a threefold articulation of art, science, and technology. He thinks that the problem of the continuous separation of these three basic dimensions of design lies in disagreement about their relative weight and their adequate articulation. Today, everybody tends to agree upon the necessity of including art, science, and technology in a design curriculum. But he stated that disagreement arose, from the different opinions about their relative importance, and in the regard to their particular function, or in other words, how they should be articulated. Therefore, he stressed the importance of well-defined overall purpose of design education and practice as a key aspect which will establish coherence in the curriculum.

An inquiry into the historical development of design theory reveals that the discipline has adopted two major paradigms to account for the logics of design thinking: applied art and applied science. Findeli argued that both of them take

their roots in the nineteenth century, and must be considered as outdated today. At the Bauhaus design was considered to be an artistic or aesthetic theory applied to practice. In other words, students were expected to apply in the *Werklehre* what they had learned in the *Formlehre*. Applied science follows the same structure: instead of art, science is now playing the role of a referent, or "fundamental discipline" to be applied into practice. In this model, between theory (science) and practice (technology) there was one implicit, deductive link. The underlying theoretical model of design at the ULM HfG was the following: design tended to be considered as applied science, mainly human and social science. In other words, the design project was to be deducted from the knowledge gathered in the theoretical courses. Findeli underlined that as a result of this logic, one often hears in design schools that, if the problem is well stated (if the preliminary scientific inquiry has been thoroughly conducted and the functional criteria precisely established), the solution will follow almost automatically. Therefore, even today, the most widely-accepted (and practiced) logical structure of the design process have linear form of logic. A process starts with a situation "A" which represents identification of need or a problem, then it goes to situation "B" in which the final goal, or solution is imagined and described, and the final step represents an outcome in the act of design which represents causal link of the transformation of situation "A" to situation "B". But Findeli argued that systems and complexity theories have further contributed to a radical transformation of the mechanistic model of the design process. The main consequence is the introduction of teleology (the explanation of phenomena by the purpose they serve rather than by postulated causes) into an otherwise strictly causal sequence. As such, the concept of project gains a much stronger theoretical status. Therefore, instead of "applied" science, Findeli proposed to speak of "involved," "situated,"

or "embedded" science. For him, such a model considers that the scientific inquiry and attitude are carried into (instead of applied to) the field of the project and of practice, so that the former are modified by the latter, and vice versa. His opinion is that the designer's task is to understand the dynamic structure and shape of the system, its "intelligence." One cannot act upon a system, only within a system; one cannot act against the "intelligence" of a system, only encourage or discourage a system to keep going its own way. The production of a material object is not the only way to transform state "A" into state "B" and since the designer and the user are also involved in the process, they end up being transformed too, and this learning dimension should be considered as pertaining to the project.

Also Findeli thinks that until now, emphasis has been put mainly on the complexification of the models describing the design process, and on the semiotic complexification of the perception and reception of the products of design. He believes that traditional focus of the design process proposed by Gropius, on psychology of visual perception, emphasizing visual intelligence has to depart from its traditional connection with the material world and its artefacts. He proposes that today's different kind of visual intelligence, one which enables designers to see everything in a relationship, (as Moholy-Nagy articulated), will be required from the designer and therefore, taught to the students. He states that the input "PROBLEM" and the output "ACTION" of the design process are not considered to be part of the design process. The "problem" is given, and usually is considered as such in design practice and in the schools design studios. And "action" comes out of the process, ready to live a life of its own, in another realm. Findeli reminds us that in reality, problem and action dwell in the same world, of which the designer also is part, not only as a professional, but also as a citizen. He strongly underlines that designers should be interested in the origin and the destination

of their projects. The process and product should be completed, on one hand by taking into consideration all relevant inputs in the beginning of the project, (not just considering design work, but clients' motives, philosophy and expatiations) and on the other hand, by consideration of the impact of the project. He argues that, today's underlying anthropology of design is too narrow, because it is usually reduced to anthropometrics, ergonomics, and consumer psychology and sociology. Likewise, the external world for designers is also usually reduced to its biophysical aspects, ecological and environmental problems. But the external world also includes other interconnecting issues such as the technical or man-made world, the biophysical world, the social world, and the symbolic world or "semioclasm". These inner and outer worlds interact with each other. Therefore, before any project can be launched within such a complex situation, a designer must make sure that there is an adequate representation of the content, the structure, the evolutionary dynamics, and the trends of the system. He thinks that this version of visual intelligence should be taught through a qualitative, phenomenological approach. For him, the course of the basic design, if properly reconsidered, will be the best pedagogical tool for teaching such an approach. Also he believes that aesthetic education will be the best way to apprehend its dynamics. Furthermore, such a basic design education will not only have an effect upon the designer's intelligence of complex systems, but also upon the designer's professional responsibility when dealing with systems (the ethical aspect).

Since the issue of the dematerialization of our world has become a recurring leitmotiv in design, Findeli describes the ways in which the product centered attitude could be replaced by a new one if design is to survive and evolve according to the conditions of the new paradigm. The first way is the shift towards a system approach, from a "problem and solution"

to a "state 1 and state 2 of the system" situation, which helps to push material artefacts to the background in favour of the actors within the system. This, in turn, yields to the end of the fetishism of the artefact. The second way is that the systematic questioning of the design brief will invite designers to look for the "dark side" of the object. They will become more interested in the human context yielding the brief than in the classical "product description" brief generally used in design and engineering. The third, methodologies developed for the design of material products could be transferred to the world of immaterial services, if adequate epistemological care is taken. The fourth way is the shift towards a sustainable and ecological design, since everybody agrees to the fact that there are too many products in our environment, and many designers are already engaged in a more sustainable design attitude.[129]

Therefore, according to Findeli, it can be concluded that the main foundations of design curriculum instead of science and technology, which dominate in structure of current design curriculum, should be teaching and training in the notions of perception and action. Perception in the context of visual intelligence and action meaning that a technological act is always a moral act. The relationship between perception and action should not be studied through deductive but aesthetic logics. Visual intelligence, ethical sensibility, and aesthetic intuition can be developed and strengthened through some kind of basic design education. This course of Basic Design, should not be only in the first year as a preliminary course, like in the Bauhaus tradition, but it should be taught in parallel with studio work through the entire course of study, from the first to the last year, as some kind of a continuous spiritual, mental and practical exercise, designed for students to realize and contribute to the transformation of current vision of the world. And that for Findeli is what a paradigm shift is really about. The nature and context of this fundamental course should be

adapted to our contemporary world and future challenges. In regard to contemporary world changes, issues and future challenges, he thinks that if design does not want to become just a reactive discipline "a branch of product development, marketing communication, and technological fetishism", it will have to become proactive; in other words it will have to propose "new scenarios for the future". For him, the profile of design profession need not—and should not—remain what it is today, otherwise these professions might disappear. It is, therefore, designers' responsibility to imagine the future profile of their profession.

3.3 THE PLACE OF DESIGN EDUCATION IN THE ARENA OF HIGHER LEARNING AND CONTENT OF DESIGN CURRICULUM

As there is consensus in scholars' opinions regarding the need for integrative approach in design education, the same thing cannot be said for their attitudes regarding the question how design education should be positioned within the arena of higher learning and the question regarding the nature and content of courses in design curriculum.

PLACE OF DESIGN EDUCATION IN ARENA OF HIGHER LEARNING

As it now stands, different views of how Industrial Design should be positioned within the arena of higher learning are not expected to come to consensus. Charles Owen believes that the most difficult task facing the design education today is probably that of developing the faculty needed for tomorrow. He underlines that design education is a young discipline, and that educational programs in design only came into being when the value of design thinking was well enough recognized to

create a demand greater than that which could be supplied naturally from diversified sources. Programs for product and communication design began invariably in art schools. The problems of industry were introduced into studios and treated by art faculties in master-apprentice fashion. As the knowledge required for a designer to become successful was better understood, courses were defined to teach it. Undergraduate degree programs in design were described and proliferated, gradually also separating themselves from parent art programs. The beginnings of graduate education in design followed a similar paradigm. Those choosing graduate programs, studied closely with faculty members in a one-to-one mode and after sufficient experience, conducted a comprehensive project to completion for the Master's degree.[130] Since there is no integrative approach in current design education, and enough teaching staff which could cover the various new specialist area, design education institutions must decide on their formal organization place in higher education. But it seems that finding sufficient number of educational personnel is still a problem for design faculties. Owen is convinced that as more progressive programs emerge, there will be a growing pool of new graduates to teach in future. PhD programs should produce graduates especially prepared for research and teaching. The temporary solution is to engage the specialists from other fields who have interests sympathetic to those of design. It is not uncommon to find scientists, scholars and technologists whose own breadth of interest extends to issues of design.[131] They can offer rich extensions to traditional curricula, either in specialty courses or in courses team-taught with design teachers. Scientifically based design body of knowledge and rigor research design institutions will be even more difficult to develop. Design education, except for engineering design and some architectural design, has had the tradition of the fine and applied arts as its model, where personal exploration substitutes for research. Charles Owen

believes that because design is integrative discipline it needs firm grounding in the subject matter of the arts, the sciences, technology and the humanities. To strengthen this "position of balance", for him the ideal location of a design program is *not* in any one of the typical colleges of art, engineering, sciences or humanities, but in a college or school devoted to the integrative use of all of those reservoirs of knowledge. For teaching students how to design, the sources of information and inspiration are those of the *whole university;* the processes to use that wisdom in better products and communications are what are special to the design program.[132]

Liem and Sigurjonsson, identify three general types of current design schools.[133] The first type is the Art and Design schools or 'Kunsthochschule' in Germany. These schools are not affiliated to any university, and usually offer a wide variety of Art and Design Courses. The second type is design schools which are partly independent, in the sense that they are affiliated to a university, but with different administrative and operating criteria than other members of a university. Examples of such design schools are: Umeå Institute of Design (Sweden), Academy of Arts & Design, Tsinghua University (China), Nanyang Technological University, School of Art Design and Media (Singapore). The third type of design schools is fully integrated in a university system, meaning that they follow the university's rules and regulations concerning teaching and research. The education supporting this research is scientifically oriented. Examples of Design Universities are for example the Norwegian University of Science and Technology, Delft University of Technology, National University of Singapore and Technical University Eindhoven.

Referenced to this third type of design schools, there is still an on-going debate whether designers should be educated as generalists or specialists. The School of Design at Carnegie Mellon University in the U.S. offers the generalist-oriented

programs. With multiple general curricula and the interdisciplinary collaboration with the departments of engineering, management, and social science it enables students to acquire a higher level of generative design expertise. The ID department at the Technical University Eindhoven presents specialist-oriented model of design education. It is based on the educational goals of 'competency based learning' and 'student as a junior employee'. It enables students to learn within a simulated professional environment by executing specific design projects and intensive contacts with the industry.

THE NATURE AND CONTEXT OF COURSES IN DESIGN CURRICULUM

Regarding the issue of generalist or specialist approach to design education, and the knowledge which should be taught in different study levels, Charles Owen proposed that design undergraduate programs should be university level programs awarding four or five year baccalaureate degrees. Together with the special program of knowledge and skills necessary for design, this program should in adequate way mix the elements of a liberal arts education with those of a technological one. Since graduate level programs now exist in significant numbers, he believes that it is no longer necessary that an undergraduate program undertakes to teach all that is known of design. Instead, he proposes that students in the undergraduate program should develop fundamental skills; inventiveness and sensitivity; general knowledge; integrative and critical thinking; and the ability to apply design processes to problems of institutions and industry. On the graduate level programs students should choose between different orientations for professional mastery in Master of Design programs, and for research in Master of Arts or Master of Science and PhD programs. In that way schools will have incentive to pursue excellence in specialized design areas, having the direction for the investments in personnel and facilities required to achieve quality.

Specialized professional programs for transportation design, design for the aged and disabled, industrial and construction systems design, consumer products design, communication and control systems design and many other industry specific forms of design can be offered as separate master programs. Generalized professional programs can also be implemented in master studies, with less specific emphasis on content and greater attention to contemporary design theory and processes and their mastery through application. Research programs similarly can be specialized to individual school strengths. Some may become content specific, and others may focus on general aspects of theory and process relevant to design. Research programs at the master's level should emphasize the development of research and development skills. At the PhD level, these skills should be employed to help create the body of knowledge that will be used in industry and taught in the masters' and bachelors' programs of the future.[134]

Liem and Sigurjonsson believe that the adaptation of industrial design education in the "Corporate World" of higher learning and research should be taken very seriously; clear objectives are to be defined for undergraduate and postgraduate design education with respect to massification trends in higher education. They think that students should be mentally prepared to commute from generic to specialist as well as, from abstract to concrete modes of working and vice versa. Comprehensive and complex studio projects should be implemented as platforms, where social and interdisciplinary learning practices can develop in line with selected design themes, processes and methods. They stress that practicing designers should be more involved in tutoring if "designing" should remain the core subject of the educational curriculum and if time and opportunities for research are to be created for tenure-track and tenured faculty. They suggest pairing faculty and practicing designers in the course management, teaching and tutoring.

Project management, processes and methods are to be trained by faculty, whereas skills, philosophies and experiences from practice are to be communicated by the practicing design tutor. If properly managed and executed, the move to direct faculty to become specialist in certain areas of design through research would encourage an atmosphere of mentorship and scholarship. This will expose students to a research-based learning environment, focusing on the study of behaviours, cultures, processes and methods. In collaborative design projects and research with various stakeholders, students should be exposed to "social learning", which is complementary to interdisciplinary teamwork. Liem and Sigurjonsson believe that this would then positively encourage mentorship and scholarship, leading to an engaged way of learning and working that nurtures a shared commitment and motivation for the ethic of inquiry and intellectual rigor, to the excitement of speculation, creativity and discovery.

Regarding the question of current dilemmas in the academic community, in terms of courses that should make the content of the curriculum, or in other words what to teach designers, the most plastic explanation was given by Lucas Verweij[135]. Lucas Verweij thinks that current design practice has expanded in all imaginable directions, but the world of education does not know how to respond to the new situation. There is no consensus between design scholars what they should teach future designers, and for what professions they should actually educate them: is it entrepreneurs, artists, engineers, writers, innovators or researchers? And the biggest problem according to him is that there is no time to reflect on the answer, because courses and programmes must be developed quickly in response to the crazy growth in the market for design education. He concludes that for the last twenty years design expanded in so many directions that now it includes interaction design, game design and app design.

Managerial tools now include design thinking and business model design. In the humanitarian domain there is the service design, human-centered design and social design. But, he underlines that none of these new directions bear much relation to the roots of the profession of the original design – industrial or product design. Instead, design is increasingly viewed more as a mentality than a skill. And while education struggles with this shift, the market for education keeps on growing. At the same time design explosion disrupts education. He recalls that half a century ago, universities established courses in design largely as offshoots of mechanical engineering. In addition to technology, designers received academic instruction in design methods. Design freedom was therefore limited. Academies of art established courses grounded in ceramic and graphic design, which were both practical and artistic in orientation. For decades just two professional profiles existed alongside each other: a designer was either a creative engineer or a practitioner of an applied art. Today teachers and administrators in the field of education disagree about what to teach designers. He said that in Eindhoven the tension regarding this issue was so intense that it even culminated in a personal shootout among the academy's management. Lucas Verweij underlines that the basic dilemma of design scholars is in regard to questions such as: Is collaboration with other disciplines the most important aspect? Or is it still a creative ability? Should programming be a compulsory subject? Or understanding of production processes? Is the knowledge of materials still important? Which entrepreneurial, journalistic and research skills should students learn? And should they be instructed in a more didactic setting than has been the case up to now? While schools are driven to desperation, the market for design education is growing explosively. So although fundamental questions remain unanswered, new courses are popping up everywhere like mushrooms. Lucas Verweij believes that it would be better

to leave design thinking to schools of management, and leave interaction and game design to schools of computer science. He proposes that design criticism could be instructed at schools of journalism, and social design at teacher-training colleges. A creative design dimension of these professions can develop or evolve organically in such places. Design has become a mentality that can be applied in courses structured to impart specific skills. That is better than the reverse, which is now the case. From his point of view in the current design education situation design no longer belongs to anybody. Or what is for Lucas Verweij maybe most important design no longer belongs to the people, places of education or lobby groups that have represented and tutored it for decades.

4 DESIGN COMPETENCIES FOR THE 21ST CENTURY

Due to the rapid development of technology, 50 of the skills that students learn in schools today will be out of date when they are employed. On the other hand, approximately 70 of the competencies of industrial designers are acquired through on-the-job experience.[136] Thus, it is difficult for design education to form a designer who has adequate special knowledge but also possesses the wide perspective that is needed in the complex environment we face today and in the more complex environment that we are likely to face in the future.[137] Lewis and Bonollo claim that (product) designers not only need the individual cognitive skills and overall skill displayed in execution of design process, but also require other skills, such as negotiation with clients, problem solving, acceptance of responsibility for outcomes, interpersonal skills and project management. In addition to design professional skills and knowledge, an industrial designer needs to have general competencies, team spirit and personality to accept challenges.[138] The new designer in the 21st century will need to fulfil the roles of an intelligent maker, knowledge worker, sustainable entrepreneur, and active citizen concerned with issues of environment, society, commerce, network communication, etc.[139] Ideally, each industrial designer should be equipped with every competency mentioned above. However, those competencies are extensive and numerous, so it is not possible for all students to acquire all of them. But that does not mean that university education

needs to immediately respond to the industry's demand for certain knowledge and skills and neglect the ideals and goals of a university. Universities should initiate pioneer research and visions to educate students with the abilities to learn and adapt, to be able to lead the development of the industry.[140] In any case, it is not easy for schools to arrange design curricula in order to help students to learn general and special competencies during the limited time period.

Literature review of research about design competencies reviles the existence of two dominant approaches to education: specialist and generalist. Through the study of those researches it is possible to observe two major conceptual paradigms. One line of research follows the reductionist's paradigm, with the main assumption that design competence is a large set of elementary competencies such as hand drawing, verbal communication, spatial viewing, critical analysis, creative ingenuity, and manual dexterity. Another line follows the integrative or holistic paradigm, with the main assumption that design competence is holistic in nature, and as such, integrates multiple constituents which are difficult to separate since they mutually interact.[141] The first type of research puts the emphasis on the identification of particular competencies that are needed in a particular design practice or by a design task. In the reductionist's view, design competence is considered to be nothing else than a set of low level competencies such as drawing skills, spatial vision, specialized knowledge, intuitiveness and creativity, verbal communication, and technical writing, which have been typically addressed disjointedly. The second type of research is focused on the capacities embraced by design competence and investigates how they can be amplified by each other in an integral way. In the holistic view, design competence is a synergetic construct of some generic elements (human capacities) rather than being added up by low level competencies. From the holistic interpretation, no element of design competence

can exist apart from the whole, and the individual elements are determined by their relations to all other elements.[142]

Sethia claims that a higher level of design roles, a Generative Design, is emerging because the nature of the design profession tends to integration, which enables it to play a critical and active role in the product development.[143] Horvat, stresses that construction of knowledge and competence is not only a personal, but also a social problem. Therefore we can differentiate personal competence, which is related to individual professionals, and communal competence, which is related to a team or a community of professionals. Creativity, communication, integrative thinking, project work, problem solving, and learning from examples are typical personal competencies necessary for the industrial design. Multi-disciplinary collaboration, dislocated communication, balanced comprehension, and resource sharing are typical communal competencies. Communal competencies are becoming more and more important for a successful operation nowadays, when the conventional (hierarchically organized) companies are converted to self-directed, cross-functional, process oriented and knowledge-based companies.[144]

The ICSID suggests that a comprehensive ID education program should at least educate students in three categories of competency: 1) generic attributes problem solving, communication skills and adaptability to rapid changes; 2) specific industrial design skills and knowledge, design thinking and design process, design methodologies, visualization skills and knowledge, knowledge of product development processes, manufacturing, materials and processes, design management, environmental awareness, model making, etc.; 3) knowledge integration such as strategies of system integration. In addition to the above-mentioned skills, other skills should also be emphasized, such as negotiation with clients, project management, and communication. The IDSA provides a detailed

checklist, including 44 technical skills and 10 categories of personal skills, so that students who would like to choose industrial design as their career can evaluate themselves.[145]

Overbeeke et al. identified nine competencies that are requested to be developed by industrial design education. They are sorted as core competencies and meta-competencies. The core competencies are: (1) ideas and concepts (developing visions and innovative concepts by using creativity techniques, experimentation and operative research), (2) integrating technology (awareness of technologies and combining technologies for products and realization), (3) user focus and perspective (observing, analysing, and interpreting user needs), (4) social and cultural awareness (observing and analysing social behaviours and cultural contexts), (5) market orientation (exploring strategic marketing opportunities and consumer oriented positioning of products), and (6) visual language (connecting thoughts to function and form by visual means). The meta-competencies are: (1) multi-disciplinary teamwork (performing in international multidisciplinary teams), (2) design and research process (mastering design and operative design research processes), and (3) self-directed and continuous learning (personal development by defining new learning goals and approaches).[146]

ICSID formulated the exit profile of a general design graduate as follows: 1) primary cognitive abilities: critical, innovative, lateral and creative thinking, motivation and curiosity, perception of design problems, conceptualization of new design solutions; 2) secondary cognitive abilities: oral, graphic and symbolic communication, research and discovery, discipline of ethics and morality psychology and philosophy of designing, competence in the design specialization; 3) skills: design methodologies; materials, processing and model making, computer-aided design and other software; 4) social context: grasp of the cultural heritage, teamwork, collaboration and leadership, entrepreneurship and continuing education; 5)

subject matter expertise knowledge of the subject matter and context for design; fundamental scientific principles and their application, basic laws, principles and design practice in the subject.[147]

Since designing a curriculum presents a multifaceted challenge that includes questions about learning goals, such as: Which competencies are important for the professional practice? What should the relative emphasis be among them?, all relevant stakeholders who have interest in such matters should be informed about faculty decisions. In the context of design the most important opinions are from design practitioners, design clients and students. Those opinions should be expressed as ratings of importance to stakeholders for each competence and skills. In order to be qualified for design tasks at various stages, the competencies of designers vary, depending on different roles played in the product development process. The required professional abilities for the titles of junior designers, senior designers and design managers are different from country to country.[148] Furthermore, required competencies of designers vary depending on different roles played in the product development process, the content of design work, the level of design manpower and the demand of specific country.[149]

Yang et al. conducted the empirical research in Taiwan aiming to find out what kind of competencies the job market required for design jobs, which are the most valuable ones, and to find attitude of the job market on the dilemma whether designers should be educated as generalists or specialists.[150] A total of 265 job opportunities in the industrial design profession grouped into 13 job titles are classified into three categories: a) 57 fall on the Industrial Design (ID) group: including industrial designer, senior industrial designer, and design director/manager. b) 31.3 fall on the Mechanism Design (MD) group: including mechanism designer, senior mechanism designer, and

mechanism director/manager. c) 11.7 fall on others: including planning, management, interface, package and CAID, etc. Results showed that for the overall ID profession, the top five competencies are as follows: 3D graphic software ability, communication ability, fluency in English, 2D graphic software ability, creativity and imagination. Communication ability is a general competency commonly requested by all three categories, whereas 3D graphic software ability is a professional competency requested by both ID and MD groups. In addition to professional and general competencies, applicants' personality and attitudes, such as active, aggressive and optimistic (10.6) able to travel abroad (7.2) interested in and devoted to design (4.5%) and having team spirit (4.5%), etc. are also mentioned. Regarding the experience, experience with a particular industry or product is the most important and the ability to work independently is the second. According to the discoveries of this study, the ID practice has developed toward both integration and specialization. It seems that the scale of corporations presents one of the most influential factors on the decision of specialization or generalization. Some large companies have divided the ID function into specialization based on different design tasks in the product development process. For example, the BenQ group has set up a Centre for Digital Fashion Design to recruit ID talents, including the titles of design researcher, design project competencies and manager, ID leader, CAID designer, industrial designer, mechanism designer, package designer, 3D/2D animation/computer graphic designer, human factor researcher, user interface specialist, etc. Due to their limited resources of manpower and cost, small companies tend to integrate and expect designers to be fully responsible for the concept design at the beginning, as well as for the detailed design in the final stage. However, on the other hand, large companies, particularly the high tech industry, consider the increasingly complex technology and demanding awareness of

consumers, and realize that they need to be devoted to design research in order to understand user needs. In other words, large companies utilize the specializations of concept research, mechanism design, interface design, interaction design, CAID, etc. to introduce more user-friendly products or systems. There are three implication of this study for design education. The first considers requirements for design education to be reviewed and updated periodically, since the continuous transformations of new technology and the product development process has stimulated the development and changes in the design practice. For example, the results of the study shows that 55.1% of job openings request applicants to be proficient in 3D graphic software; so schools may decrease the ID students' training in drawing renderings and making sophisticated models since they are being replaced by computers. Second, in addition to professional knowledge and skills, employers also value applicants' general competencies, such as abilities to communicate, coordinate and organize, with experience of studying or living abroad, having international views, etc. in order to respond to globalization. Moreover, personality and attitudes such as being active, aggressive and optimistic; enthusiastic with a sense of responsibility; interested in and devoted to design and the ability to travel abroad are additional expectations for job applicants. Third, one of the conclusions in this study is that since design educators are not able to predict the possibilities of technology it is necessary to emphasize the design process based on the inquiry approach and continuous learning of new knowledge and skills for design students in order for them to adapt to these changes. In particular, there should be greater emphasis on the process and regarding products as media instead of a final purpose. The role of industrial design in the product development process has changed and extended.

In the study conducted by Yeh, two surveys were respectively conducted in the USA in 1998 and in Taiwan in

2001 to search for the demanded competencies, their relative importance, the expected performance levels, and the performance evaluations of the baccalaureate industrial designers from the viewpoints of industries.[151] Accordingly, there were respectively 69 and 62 competencies identified and included in the questionnaires used in the USA survey and the Taiwan survey. Then these items were divided into seven professional competence categories: (1) *conceptual competence*: the fundamental knowledge upon which professional practice is based, (2) *technical competence*: the ability to perform fundamental skills required of the professional, (3) *contextual competence*: an understanding of the broad social, economic, and cultural settings in which the profession is practiced, (4) *interpersonal communication competence*: the ability to communicate effectively with others through a variety of symbolic means, (5) *integrative competence*: the ability to mix conceptual, contextual, technical, and interpersonal communication competence to make informed judgments' about appropriate professional strategies to be employed in practice, (6) *adaptive competence*: the ability to adjust to new conditions produced by in a rapidly changing technological society and the dynamic nature of professions, and (7) *professional attitudes* which are often considered to be part of "becoming professional". The survey results showed that in the USA the industries had a higher demand of the industrial design profession in the areas of "creativity", "sketches", "visualizing design concepts", "problem solving", "knowledge of 3D forms", "design methods", "critical thinking", "portfolio preparation", "openness to change" and "communicate in writing". In Taiwan, the industries had a higher demand of the industrial design profession in the areas of "computer-aided industrial design", "working hard", "professional accomplishments and techniques", "form ability", "technical drawings", "problem solving", "learning ability", and "thinking and practicing". The problem solving ability

and the form ability are highly demanded by the industries of both countries. The ability of creative thinking is valued more in the United States and the ability of computer-aided design is valued more in Taiwan. In regard to the performance evaluation of the industrial designers, the results of the USA survey indicated that the industrial designers performed best in the areas of "creativity", "knowledge of 3D forms", "openness to change", "willingness to take reasonable risks", and "problem solving". The mismatches between the US industry demand and the performance of the industrial designers were greatest in the areas of "making good oral presentations", "communicate in writing", "knowledge of marketing and sales principles", "visualizing design concepts", and "knowledge of processes of materials". In Taiwan industrial designers were identified to perform best in the areas of "computer-aided industrial design", "working hard", "using design-aided tools", "concept development", and "creativity". The greatest mismatches between the demand and the performance of Taiwan's industrial designers were in the areas of "foreign language ability", "budget analysis" and "tendency analysis".

One larger sample study was conducted in 2007, by Liu. T. L. on the U.S. design industry's perspective regarding the priority of necessary design skills, the degree to which design industry is satisfied with recent graduates' skills, and the focus of the industrial design faculty.[152] The aim was to help industrial design educators to acknowledge the expectations of the industry for their students and to direct the curriculum towards enhancing the competitiveness of practicing designers. For the purpose of the study an 18-question survey was appealed to a varied population of design professionals on several issues relating to design education including the priority of various design skills, areas needing improvement in design education, company hiring practices, and the transition of the terminal degree for industrial design educators from Master's to Ph.D.

The research sample included a range of organizations, from small design consulting firms to large-scale manufacturing corporations. The survey was distributed to a broad spectrum of 1,343 designers, managers, and executives working for both design consulting firms and manufacturers. The survey results indicated that industrial design, on the whole, plays a more (41%) or much more (29%) important role for manufacturers than it did five years ago. This increasing significance indicates that corporate America is focusing on industrial design as a strategy to help answer escalating international competition and satisfy more demanding consumers. Results also showed that the manufacturers, whose industrial design function had become much more important in the past five years, reported a more than 10% average annual growth. Those high growth rates imply that the quality of design graduates is becoming increasingly important to American firms. The results show that the industry ranks the three most important criteria for hiring new designers in the following order: 1) design graduate's portfolio; 2) creativity; 3) graduate's experience. Resumes, grade point averages, and the use of entrance tests were rated with less magnitude. The portfolio, the most important factor according to this survey, presents a potential job candidate's design skills integrated with the designer creative ability and problem solving capability. In regard to the most important skills, results show that problem solving and innovation, closely followed by sketching are the top three skills. Of the secondary importance were teamwork, verbal, and materials skills, followed by computer-aided drafting (CAD), styling, production, anthropometry, marketing, human factors, and technical engineering skills. The category "model making" was ranked least important. However, the difference between the least important and most important categories was only in a few points, indicating that after problem solving, innovation, and sketching, all other skills are similarly important, with

the exception of model making. A balanced design education cantered on these three major skills seems to be the expectation from the industry. Furthermore, according to this survey, practicing design professionals see innovation, problem solving, and sketching (three of the most important skills for graduates to possess) as areas which need to be improved in an education context. For example, respondents were moderately satisfied with students' sketch abilities, and most satisfied with students' model-making abilities, which was the least important category when professionals were asked to rank the most important skills for an industrial designer. Other areas, such as verbal skills, teamwork, technical engineering, marketing, and knowledge of materials also need to be improved because they were rated substandard for graduates. Since the field of marketing is prevalent with research opportunities, respondents think that students will only benefit from learning the basic marketing concepts and from understanding how products should be designed to compete in the marketplace. Respondents believe that fundamental marketing research strategies are necessary for designers to understand their target market. They think that placing industrial design students in a more business-like context, such as industry collaboration projects, where they must practice real-world design processes, will help them know what to expect and what is expected of them as they move into the work environment. In regard to material knowledge and technical engineering, since most manufacturers have specific needs for materials and engineering, respondents stressed that it is not realistic for design students to be expected to have mastered those needs simply by studying materials, books or visiting manufacturing facilities. They think that industrial design curriculum should focus on providing students with a basic understanding of industrial processes, awareness of the many different types of materials available, and basic marketing and research concepts involved when developing a new

product. This is because as a new industrial designer becomes more experienced in a chosen field, designer expertise in the areas of materials and technical engineering most important to that field will increase. The results of the survey also showed that respondents from the design industry do not see design education institutions enough applicable to the teaching of problem solving, innovation, and design skills, which make up the primary need from the point of view of the industry. With new technologies becoming the current driving force of innovation, these skills will be even more valuable as designers move even further into unknown territory. Furthermore, the results of this study showed that most designers and design managers do not advocate a complete revamping of university requirements, such as requiring a Ph.D. to teach design skills. From the perspective of the industry, design education should improve its ability to teach design skills, to inspire creativity, and to educate students to intelligently solve the problems that they will face every day in their design career. In the pursuit to outlast and outperform international competition, it remains the mission of today's educators to develop fresh designers equipped with the skills needed to succeed.

The research undertaken by Cartier P. (2011) gives students' perspective on their most valuable expectancies in design education.[153] Based on their content, students' statements were classified in three basic issues: most preferred instruments which transfer the different aspects of design knowledge to students, most valuable aspects of students' expectations in design education; and comparisons of the 1st and 4th year ID students' ideas. In regard to the most preferred instruments for the transfer of different aspects of design knowledge, from students' perspective, workshops, seminars, conferences, openings or other social activities which help them to communicate with people like designers, company managers, and design researchers represent the most valuable instruments. Also

students prefer activities like internships in production companies', factory tours and fairs where they can share information and reach directly, see and touch material objects. The research participants put forward internet as the most appropriate and accessible information tool (100% of research participants) but they do not consider it as the most useful tool for their advance in design education. The most valuable aspects of students' expectations in design education are creativity, conceptual approaches and innovation. The most preferred lectures are design history, art history and creativity methods. Those subjects help them gain the attributes, skills and knowledge in the way which urge their creativity, innovativeness, problem solving potential and help them design artefacts that respond to human needs. Participants stated that some aspects of design such as design thinking and design process, design methodologies, visualization skills and knowledge, knowledge of product development processes, manufacturing, materials and processes, design management, environmental awareness, model making, etc., represent the basic values, but for them they are not the most important ones. Students believe that technical information and skills about ID can be developed, but creativity and knowledge should be given at school. Therefore, students' priorities are creativity and creativity methods, although they also believe that other values, skills and knowledge equally create the basic structure of design and design education. Regarding the expectations of students from the 1st and 4th year, students from the 1st year expect to learn about form, presentation skills, model making, aesthetic values, and they do not concentrate on specific industrial design skills and knowledge. Half of the 4th year ID students prefer their projects to be more about concept designs, and the other half like to work in collaboration with firms. All 4th year students emphasized the importance of creativity methods during the project process. Most important common expectation of 1st

and 4th year students was in regard to creative thinking and creative learning. Therefore, the results of this study indicate that for the design students, creative activity and creative learning is one of the most important parts of education which also represents the most common and valuable expectancy of students in design education.

PART III: QUALITY AND RELEVANCY OF DESIGNERS' KNOWLEDGE, SKILLS AND COMPETENCIES FROM THE PERSPECTIVE OF DESIGN PROFESSIONALS, DESIGN PROFESSORS AND BUSINESS ACTORS

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The empirical research simultaneously conducted by three project partners in three countries – Croatia, Austria and Macedonia is presented in the third part of the Study. The main purpose of this research is that together with the theoretical research results create a basis for defining and proposing appropriate guidelines for the improvement of current design education and the content of design curriculum, in form of deficient design competencies, knowledge and skills. Those guidelines should help bridge the gap between the designer's educational and working environment. On the basis of those guidelines, a project team of experts will develop a Design Training Program which should address the identified skills' mismatch. Research was carried through online surveys and focus group interviews of three stakeholders' groups: Design Professionals, Design Professors, and Business Actors with the intention to obtain their opinion on the quality and relevancy of knowledge, skills and competencies which designers acquire during their education, as well as their opinion on the potential current mismatch of the skills which designers obtain in their formal education and skills needed in their current and future practice. Therefore in the first chapter, the purpose and methodology of the research were explained. In the second, third and fourth chapter, results from the surveys and focus groups conducted in all three countries were presented. The fifth chapter refers to the comparative analysis of the results of the overall research.

1 PURPOSE AND METHODOLOGY OF RESEARCH

THE MAIN PURPOSE AND OBJECTIVES OF RESEARCH

The main purpose of the research was to acquire information about a possible mismatch between knowledge, skills and competencies that design students obtain through their formal education and those ones that are most demanding in real life practice. In order to get the opinion from more stakeholders: from Design Professionals, Design Professors, and Business Actors, three separate questionnaires have been designed and three separate surveys in each country were conducted. In addition, in each country interviews with Focus groups with the above-mentioned stakeholders groups were conducted. Since the surveys from business actors groups didn't achieve relevant response rate valid enough to draw objective conclusions, for this stakeholder group only interviews with the Focus groups were presented.

METHOD AND SAMPLING

For the purpose of data collection, and data analysis, a descriptive research approach was used. The mixed method approach consisting of a cross sectional online survey and semi- structured interviews with the Focus groups was used in order to produce more well-rounded data and conclusions. Online surveys and three focus group interviews were simultaneously conducted in three countries: Austria, Croatia and Macedonia. When the problem is specific, respondents which could give answers about that problem are also defined by specific criteria. Therefore, since the subject of this research is

specific, judgment/nonprobability sampling based on researchers' knowledge and professional judgment was used as a sampling technique. The data base of three vocational designers' organizations which conducted the research – designaustria, Croatian Designers' Association and Public Room were used as a sample frame.

QUESTIONNAIRE INSTRUMENT DEVELOPMENT

In an attempt to address the content validity of the survey instrument, there were 3 stages of development and revision of the questionnaires used in this research: 1) Generating the preliminary list of questions from literature reviews and researchers' experience, 2) Developing the pilot Questionnaire which was administered to Focus groups, (3) Constructing the Final Questionnaire which was administered in the Survey based on the data collected through the Pilot Questionnaire. In designing the questions, a combination of structured and unstructured questions was used. Respondents had a choice to select between presented answers and an option to write their own answers if they were not satisfied with the offered options. Dichotomous questions, ordinal questions, Likert scaling questions and filter or contingency question were used.

SURVEY RESEARCH

The questionnaire for this survey was created for young professionals with a degree in product design. Accordingly, there were respectively 85 questions and sub-questions defined where 40 questions were in relation to different knowledge, skills and competencies. This questionnaire contained four groups of questions that relate to the following topics:

The first group of questions included general information related to the respondents' educational and professional background, curriculum they attended in design school and the time they spent in professional practice.

The second group of questions is related to respondents' professional design practice: their current employment status, their expectations in relation to employment/work during their education, their experience of meeting their first client, their experience about their first project in terms of briefing, research, concept development, design development, clients' feedback, project implementation, communication and their expectations for further career development.

The third group of questions is related to design education regarding the respondents' level of satisfaction with following groups of skills and competencies which they acquired/not acquired through their formal education:

— Skills related to specific phases of the working process: research and analyses, concept development, design skills, oral and visual presentation skills, communication skills, the capacity to grow and innovate, managerial skills.

— For respondents with an MA degree competencies related to Dublin-competencies framework which cover: a) knowledge of and insight into the profession as a foundation of the ability for an original development or application of ideas, often within the framework of a research, b) application of knowledge and insight in a broader or multidisciplinary context, as a capability to deal with complex matter; c) formation of judgment in the sense of the capability to form a judgment based on incomplete or limited information, taking into account social and ethical responsibilities, d) communication in sense to be able to convey conclusions in a clear and unequivocal way to specialist or non-specialist audiences, e) lifelong learning ability in sense to be able to continue with education that is characterized by self-activation or its autonomous nature. The Dublin descriptors framework offers generic statements of typical expectations of achievements and abilities associated with awards that represent the end of each of a (Bologna) cycle or level. The descriptors are phrased in terms of competence levels, not learning outcomes, and they enable to distinguish between the different cycles of education in a broad and general manner.

— Skills concerning: 1. Design thinking and design process (analytical thinking, task clarification, concept generation, evaluation and refinement, critical thinking, design synthesis, design methodology, other), 2. Visualizing skills (sketching, 3D modelling, model making, product development, manufacturing, other), 3. Design management: communication of results, managing design action, ability to take initiative, ability to organize work, ability to manage people, overall skill displayed in execution of process, entrepreneurship skills, other).

Also there are the questions about the respondents' satisfaction with the professional attitude they acquired through formal education concerning: expert behaviour in dealing with and handling of the design problem, dedication and motivation to be a good designer, knowledge acquisition and managing task, teamwork and the ability to run the task smoothly, time management, and responsibility of the outcomes. Also respondents were asked about their satisfaction with the specific knowledge they acquired through the education process in relation to: knowledge of history and theory of design, knowledge in sustainability, and knowledge of the involvement of the design profession in the socio-economic flows. Furthermore, there are the questions relating to the respondents' level of satisfaction with their preparation for a professional career regarding the: acquisition of skills needed in a professional career, extent to which their course was practice-oriented, information on career opportunities, contact with the professional world, and information about independent professional work (administration, tax, setting rates, etc.). Respondents were also asked: How they acquired additional competencies after finishing studies? Do they think that additional competencies should have been taught in school? How, during the study, they presented their final projects? Did they have a chance in their design school to work on projects or assignments for clients (either industrial or artisan production)? And from their point of view how useful were those projects or assignments for their professional development, and what their level of satisfaction with them was? Respondents were also asked what was the best model for acquiring basic design skills and competencies. Finally respondents were asked to evaluate their design education, and to indicate their overall satisfaction with the school/s they attended.

The fourth group of questions was related to the matter of internship/apprenticeship in design education institutions.

Respondents were asked if they had a chance to have an internship/apprenticeship with a company during their studies. How useful was the internship/apprenticeship for their professional career? Was internship/apprenticeship an obligatory part of their study programme? Did they think that internship/apprenticeship should become an integral part of design education?

At the end of the questionnaire, respondents were asked to describe what were the most valuable experiences acquired during their collaboration with the business sector in general, and to add anything important in their opinion, related to the topic of collaboration between designers and the business sector.

Since the group of questions pertaining to the level of the Design Professionals' satisfaction with acquired knowledge, skills, competencies during their formal education are structured on the basis of Likert-type scale, with two types of five ordered response levels: (a) 1- poorly, 2-moderately, 3-fairly, 4-well, 5-very well; b) 1-very unsatisfied, 2-unsatisfied, 3-neutral, 4-satisfied, 5-very satisfied, for the purpose of this analysis two opposite levels of satisfaction: the High Level of Satisfaction and High level of Dissatisfaction were determined. Their scores are equal or above 50% (= 50% >) of total percentages of well and very well statements, and total percentages of poor and moderate statements concerning each topic. In other words the middle level on the scale (3-fairly, and 3-neutral) was excluded in order to generate results for the High Level of Satisfaction and Dissatisfaction.

2.1 CROATIAN RESULTS

In Croatia, a total of 45 questionnaires were collected, with the response rate of 39%. In regard to gender, 23% of the respondents were male, and 77% were female. In regard to their educational and professional background, 40% of the respondents had finished a 5-year Bologna graduate program, 40% had finished the Pre-Bologna study program, and others had a Bologna bachelor degree. Most of them have worked as professionals for the last 5 years (38%), and (33%) for the last 10 years. The majority of them (66%) did not maintain contact with their faculties and 42% of them said that the main reason for that was that their former schools were not opened for projects with alumni students. Half of the respondents were self-employed/freelancers, while the others were self-employed as owners of design companies (18%), as in-house designers with fixed term or open ended contract (18%), and the rest of them were unemployed, or employed in some other way. In regard to their expectations in relation to employment after finishing their education, most of them wanted to establish their own design studio/company (41%) and to work as freelancers 20%.

The largest percentage of the respondents met their first client through their family and friends (24%), and 24% of them with help from their design school network. In regard to respondents' experience in their first project briefing 55% of them said that the client did not provide them with a well written and professional brief. In regard to their experience with the research for their first project, 21% of them stated that they had enough time and resources to make a good design research and 37% said that they did not. With regard to the feedback that respondents got from their first client, 47% of them more or less think that the client's feedback was useful. In relation to their experience with the project implementation, 49% of them stated that they implemented their first professional

project without any difficulty, and 56% of them stated that their communication with client was more or less on a good level.

Based on the results of the survey, a total of 21 knowledge, skills and competencies with which designers are highly satisfied can be identified, and 5 of them with which they are highly dissatisfied (See Table 1. below).

Table 1.1 Knowledge, Skills and Competencies with which Croatian Design Professionals are Highly Satisfied (= 50% > of Well and Very well or Satisfied and Very satisfied statements)

Working process skills		Acquired professional attitude	
Research and analyses	56%	Dedication and motivation	
Concept development	61%	to be a good designer	57%
Design skills	59%	Knowledge acquisition	
The capacity to grow		and managing tasks	66%
and innovate	53%	Responsibility of the outcomes	53%
		Knowledge of history	
Design thinking and		and theory of design	66%
design process skills			
Analytical thinking	78%	Dublin descriptors	
Task clarification	78%	Knowledge of and insight	
Concept generation	75%	into the profession	52%
Evaluation and refinement	62%	Application of knowledge	
Critical thinking	66%	and insight	53%
Design synthesis	61%	Formation of judgment	69%
Design methodology	51%	Communication	61%
		Learning skills	64%
Visualizing skills			
Model making	52%		

Table 1.2 Knowledge, Skills and Competencies with which Croatian Design Professionals are Highly Dissatisfied (= 50%> of Poorly and Moderately or Unsatisfied and Very unsatisfied statements)

Working process skills		Design management skills	
Managerial competencies	69%	Ability to manage people	62%
		Entrepreneurship	65%
Visualizing skills			
3D modeling	50%		
Manufacturing	58%		

With regard to all other knowledge, skills and competencies, the respondents are generally satisfied, which for the purpose of this analysis is the level of satisfaction generated as sum of fairly, well and very well statements equal or above 50% (= 50% >).

For example, in respect to working process skills, the respondents are generally satisfied with their oral and visual presentation skills and communication skills, but not that much as they are with other skills, since the largest number of them stated that they regarded these skills as fairly satisfied (36% and 33% respectively). With respect to visualizing skills, results show that designers are generally satisfied with sketching and product development skills, but in case of product development there are also a large percentage of more or less dissatisfied respondents. In regard to design management abilities results show that respondents are generally satisfied with communication of results, managing design action, ability to take initiative, ability to organize work and ability to display their overall skills during the execution of the design process. In regard to those skills and abilities, the largest number of the respondents answered that they are fairly satisfied, but also a large number of them are dissatisfied. Regarding the questions of respondents' satisfaction with the professional attitude they acquired through formal education, the respondents were satisfied with the acquired expert behaviour in dealing with and handling of the design problem, with their teamwork ability and ability to run the task smoothly, and with time management with which most of the respondents where fairly satisfied. Regarding the respondents' satisfaction with the specific knowledge they acquired during their education in case of the knowledge in sustainability the results were mixed, since 34% of them answered that they are fairly satisfied, 34% of them answered that they are poorly or moderately satisfied, and 31% of them answered that they are well or very well satisfied with the

obtained knowledge of sustainability. In case of knowledge of involvement of the design profession in the socio-economic flows, 44% of the respondents were poorly and moderately satisfied, 32% of them were fairly satisfied, and 23% were well and very well satisfied.

With regard to the respondents' level of satisfaction with their preparation for professional career, results show that the respondents are mostly satisfied with the acquisition of skills needed in a professional career where 44% of them are satisfied and very satisfied. As for the satisfaction of the respondents with the extent to which their course was practice-oriented, 43% of them were satisfied and very satisfied. Regarding the question of the respondents' contact with the professional world during their education 42% were generally not satisfied, and just 19% of them were satisfied and very satisfied. Even a larger rate of dissatisfaction was in regard to the information about carrier opportunities where more than half of the respondents (58%) were more or less unsatisfied. But the highest rate of dissatisfaction was the one relating to their design school's offer of information about independent professional work (administration, tax, setting rates, etc.), where 50% of respondent were very unsatisfied and 29% of them were unsatisfied, which makes a total of almost 80% more or less dissatisfied respondents.

The largest number of respondents (44%) acquired additional competencies in their workplace and through working process, and 76% of them thought that additional competencies should have been taught in school. The largest percentage of respondents (46%) said that they presented their final school project through drawing and sometimes in addition to that they produced a model. The majority of the respondents (63%) stated that they had a chance to work on projects or assignments for clients during their regular design education and 56% of them believed that it was a very useful experience for

their professional development. Also 79% of them agreed that real-life projects offer structure and organization for students in terms of time management, and 87% of them believe that real-life projects offer more potential for learning new skills, especially cross-sectorial skills. The largest percentage of designers (87%) thought that real-life projects were worthwhile because they lead to production of prototypes and have the potential to be placed on the market, which is a good reference for a student. The highest percentage of designers (43%) considers the Bologna graduate five year program (3 + 2) to be the best model for acquiring basic design skills and competencies, and 40% of them thought that that was the Pre-Bologna study program. Regarding the questions about schools conditions for internship/apprenticeship, the largest number of Croatian respondents (66%) did not have a chance to have an internship/apprenticeship with a company during their studies, and they believe (100%) that it was generally useful for the professional career. 84% of them stated that internship/apprenticeship was not an obligatory part of their study program, and 82% believed that it should become an integral part of design education. The survey results reveal that 53% of the Croatian Design Professionals are generally satisfied with their education, while 31% of them declared themselves neutral on this issue. Only 11% of them stated that they are more or less unsatisfied.

2.2 AUSTRIAN RESULTS

In Austria a total of 25 questionnaires were collected, with the response rate of 23%. With regard to gender, 60% of the respondents were female, and 40% were male. The largest percentage of respondents (41,7%) had finished the Pre-Bologna study program, 17% of them had finished a 5-year Bologna graduate program, 17% had a Bologna bachelor degree and the rest of them had finished some alternative educational program. The majority were professionally engaged for the last 10 years (64%). Most of them (56%) maintained the contact with their faculties.

In regard to the questions related to their professional design practice, the largest number of the respondents (33%) was self-employed/freelancers, while the others were self-employed as owners of design companies (18%). 33% of the respondents worked as in-house designers with a fixed term or open ended contract and the rest of them were employed in some other way. In regard to their expectations in relation to employment after finishing their education, the largest percentage of them (22%) wanted to have a job with a design studio, and 29% of them wanted to work as freelancers, individually or with a team.

The largest number of the respondents (31%) met their first client through their family and friends, and 25% through job applications and portfolio presentations. With regard to the respondents' experience in their first project briefing, 46% of them said that the client did not provide them a very well written and professional brief. In respect to their experience with research for their first project 47% of them stated that they did not have enough time and resources to make a good design research, and 35% of them said that they did. With regard to the feedback that respondents got from their first client, 43% of them more or less agreed that the client's feedback was useful. In regard to their experience with project implementation 43%

of them stated that they, more or less, implemented their first professional project without no difficulty, and 45% of them stated that their communication with client was, more or less, on a good level.

Based on the results of the survey, a total of 11 knowledge, skills and competencies with which designers were highly satisfied can be identified, and 6 of them with which they were highly dissatisfied (See Table 2. below).

Table 2.1 Knowledge, Skills and Competencies with which Austrian Design Professionals are Highly Satisfied (= 50%> of Well and Very well or Satisfied and Very satisfied statements)

Dublin descriptors	
Application of knowledge and insight	54%
Formation of judgment	54%
Communication	54%
Lifelong learning	64%
Design thinking and design process skills	
Analytical thinking	70%
Task clarification	57%
Concept generation	52%
Critical thinking	62%
Visualizing skills	
Sketching	52%
Design management skills	
Communication of the results	50%
Acquired professional attitude	
Knowledge acquisition and managing tasks	53%

Table 2.2 Knowledge, Skills and Competencies with which Austrian Design Professionals are Highly Dissatisfied (= 50% > of Poorly and Moderately or Unsatisfied and Very unsatisfied statements)

Working process skills	
Managerial competencies	61%
Design thinking and design process skills	
Design methodology	57%
Design management skills	
Ability to manage people	62%
Entrepreneurship	68%
Overall skill displayed in execution process	50%
Specific knowledge	
Knowledge in sustainability	56%

With regard to all other knowledge, skills and competencies, the respondents are generally satisfied (sum of fairly, well and very well statements = 50% >).

Results of the survey show that in regard to the working process skills, the Austrian designers are generally satisfied with the following acquired skills: research and analyses, concept development, design skills; oral and visual presentation skills, communication skills and with the capacity to grow and innovate. In case of the capacity to innovate and grow, given that a large percentage of designers also stated that they are more or less dissatisfied (48%), there is certainly a room for improvement of this ability through the education process. In regard to the Dublin descriptors' framework, the results of the survey showed that the respondents are highly satisfied with all the competencies except the one related to knowledge of and insight into the profession that offers a foundation from which a student can make an original contribution to the development or application of ideas, often within the framework of a research. In regard to this knowledge, they are generally satisfied (36.4% of them stated that they are well or very well satisfied, 27.2% of them are fairly satisfied, while 36.4% of them are generally dissatisfied).

In respect to design thinking and design process skills, respondents are generally satisfied with evaluation and refinement and design synthesis skill. As for visualizing skills, results show that the respondents are generally satisfied with model making, product development and manufacturing skills. In the case of model making and manufacturing, the large percentage of designers also declared that they are more or less dissatisfied (45% and 40% of them respectively).

In regard to design management abilities, respondents are generally satisfied with the level of the acquired ability to manage design action (42% of poor and moderate statements), ability to take initiative and ability to organize work.

In case of the ability to manage design action a large number of the respondents also answered that they are more or less dissatisfied (42%). Respondents were also generally satisfied with the acquired professional attitude in relation to expert behaviour in dealing with and handling of the design problem, with their teamwork ability and ability to run the task smoothly, their dedication and motivation to be a good designer, with time management and with their responsibility for outcomes. In respect to the time management ability, there was also a large percentage of unsatisfied respondents, thus it is a matter which Austrian design education institutions should pay more attention to. Regarding the respondents' satisfaction with specific knowledge they acquired during their education, results showed that respondents were generally satisfied with their knowledge of history and theory of design, and with the knowledge of involvement of the design profession in the socio-economic flows.

With regard to the respondents' level of satisfaction with their preparation for a professional career, results show that the respondents are mostly satisfied with the contact with the professional world during their education (55%) and with the acquisition of skills needed in a professional career (47%). As for the satisfaction of the respondents with the extent to which their course was practice-oriented, 44% of them are more or less satisfied, and 39% are more or less dissatisfied. Regarding respondents' level of satisfaction with information about carrier opportunities provided during their education process, 53% of the respondents are generally dissatisfied. But the highest rate of dissatisfaction is the one relating to their design schools' offer of information about independent professional work (administration, tax, setting rates, etc.), where 63% of respondent were generally unsatisfied.

Results showed that the largest percentage of respondents (39%) acquired additional skills and competencies through

their workplace and working process, and that 78% of them thought that additional competencies should have been taught in school. On the question: How did they visually present their final school projects? 31% answered that they did that through well designed drawings (3D rendering, illustration), 31% answered that they sometimes produced a model in addition to the drawing, and 32% of them said that they always produced either a functional model or a prototype. Also, the largest percentage of respondents (65%) said that the workshop fulfilled its purpose for delivering well-produced models and prototypes, and 53% of them said that they had a chance to work on projects or assignments for clients during their regular design education. Furthermore, 58% of them stated that it was a very useful experience for their professional development. Also, 83% of the respondents believed that real-life projects offer structure and organization for students in terms of time management, and 64% of them believed that real-life projects offer more potential for learning new skills, especially the cross-sectorial skills. The majority of them thought (70%) that real-life projects were worthwhile because they led to production of prototypes and had the potential to be placed on the market, which is a good reference for students. The highest percentage of respondents (38%) considers the Bologna graduate five-year-program (3 + 2) to be the best model for acquiring the basic design skills and competencies, and 30% of them thought that that was the Pre-Bologna study program.

Regarding the questions about schools' conditions for internship/apprenticeship, the largest number of Austrian Design Professionals (83%) had a chance for internship/apprenticeship with a company during their studies, and they believe (100%) that it was generally useful for their professional career. Also, 73% of them had internship/apprenticeship activities as an obligatory part of their study program, and 93% of them believed that it should become an integral part

of design education. The results of the survey show that 65% of respondents are generally satisfied with their education, while 17% of them declared themselves neutral on this issue. Only 18% of them stated that they are more or less unsatisfied.

2.3 MACEDONIAN RESULTS

In Macedonia a total of 34 questionnaires were collected, with the response rate of 68%. In regard to gender, 74% of the respondents were female, and 26% were male. The largest percentage of the respondents (32.4%) had finished the 5-year-Bologna graduate program, 23.5% of them finished the Pre-Bologna study program, 26.5% had a Bologna bachelor degree and the rest of them finished some alternative educational program. The majority of them have been professionally engaged for the last 5 years (50%). Most of them (56%) did not preserve any contacts with their faculties, and as main reason for that, the largest percentage of them stated that it was because the school/school network was not opened towards projects with alumni students. The majority of the respondents (56%) work as in- house designers with fixed term or open ended contract, 6% of them are self-employed/freelancers, while the others are self-employed as owners of design companies (17%), unemployed (12%) or employed in some other way (9%). In regard to their expectations in relation to employment after finishing their education, the largest percentage of them (28%) wanted to establish their own design studio/company, and 23% of them wanted to have a job with a design studio.

The largest percentage of the respondents met their first client through their employer (26%), through family and friends (23%), and through social networks (22%). In regard to respondents' experience in their first project briefing, 40% of them said

that that the client did not provide them a very well written and professional brief. In regard with their experience with the research for their first project, 47% of them stated that they had enough time and resources to make a good design research. With regard to the feedback that respondents got from their first client, 53% of them more or less think that client's feedback was useful. In regard to their experience with the project implementation, 55% of them stated that they implemented their first professional project without any difficulty, and 62% of them stated that their communication with client was more or less on a good level.

Based on the results of the survey, total of 17 knowledge, skills and competencies with which designers were highly satisfied can be identified, and 6 of them with which they were highly dissatisfied. (See Table 3 below).

With regard to all other knowledge, skills and competencies, the respondents are generally satisfied (sum of fairly, well and very well statements = 50% >).

For example, in respect to working process skills, the respondents are generally satisfied with the communication skills and their capacity to grow and innovate. As for the Dublin descriptors' framework respondents are generally satisfied with the application of knowledge and insight into the profession and formation of judgment. In respect to design thinking and design process skills designers are generally satisfied with evaluation and refinement, design synthesis and design methodology skills, in regard to which the largest percentage of respondents stated that they are fairly satisfied. With regard to visualizing skills, results showed that designers were generally satisfied with 3D modelling, model making, product development, and manufacturing skills. In case of manufacturing skills there is also a large percentage of unsatisfied respondents (46%). With respect to design management abilities, respondents are generally satisfied with the communication of results, ability

to take initiative, and ability to organize work. In regard to mentioned abilities there is also a large percentage of more or less dissatisfied respondents.

Table 3.1 Knowledge, Skills and Competencies with which Macedonian Design Professionals are Highly satisfied (= 50% > of Well and Very well or Satisfied and Very satisfied statements)

Working process skills		Visualizing skills	
Research and analyses	62%	Sketching	54%
Concept development	69%		
Design skills	54%	Professional attitude skill	
Oral and visual presentation skills	59%	Knowledge acquisition and managing them	54%
		Teamwork and the ability to run the task smoothly	65%
Dublin descriptors		Time management	60%
Communication	50%	Responsibility for the outcomes	64%
Learning skills	66%		
Design thinking and design process skills		Specific knowledge	
Analytical thinking	59%	Knowledge of history and theory of design	52%
Task clarification	54%	Knowledge in sustainability	62%
Concept generation	55%		
Critical thinking	54%		

Table 3.2 Knowledge, Skills and Competencies with which Croatian Design Professionals are Highly dissatisfied (=50% > of Poorly and Moderately or Very unsatisfied and Unsatisfied statements)

Working process skills		Design management skills	
Managerial competencies	58%	Managing design action	52%
		Ability to manage people	52%
Dublin competencies		Overall skill displayed in execution of process	52%
Knowledge of and insight into the profession	50%	Entrepreneurship skills	58%

Regarding the questions about respondents' satisfaction with the professional attitude they acquired through formal education, the respondents are generally satisfied with the acquired expert behaviour in dealing with and handling of the design problem, and with their teamwork ability and ability to run the task smoothly. Regarding the respondents' satisfaction with specific knowledge they acquired during their education they are generally satisfied with the knowledge of involvement of the design profession in the socio-economic flows.

With regard to the respondents' level of satisfaction with their preparation for a professional career regarding the acquisition of skills needed in a professional career, the extent to which their course was practice-oriented, information on career opportunities, contact with the professional world and information about independent professional work (administration, tax, setting rates, etc.), the results showed that Macedonian Design Professionals are highly dissatisfied with their preparation for a professional career during their education since on average, a 55% of them regarding each of the above topic stated that they are very unsatisfied and unsatisfied.

The majority of Macedonian Design Professionals acquired additional competencies in their workplace and through working process, and 91% of them thought that additional competencies should have been taught in school. The biggest number of designers (56%) presented their final school project through well designed drawing (3D rendering, illustration). The largest percentage of respondents (37.5%) said that they did not have a modelling workshop in their design school, and 58% of them said that during their regular design education they did not had a chance to work on projects or assignments for clients. Those ones who during their regular education had a chance to work on projects for real client thought that it was a very useful experience for their professional development.

Almost all Macedonian designers (91%) agreed that real-life projects offer structure and organization for students in terms of time management, and all of them (100%) believe that real-life projects offer more potential for learning new skills, especially the cross-sectorial skills. The majority of the respondents (67%) thought that real-life projects were worthwhile because they led to production of prototypes and had the potential to be placed on the market, which is a good reference for any student. The highest percentage of respondents (52%) considered the Bologna graduate five-year-program (3 + 2) to be the best model for acquiring the basic design skills and competencies. Regarding the questions about schools' conditions for internship/apprenticeship, the largest number of respondents (75%) had a chance for an internship/apprenticeship with a company during their studies, and they believe (87%) that this practice was generally useful for their professional career. The majority of them (67%) had internship/apprenticeship activities as an obligatory part of their study program, and 92% of them believe that internship/apprenticeship should become an integral part of the design education. Results of the survey show that the largest percentages of designers (78%) are more or less satisfied with their education.

3 DESIGN PROFESSORS: SURVEY RESULTS

SURVEY RESEARCH

The questionnaire for this survey was created for Design Professors who teach in Croatian, Austrian and Macedonian design schools. Questionnaire consisted of the 74 questions and sub-questions where 40 questions concerned different knowledge, skills and competencies, the same as in the designer's questionnaire. This questionnaire contained six groups of questions that relate to the following topics:

The first group of questions included general information about design schools' collaboration experience with the business sector such as the schools' cooperation with the business sector on real-life projects, intensity of collaboration, types of organizations or companies with which design schools cooperate, cooperation with organizations.

The second group of questions is related to design schools' models of cooperation with the business sector. The main purpose of those questions was to generate information about the most commonly used models of cooperation between design schools and the business sector, scholars' opinion on the most successful models of cooperation and about the implementation of those models in the formal design curriculum. Also, Design Professors were asked about the efficiency of the working process organization during the collaboration projects, and about the extent of the multidisciplinary approach in realization of these projects.

The third group of questions is related to collaboration projects outcomes. Respondents were asked about the extent

to which the collaboration projects with the business sector were developed, how they were produced, whether they were commercialized, as well as about the students' benefits from the collaboration/s on projects with the business sector in terms of acquired knowledge, skills, or benefits of other kinds.

The fourth group of questions is related to design education regarding the design scholars' level of satisfaction with the following groups of knowledge, skills and competencies which design education institutions provide for students during their process of formal education:

— Skills in regard to specific phases of the working process: research and analyses, concept development, design skills, oral and visual presentation skills, communicative skills, the capacity to grow and innovate, managerial skills.

— Master course programs' competence outcomes related to Dublin-competencies framework which cover: a) knowledge of and insight into the profession as a foundation of the ability for an original development or application of ideas, often within the framework of a research, b) application of knowledge and insight in a broader or multidisciplinary context, as a capability to deal with the complex matter, c) formation of judgment in the sense of the capability to form a judgment based on incomplete or limited information, taking into account social and ethical responsibilities, d) communication in the sense to be able to convey conclusions in a clear and unequivocal way to specialist or non-specialist audiences, e) lifelong learning ability in the sense to be able to continue with education that is characterized by self-activation or its autonomous nature. The Dublin competence framework offers generic statements of typical expectations of achievements and abilities associated with awards that represent the end of each (of the Bologna) cycle or level. The descriptors are phrased in terms of competence levels, not learning outcomes, and they enable to distinguish in a broad and general manner between the different cycles of education.

— Skills concerning: 1. Design thinking and design process (analytical thinking, task clarification, concept generation, evaluation and refinement, critical thinking, design synthesis, design methodology); 2. Visualizing skills (sketching, 3D modelling, model making, product development, manufacturing); 3. Design management (communication of results, managing design action, ability to take initiative, ability to organize work, ability to manage people, overall skills displayed in execution of process, entrepreneurship skills); 4. Professional attitude skills (expert behaviour in dealing with and handling of the design problem, dedication and motivation to be a good designer, knowledge acquisition and task management, teamwork and the ability to run the task smoothly, time management, responsibility of the outcomes).

The fifth group of question is related to the matter of internship/apprenticeship and alumni network in design education institutions. At the end of the questionnaire Design Professors were asked to describe what was their most valuable experience acquired during collaboration with the business sector, and to add anything they think is also important regarding this issue.

Since the group of questions pertaining to the level of the Design Professors' satisfaction with the acquired knowledge, skills, competencies during their formal education are structured on the basis of Likert-type scale, with two types of five ordered response levels: (a) 1- poorly, 2-moderately, 3-fairly, 4-well, 5-very well; b) 1-very unsatisfied, 2-unsatisfied, 3-neutral, 4-satisfied, 5-very satisfied, for the purpose of this analysis two opposite levels of satisfaction: the High Level of Satisfaction and High level of Dissatisfaction were determined.

Their scores are equal or above 50% (= 50% >) of total percentages of well and very well statements, and total percentages of poor and moderate statements concerning each topic. In other words the middle level on the scale (3-fairly, and 3-neutral) was excluded in order to generate results for the High Level of Satisfaction and Dissatisfaction.

3.1 CROATIAN RESULTS

In Croatia, the total number of potential respondents in this survey was directly related to the total number of professors who teach in the field of product design and which in the case of Croatia, as well as in other countries, is generally small. The respondents from Croatia teach design or industrial design courses on five different Croatian educational institutions. A total of 10 questionnaires were collected, with the response rate of 63%. In regard to gender, 50% of the respondents were male, and 50% were female.

The results of the survey showed that educational institutions for the purpose of students practical design education carry out collaboration with the business sector on real-life projects. Most of them have been collaborating with the business sector for more than 11 years, and the average length of those projects was from one to five months. The major percentage of institutions collaborated with production companies.

In regard to the models of cooperation with the business sector, the major percentage of the respondents (63%) said that cooperation with the external sector was initiated by their institutions, and that the most common form of implementation of these projects was through regular semester assignments (33%), workshops (29%), and student competitions with or without mentor assistance (33%). Also, 40% of them thought

that regular semester assignments were the most successful models of cooperation, and that in regard to undergraduate studies they mainly conducted that project in the third year (50%), and in respect to graduate studies they usually conducted them in the first year of study (79%). Results showed that the models of cooperation with the business sector on real life projects were not implemented into formal design curriculum in all institutions since 44% of the professors said that they were implemented, and 44% that they were not. As for the ways of organizing the working processes the most common (50%) and efficient way (60%) was that each student works individually on a single brief for the client. In regard to the multidisciplinary approach to these projects most of the respondents said that students from other disciplines were engaged on some of the projects and that they were mostly (57%) from the field of architecture. Results showed that the usual phase of the working process when the client was involved in the project was the phase of writing a brief (19%), consulting (19%) and product development activities (19%). During collaboration projects students were usually introduced to technological production processes through organized visits to the production facilities. Results also showed that students, depending on the type of the project, generally actively communicated and consulted the client and their employees during the collaboration projects, and that they usually communicated with the engineers and the business people.

In regard to the outcomes of the collaboration projects results of survey showed that project outputs come in the form of visual presentation (20%), product specification (10%), functional model (10%), prototype (20%) and brand (10%). As for the prototypes, they were usually produced by school workshop facilities (33%), by clients which financed and produced the prototype in their own production facility, (33%) or outside of their production facility (33%). Most of the professors (70%)

stated that many of the products that were the result of cooperation with the business sector are placed on the market. From professors' opinion the major areas in which the students had benefited from the collaboration projects with the business sector was the technical knowledge (60%) and obtaining references and contacts/network for further employment (20%).

Based on the results of the survey a total of 22 knowledge, skills and competencies with which Croatian Design Professors were highly satisfied can be identified, and none of them with which they were highly dissatisfied (see Table 4 below).

Table 4. Knowledge, Skills and Competencies with which Croatian Design Professors are Highly Satisfied (= 50% > of Well and Very well or Satisfied and Very satisfied statements)

Working process skills	
Research and analyses	50%
Concept development	70%
Oral and visual presentation skills	60%
Communicative skills	60%
Dublin descriptors	
Knowledge of and insight into the profession	57%
Application of knowledge and insight in to profession	50%
Communication	57%
Learning skills	57%
Design thinking and design process skills	
Analytical thinking	62%
Task clarification	86%
Concept generation	62%
Evaluation and refinement	62%
Design synthesis	50%
Design methodology	75%
Visualizing skills	
Sketching	50%
3D modeling	87%
Model making.	62%
Design management skills	
Ability to take initiative	67%
Professional attitude	
Expert behavior in dealing and handling the design problem	62%
Knowledge acquisition and managing tasks	50%
Specific knowledge	
Knowledge of history and theory of design	62%
Knowledge in sustainability	50%

With regard to all other knowledge, skills and competencies, the respondents are generally satisfied (sum of fairly, well and very well statements = 50% >).

For example, in respect to the working process skills, Croatian professors are generally satisfied with design skills, the students' capacity to grow and innovate and managerial skills. In case of the first two mentioned skills, the largest percentage of the professors are fairly satisfied, and in case of managerial competencies besides the large percentage of fairly statements (40%), there was also a large percentage of generally dissatisfied respondents. This fact indicates that there is a considerable space for the education improvement regarding this skill. As for the Dublin-competencies, professors are highly satisfied with the students regarding all those competencies, except one related to the formation of judgment, with which professors were generally satisfied.

In regard to design thinking and design process skills and abilities, only in the case of critical thinking professors are not highly, but generally satisfied with the developed ability of students regarding this issue (37.5% well and very well satisfied, 25% fairly and 37.5% dissatisfied). With respect to visualizing skills, professors are generally satisfied with students' product development and manufacturing skills. In the case of product development skills, the majority of the professors (57%) are fairly satisfied, and in case of the manufacturing skill, a large percentage of professors (43%) were generally dissatisfied.

As for design management abilities, except for the ability to take initiative with which professors were highly satisfied, professors are generally satisfied with students' abilities to communicate results, manage design action, organize work, manage people, displaying their overall skills in execution of process, and with their entrepreneurship skills. In respect to all those skills, professors fairly statements dominate in the total score of this question. Only in the case of entrepreneurship

skill professors expressed a higher level of satisfaction (43% of them well and very well, and 28.6% fairly satisfied) which is opposite from the Croatian Design Professionals' opinion, who expressed a high level of dissatisfaction with this skill. Regarding students' professional attitude, professors are only highly satisfied with students' expert behaviour in dealing with and handling of the design problem and with their knowledge acquisition and ability to manage the tasks. In regard to other attitudes and abilities, professors are fairly satisfied with students' dedication and motivation to become good designers (50%), their teamwork ability and ability to run the task smoothly (62%), with their time management ability (62%), and with students' attitude regarding responsibility for outcomes (43%). As to the professors' satisfaction with provided specific knowledge, they were generally satisfied with the students' knowledge of involvement of the design profession in the socio-economic flows, where 43% of them were fairly satisfied, and 29% were generally dissatisfied.

Regarding the questions about the conditions for internship/apprenticeship, which Croatian design high education institutions provide for design students, the results of the survey showed that internship/apprenticeship was not an obligatory part of Croatian design study programs (87% of "NO" answers), but all professors (100%) believe that internship/ apprenticeship should become an integral part of design education. In relation to the question about the best educational model for acquiring the basic design skills and competencies, 25% of them believe that the Bologna 5-year-graduate program is the best program, 25% of them thought that the best educational model is the Pre-Bologna study programme, while other 50% stated several alternative opinions such as that it should be a model which will allow a wider selection of students during the first year, then three years of teaching basic design skills, then a year or two of practice and a year or two to acquire research,

management and organizational skills. Another suggestion is that the Bologna system 3 + 2 should be extended by one year of mandatory practice. Finally, one of the professors commented that from his/her experience, one program that unites good models in which students acquire design skills and competencies simply does not exist. The professor emphasized that no educational system (either Bologna or before Bologna) provides enough working hours (or ECTS) for teaching practical skills and knowledge. Finally, the results of the survey show that 55% of the respondents are generally satisfied how design education is conducted in their institutions.

3.2 AUSTRIAN RESULTS

In Austria a total of 10 questionnaires were collected, with the response rate of 33%. In regard to gender, 70% of the respondents were male, and 30% were female. Respondents from Austria are full time and part-time/external lecturers on various design studies.

The results from the Austrian survey showed that educational institutions for the purpose of students' practical training, collaborated with external organizations, and the majority of them have conducted this kind of collaboration for more than 11 years. The average length of those projects is usually from one to five months. Regarding the type of organization with which respondents institutions usually collaborated, the majority of the respondents (50%) said that their institutions collaborated with all types of organizations; NGOs, interest organisations, private companies, production and trading companies, cultural organisations, public transport, federal government, public communities etc.

In regard to the models of cooperation with the business sector, the major percentage of the respondents (67%) said that cooperation was initiated by the external organisations/companies, and that the most common form of implementation of these projects is through student competition without mentor assistance (38%), and through regular semester assignment (38%). Most of the professors (50%) thought that students' competition is the most successful model of cooperation, and that in the case of undergraduate studies they mainly implement them in the second and third year, and in the case of graduate studies they usually did that in the first year of the study. The results showed that most institutions at which the respondents taught, implemented the mentioned models of collaboration with the external sector as part of their formal curriculum. As for ways of organizing the working process on collaboration projects, the most common (62%) and efficient way (52%) is that each student works individually on a single brief for the client. In regard to the multidisciplinary approach to these projects, most of the respondents said that students from other disciplines were engaged on some of the projects and that they came equally from the field of Engineering, Business, IT, and Art. Results showed that the usual phase of the working process when the client was involved is the project phase of writing a brief (42%), and the presentation of the final product (26%). During collaboration projects students were usually introduced to technological production processes through visual presentation (44, 4%) and through talks with clients (22%). Results also showed that students, depending from the type of the project, generally actively communicated and consulted the client and their employees during the collaboration projects, and that they usually communicated with the engineers and the business people.

In regard to the outcomes of the collaboration projects of Austrian design schools, the results of the survey showed that

project outputs mostly come in the form of visual presentation (62%). As for the prototypes, they are usually produced by school workshop facilities (67%). Half of the respondents stated that many of the products that were the result of cooperation with the business sector were placed on the market. From the professors' opinion, the major areas in which students have benefited from the collaboration projects with the business sector are ones concerning obtaining references (37%), strategic development (25%), and contacts for further employment (12%).

Based on the results of the survey, a total of 20 knowledge, skills and competencies with which Austrian Design Professors are highly satisfied can be identified, and 4 of them with which they are highly dissatisfied (See Table 5.).

Table 5.1 Knowledge, Skills and Competencies with which Austrian Design Professors are Highly Satisfied (= 50% or > of Well and Very well statement) (Satisfied and Very satisfied)

Working process skills		Visualizing skills	
Research and analyses	62%	Sketching	62%
Concept development	62%	Model making	50%
Design skills	71%		
Communicative skills	62%	Design management skills	
		Communication of results	62%
Dublin descriptors			
Knowledge of and insight		Professional attitude	
into the profession	50%	Dedication and motivation	
Application of knowledge		to be a good designer	75%
and insight	60%	Knowledge acquisition	
Formation of judgment	50%	and managing them	50%
		Teamwork and the ability	
Design thinking and		to run the task smoothly	62%
design process skills			
Analytical thinking	50%	Specific knowledge	
Task clarification	62%	Knowledge of history	
Critical thinking	62%	and theory of design	50%
Design synthesis	50%	Knowledge in sustainability	62%
Design methodology	50%		

Table 5.2 Knowledge, Skills and Competencies with which Austrian Design Professors are Highly Dissatisfied (= 50% or > of Poorly and Moderately statement) (Unsatisfied and Very unsatisfied)

Visualizing skills		Design management skills	
Product development	50%	Ability to manage people	50%
Manufacturing	50%	Entrepreneurship	50%

With regard to all other knowledge, skills and competencies, the respondents are generally satisfied (sum of fairly, well and very well statements = 50% >).

For example, Austrian Design Professors are generally satisfied with the students' managerial competencies and capacity of students to innovate and grow, but mostly on a fairly level (40% and 37% respectively). Also in respect to those two competencies there were a large percentage of professors who were more or less dissatisfied (43% and 37% respectively).

With regard to the Dublin-descriptors, Austrian professors are generally satisfied with communication and learning skills, but the largest percentage of them are fairly satisfied. In respect to design thinking and design process skills, the respondents are generally satisfied with students' evaluation and refinement, concept generation skills, in respect to which the respondents are mostly fairly satisfied. With regard to visualizing skills professors are generally satisfied with students' 3D modelling skills. As for design management abilities, professors are generally satisfied (mostly on a fairly level) with the students' ability to manage design action, their ability to take initiative, to organize work as well as with their overall skill displayed in the execution of the process.

Regarding professor's satisfaction with the students professional attitude they are generally satisfied (mostly on the fairly level) with students' expert behaviour in dealing and

handling the design problem, students' time management ability and their responsibility for the outcomes. As to the professors' satisfaction with provided specific knowledge, they were generally satisfied with the knowledge of involvement of the design profession in the socio-economic flows, where 25% of them were fairly satisfied, and 38% were generally dissatisfied.

Regarding the questions about conditions for internship/apprenticeship, which Austrian design high education institutions provide for their students, the results of the survey showed that internship/apprenticeship is an obligatory part of design study programs (71% of "YES" answers), and professors generally believe that internship/apprenticeship should become an integral part of design education. The largest number of professors (86%) stated that their institutions have alumni network. In relation to the question about the best education model for acquiring the basic design skills and competencies, 43% of them believe that the Bologna 5-year-graduate program is the best program, 14% of them thought that the best educational model is the Pre-Bologna study programme, while other 14% thought that that is the Bologna undergraduate program. The results of the survey show that 50% of the respondents are generally satisfied how design education is conducted in their institutions, 25% of them are neutral concerning this question and 25% of them are dissatisfied.

3.3 MACEDONIAN RESULTS

In Macedonia a total of 8 questionnaires were collected, with the response rate of 57%. In regard to gender, 37% of the respondents were female, and 63% were male. Respondents from Macedonia teach design at the Faculty of Art and Design in Skopje.

The results of the survey showed that the educational institutions for the purpose of students' practical design education carried out collaboration with the business sector on real-life projects. Most of them have collaborated with the business sector for more than 6 years, and the average length of those projects is from one to five months. They collaborated equally with production companies, trade companies and civil society organizations, but also with the national and local government and international organizations.

In regard to the models of cooperation with the business sector, the major percentage of the respondents (60%) said that cooperation with the external sector was initiated by their institutions, and that the most common form of implementation of these projects is through workshops (50%), and student competition with or without mentor assistance (50%). Most of the professors (50%) thought that the workshop is the most successful model of cooperation. They usually conducted these projects in the third year in the case of undergraduate study program and in the case of graduate studies in the first and the second year. Results showed that models of cooperation with the business sector on real life projects were implemented in the formal design curriculum. As for the ways of organizing the working process, the most common three ways were that a team of students worked for several different clients, a team of students worked on a single brief for a client, and that each student worked individually on a single brief for client, which from the Macedonian professors' opinion, is the most

successful way. In regard to the multidisciplinary approach to these projects, most of the respondents said that students from other disciplines were engaged on some of the projects and that they were mostly (50%) from the field of Art. Results showed that the usual phase of the working process when the client was involved in the project was the phase of product development (27%) and presentation of the final product (27%). During collaboration projects students are commonly introduced to technological production processes through visual presentation. Results also showed that students, depending on the type of project, generally actively communicated and consulted with the client and their employees during the collaboration projects, and that they usually communicated with the engineers and the business people.

In regard to the outcomes of the collaboration projects, the results of the survey showed that project outputs came in the form of visual presentation (33.3%), and prototype (33%). As for the prototypes, they are usually produced by school workshop facilities (66%). Half of the respondents stated that products that were the result of cooperation with the business sector were placed on the market and half of them stated that they were not. From professors' opinion, the major areas in which students have benefited from the collaboration projects with business sector are the technical knowledge (16.7%) market analysis (16.7) and contacts/network for further employment (33.3%). For others (33%) that are future employment and experience.

Based on the results of the survey a total of 36 knowledge, skills and competencies with which Macedonian Design Professors are highly satisfied can be identified, and 1 of them with which they are at the same time highly satisfied and dissatisfied (See Table 6. below).

Table 6. Knowledge, Skills and Competencies with which Macedonian Design Professors are Highly Satisfied (= 50% > of Well and Very well or Satisfied and Very satisfied)

Working process skills		Visualizing skills	
Research and analyses	71%	Sketching	83%
Concept development	71%	3D modeling	50%
Design skills	71%	Model making	67%
Oral and visual presentation skills	86%	Product development	83%
Communicative skills	86%	Design management skills	
The capacity to grow and innovate	57%	Communication of results	80%
		Managing design action	67%
Dublin descriptors		Ability to organize work	50%
Knowledge of and insight into the profession	50%	Overall skill displayed in execution of process	75%
Application of knowledge and insight	83%	Entrepreneurship skills.	50%
Formation of judgment	66%	Professional attitude	
Communication	66%	Expert behavior in dealing and handling the design problem	80%
Learning skills	100%	Dedication and motivation to be a good designer	80%
Design thinking and design process skills		Knowledge acquisition and managing them	80%
Analytical thinking	66%	Teamwork and the ability to run the task smoothly	60%
Task clarification	83%	Time management	60%
Concept generation	83%	Responsibility of the outcomes	60%
Evaluation and refinement	67%		
Critical thinking	67%	Specific knowledge	
Design synthesis	60%	Knowledge of history and theory of design	60%
Design methodology	83%	Knowledge in sustainability	60%

Knowledge of the involvement of the design profession in the socio-economic flows 50% Dissatisfied and 50% of Satisfied respondents

With regard to all other knowledge, skills and competencies, the respondents are generally satisfied (sum of fairly, well and very well statements =50% >).

For example Macedonian professors are highly satisfied with all visualizing skills (on average above 71% of well and very well statements), except for manufacturing skills where

the level of their satisfaction was a bit lower, since 33% said that they are fairly satisfied, 33.3% were generally satisfied and 33.3% were generally dissatisfied. With respect to design management abilities, professors are highly satisfied with all skills (on average 64% of well and very well statements) except for the ability to take initiative and the ability to manage people, where the largest percentage of them were fairly satisfied (50% and 60% respectively).

As to the professors' satisfaction with the provided specific knowledge in relation to knowledge of history and theory of design, knowledge of sustainability, and knowledge of involvement of the design profession in the socio-economic flows, results showed that the professors are highly satisfied with the level of students' knowledge of history and theory of design (60% of well and very well statements) with knowledge of sustainability (60% of well and very well statements) and with the knowledge of involvement of the design profession in the socio-economic flows (50% of well and very well statements). But, at the same time in the case of knowledge and history of design, 40% of the professors were poorly satisfied and in the case of knowledge of involvement of the design profession in the socio-economic flows, 50% of them were moderately satisfied.

Regarding the questions about the conditions for internship/apprenticeship, which the design education institutions provide for design students, the results of the survey showed that in Macedonia the internship/apprenticeship is an obligatory part of the design study programs (83% of "YES" answers), and that all professors (100%) believe that internship/ apprenticeship should become an integral part of the design education. In relation to the question about the best educational model for acquiring the basic design skills and competencies, 50% of them believe that the Bologna 5-year-graduate program is the best program, 33% of them thought that the best educational

model is the Pre-Bologna study program, while other 27% did not have any opinion. Results of the survey show that 50% of the respondents are generally satisfied how design education is conducted in their institutions.

4 FOCUS GROUP RESULTS

4.1 DESIGN PROFESSIONALS' FOCUS GROUPS

CROATIA

The Focus group (7 participants) was conducted with participants from the field of product design, with less than 10 years of professional experience, ranging from 23 to 33 years of age. Most of the participants had finished their studies at the Department of Product Design at the School of Design, Faculty of Architecture in Zagreb, with an exception of one participant who had studied product design in Sarajevo (Bosnia), one who had upgraded her skills during an MA course in interior design at the University College of Arts, Crafts and Design – Konstfack in Sweden, and one who is still studying product design at the School of Design, Zagreb.

Since there is a big deficiency in the production industry ever since the beginning of the 90s when the industry in Croatia started to deteriorate due to the general political crisis, most of the designers in Croatia are now working for bigger production companies abroad, smaller SMEs and artisans in Croatia, or they are starting their own business following the major overall cultural trend of designers-makers, who are at the same time designing, developing, producing, distributing and selling their own designs. The Focus group was initially chosen according to these versatile criteria.

This last group of designers-makers is specifically interesting, since they can serve as a showcase of what really is

missing in today's design education, if the current cultural context requires this shift. In that respect, what is missing is the knowledge regarding financial performance, marketing, and knowledge of intellectual property, product development and market placement. Most of the designers belonging to this new cast therefore have a lot of problems because they tend to commit to understand this type of knowledge, thus wasting their precious resources for creativity and innovation. In their own opinion, this problem could be overcome by introducing courses in design management and design production, but also during the studies by assigning program coordinators to bridge the communication between students and producers, which they find a great difficulty once they finish their studies. Those challenges in regards to real life projects should be somehow integrated into the design studies, also through obligatory internships, field work, workshops and competitions, which imply that it would be necessary to establish a network of companies willing to collaborate with schools on that level. Participants of the focus group admit that altogether, part of the problem also lies in students that are often not ambitious and motivated.

The major problem they face through the process of establishing their own brands is co-financing and distribution. In this respect, it would be useful to access that type of information together with skills in writing EU funded projects and education, in making business plans, market analyses and legal help, for instance in creating contracts or forming prices for the design product, through organizations such as the Croatian Designers' Association. It is also indicated that this knowledge was to some extent provided during the studies, but was only mastered through practice.

At the same time, almost all participants are quite satisfied with the level of knowledge that was provided to them during their studies in terms of broader design knowledge,

especially design methodology and design thinking – which on the contrary, is not needed or yet recognized by Croatian companies. In that respect it is needed to provide education for the production sector, in terms of benefits they could gain through implementation of design into their business strategies – for example through better promotion of design through design exhibitions, especially the ones organized by design schools, and gatherings of designers and the business sector. This, together with the fact that the production industry is technologically out-dated is one of the reasons Croatian designers are oriented towards foreign markets. A part of the problem lies in the fact that the clients often underestimate designers, and thus are not open to new ideas. This is why our schools should equip designers with knowledge on how to educate the clients during the working process.

Specific types of knowledge, such as design research is still evaluated as useless only because it is not easily evaluated in terms of money or profit, whereas, other design disciplines, aside from product design and visual communication, such as the critical design, or design fiction mostly do not find their way outside the very narrow design circles. Socially engaged design is not being supported either by companies, or public bodies.

Participants of the focus group all agree that the future of design does not only lay in the advanced technologies, but on the contrary, it is in the good balance between old techniques, still very accessible in the Croatian context (mainly artisans) and smart implementation of new technologies. Crowd funding platforms are indicated as good opportunities for exercising the design practice. The question and role of the designer as a provider of knowledge in creation of bigger systems, and not only as a facilitator of the production industries was mentioned as one of the key elements in understanding the role of the designer for the future.

AUSTRIA

Participants of the Austrian Focus group were 16 young Design Professionals at the age of 19 – 30 years old with an Austrian degree from either "die graphische", "die angewandte" or "FH Joanneum".

Strengthening individuality and individual approaches to the design profession is an important factor and recommendation of designers regarding the success of their carriers. From their perspective, the approach that designers are only responsible for sensitizing entrepreneurs to the usage of strategic design management is problematic. They believe that educational institutions should take the role of a communicator between advantages of Business Management for design students and vice versa. Also, they see *Innovation* as a crucial factor in the survival of design practice in the future.

On the question how they articulate their contribution as a professional designer to their client, they said that they usually do that through portfolios and reference projects. Moreover, sketches deriving from an analytical examination with the briefing of a company are part of communicating the specific contribution of designers.

In regard to the final stage of the design process a fit-to-the market realization of a product or a service is seen as successful completion of the design process. With regard to their main contributions as a professional designers to sustainable design, the market research based concepts were named as crucial starting points in the design process, more specifically the profound trend research regarding: environmental friendly necessities and customer-orientation. In regard to their knowing of the relevant technological innovations relevant for their professional work, they stated that they gain information through networking and further education, through various platforms and channels with specific topic. They also do that through international seminars, webinars, conferences, journal

studies, market research results, comparison and observation of similar relevant design positions of others through online and offline channels. Travelling and constant interest in developments were also mentioned as crucial in their forthcoming as design professionals.

MACEDONIA

Participants of the Macedonian Focus group were 10 Design Professionals between 23 and 30 years of age. They had graduated on different faculties of design: interior design, industrial design and fashion, by attending 4 years studies, all of them in Macedonia. None of them had a Master degree in design. They had graduated at the Faculty of Arts and Design at the European University Skopje (a private institution) and the Faculty of Mechanical Engineering Skopje (a state institution). Currently they are engaged as product designers and graphic designers (a project base) and produce different products, such as furniture, lighting, accessories and even fashion items.

On the question of their usual projects for enterprises they said that when they are engaged by a company it mainly goes to packaging and not to design in general and that companies prefer to get a designer only in the final process of production (make up). When they are engaged by an advertising agency they usually do branding of food and beverages industry products as well as application of graphic design on textile and accessories such as T-shirts, caps, etc.

As the main gap in their education, designers openly admit that they miss technical knowledge and sources where and how to find information about materials and techniques. The second problem they point out is that they have very little knowledge of the economy and business. They stated that all design educational institutions in the country lack technical knowledge and acquired practical skills. This is the opinion of all the interviewed designers. From their point of view, the

design curriculum is too much theory-based. Practical skills throughout real time projects are seldom developed. From the interviews it can be concluded that designers in general have basic knowledge and understanding of the business terminology after their graduation, but besides the basic terminology (supply, demand, account, costs, and cost calculation) they are not familiar with the more complex economic terms. Also, one more thing which can be concluded is that during their education they have never learned how to make presentation and how to make and organize their portfolio. Also, they have never studied negotiation techniques and even less – project management. But, all of them think that these skills are of a paramount importance for their professional work. Some of the designers have gained those skills after their studies on their own work and projects or in the company where they are employed. In terms of getting a brief from the client, designers consider the briefs from the advertising agencies the most precise and clear ones. The briefs from the production companies are not clear and even the managers do not know to explain properly what they need in terms of design/request. Institutions do not provide clear briefs as well. Designers have to make several meetings in order to understand the real assignment. The conclusion of Macedonian designers is that all project or work partners need to better educate each other in order to achieve more productive communication.

4.2. DESIGN PROFESSORS' FOCUS GROUPS

CROATIA

The Focus group consisted of 10 professors from different design educational institutions in Croatia. The majority of participants teach or were at some point involved into teaching product design at The School of Design, Faculty

of Architecture in Zagreb. One participant teaches design to students with primary focus on wood technology at the Faculty of Forestry in Zagreb, two of them are retired – one from the Faculty of Textile Technology in Zagreb, and one from the Faculty of Architecture in Zagreb. Two participants used to teach at the Academy of Applied Arts in Rijeka – one product design, and the other – fashion design. One person with a background in design and economy teaches marketing at the Zagreb School of Business and VERN' University of Applies Sciences.

Although quite versatile, all the participants in the group have addressed several major problems in regards to design education and education in Croatia in general. Namely, the so called implementation of the Bologna process, which happened forcefully, and especially in the design curricula simply was not financially supported by the government in such a way that the programs could be advanced, but on the contrary, the existing programs were just extended to one additional year according to administrative demands, without an added value between undergraduate and graduate studies. The other problem in regards to implementation of the Bologna process is its bureaucratic nature, which does not allow a lot of changes on yearly bases, which is not in accordance with today's society and the changing nature of design that needs a constant redefinition.

Another problem obstructing the nature of the design education, especially at The School of Design (where departments of product design and visual communication were established in 1989 within an interdisciplinary environment), is a legislative demand on the university level to diminish the number of external expert teachers, thus creating a situation where it is very hard to keep the level of quality in each course, given the fact that all the teachers have to be full time employed. During the meeting it was indicated that in general, design schools lack professionals from other specialist disciplines, who are able to transit their knowledge to designers. Concretely,

there is a lack of personnel to adequately teach marketing and design management at The School of Design.

Concerning practice based learning professors emphasized that there is no consensus in establishing the culture of internship in Croatia, which is one of the crucial imperatives for educating designers to be able to react to their immediate environment. Even if internships became part of the study program, it would still mean that there are very few subjects from the business sphere that would be able and willing to carry them with the students. On the governmental level there is no such program that would support a 6-month internship (in terms of subventions for the companies, like it is the case in many other western countries).

In general, there are many examples of successful integration of collaboration with the real life sector, especially at the oldest school of design in Croatia – The Faculty of Textile Technology, but also at The School of Design, within the department of product design. However, the working environments, especially clients in the production sphere still do not understand design processes. Design is still perceived as an exclusive discipline. This is why it is still hard to collaborate with the few subjects from the production sphere. One of the goals, however, through this collaborative practical semester assignments is to establish a network, or so to call a map of the production sector which would be willing to collaborate with designers, and possibly conduct internships.

There are a very few companies in Croatia that seek to consult designers in the process of creation and development of their products, and even fewer of those who do it continuously. The discussion resulted with a conclusion that there is an obvious need to work on educating clients-companies so they could understand what can be obtained with the help of a designer.

When speaking of the market, one of the participants noted that the purpose of design schools are not here to make perfect workers but to develop design thinking, alongside with development of design knowledge and competencies. During 3 years of undergraduate studies it is very hard to acquire all the necessary knowledge. On the other hand graduate studies offer a theoretical framework, which in the end results with the fact that about 60% of the students work in parallel to their studies, and sometimes, paradoxically, because of that they are not fully able to fulfil their obligations at school.

In general it seems that everyone agreed that what design practice lacks for several reasons is the following: a highly bureaucratic system from the previous state, additionally upgraded with an even more complicated system which discourages people from starting their own businesses, general lack of understanding of design in culture, and its potential benefits for the business environment, and general absence of design in curricula of elementary and high schools and state strategic documents.

In terms of future visions, Croatian Design Professors believe that it is necessary for design education in Croatia to enable the wider scope of different possibilities – for instance, so much lacking research in design. It is also very important to finally start observing the design discipline integrally, outside of the isolated categories of product and graphic design. During the talk Professors underlined several times that it is more important to educate design thinkers that can understand their environment and the context – especially due to the fact that the design discipline in terms we know it today will probably disappear very soon.

AUSTRIA

The Austrian Focus group consisted of 8 full time professors at design universities as well as external lecturers who also work as designers respectively as entrepreneurs in profit-orientated companies. The latter shared experiences of both, running companies and teaching students.

Strengthening individuality and individual approaches to the design profession is an important factor and recommendation of Austrian professors regarding successful designers' careers. In regard to Professors' opinion about the biggest challenge for the design sector/design education in the next 10–15 years, they stated that they are aware that the role of design is seen as a key economic issue and that the Design Management makes a commercial imperative as enabler of companies and nations. They believe that an effective cross-border design policy on a European scale must be implemented and consequently developed and promoted in order to ensure long-term competitive capability of SMEs as well as freelance designers. Also they agree that design schools bear the responsibility to communicate the core values of a strategic design management and need to support entrepreneurial thinking. This combination was discussed to which extent this may be a strategic approach to sustainable establishment of designers' contribution to economic growth. Furthermore the argument was brought forward that entrepreneurial thinking goes hand in hand with design thinking when it comes to identifying demands in the beginning to develop product and service solution. It was agreed by all participants that a customer-centred approach is a key ability of successful entrepreneurship.

Helping intensifying the individual independence and originality of students is seen as a key trend for Design Professors. The trend of massiveness of the design education is recognized in regard to issue that the large number of design graduates need to find their niche for the professional practice.

They emphasized the questions that should be kept in mind:

— How big is the popularity of Economic Studies in design curricula among students?
— How can design students get inspired by Business Management?
— What kind of approach to Economic Studies can design students be provided in order to understand the needs of the business sector?
— What role does design take on within the aspects of technological development, marketing objectives and production scale/economy of scope?

MACEDONIA

The Macedonian Focus group consisted of 9 professors from The European University Skopje. There are 8 professors from The Faculty of Art and Design, accompanied by 1 professor from The Faculty of Economic Studies. At the beginning, the professors stated that teaching product design without a workshop space is like training basketball without a ball and they see this as one of the biggest problems why designers lack technical skills and knowledge. The second problem that was mentioned is that in their programme there are not any subjects of economy. The designers (graduated students) should have basic knowledge of economy and business in order to be successful.

This Focus group has answered the main questions providing the following answers:

General / global knowledge and utilization of information is essential in order to survive as designer today and even more in the future. If a designer has a general overall knowledge he/she can easily be positioned on the market and can always find an industry to apply his/her knowledge to. "Think globally, act locally" – should be the motto of each designer.

Professors said that IKEA sells brain/innovation; they do not sell timber to the customers. Therefore it is important for each designer of today and tomorrow to be a kind of a "Balthazar" – an innovator. Only by linking their thinking to particular industries and solving particular problems it is possible to survive. The design education should also be formulated in a way to stimulate innovation and not just aesthetics, especially bad aesthetics.

Interdisciplinary cooperation in terms of education has not provided the desired results. In practice cooperation is not possible because each institution pulls the strings towards their position, regardless the sector they represent.

Development of design in the future goes in the direction of the digital. Within few decades there will be less material used for all objects we will have. All products will become digital or will be integrated in the human body. Minimal form and functions will be dominant. Design will be imaginary.

Digital revolution from 90s has made significant changes in terms of design. Currently there is a huge gap between design, technology and techniques on the other side. Each day this gap becomes bigger and bigger. Design will exist only until we function in a material world.

Design education will collapse if it is not able to follow the trends and development of technology.

4.3 BUSINESS ACTORS' FOCUS GROUPS

CROATIA

The Focus group consisted of various profiles of representatives (8) of the companies that share a common interest in design and benefit from the implementation of design on different levels, out of which: 1 representative of a marketing agency, 5 representatives of SMEs with a focus on furniture design and development, 1 representative of a big producer, 1 director of a small publishing company.

The participants all agreed that in Croatia, the biggest problem in regards to implementation of design into businesses lies in the fact that the business sector is altogether undereducated on those terms. Businesses are not aware of the benefits of the implementation of design into their strategies, which is also indicative of Croatian social context that still has not developed the culture of design. The prevailing paradigm among the entrepreneurs and especially microenterprises is still the lower price, rather than the good design – which means that design is considered to be a cost rather than an investment. One of the reasons is the fact that design is also not embedded into Croatian national policies, or recognized as an important tool in strategic cultural and economic documents of Croatian public institutions and bodies. Therefore, it was concluded that it is especially needed for design faculties to educate newcomers that will also be able to educate their direct environment about the importance of design in a broader socio-economic context, especially their clients, who often do not really know what they need in terms of design.

This discussion led to the observation that the designer-client communication is still one of the biggest problems in conducting the cooperation with designers, from the business perspective. One of the participants concluded that this lies in the fact that designers are oriented towards themselves, tend to observe design outside of the economic context, and very often have vanity problems. Also, it was indicated that designers lack knowledge in contemporary technologies, and technological processes altogether. One of the participants mentioned that, when hiring a designer, she expects to hire a specialist. Instead, it usually happens so that she needs to invest in educating a

designer first, before he/she learns about the processes.

Most of the participants also agreed that in general, when developing new products that serve for companies' promotion, they prefer to hire older designers, "with an established name" and with more experience as external experts, then to leave those tasks to in-house designers.

Marketing, business knowledge, communication and presentation skills, design thinking, brand development, product distribution, time management, entrepreneurial psychology and team work were indicated during the talk as necessary skills that designers should have in today's society. Those skills and competencies were integrated into the newly formed curriculum of the VERN' University of Applies Sciences, which is currently in the process of forming a specialist educational program about Entrepreneurship in Design, as emphasized by one of the participants.

All the participants have agreed that designers, upon leaving the design school, lack practice and understanding of entrepreneurship skills, and that they need additional training in order to understand the ways in which this world is functioning. It was also mentioned that they understand that part of the problem lies in the fact that those skills and knowledge were not transferred to designers during their studies in a structured and understandable way. A need for organized events as meeting points for designers and entrepreneurs, in terms of conferences, exhibitions and meetings, was indicated as a recommendation for the improvement of the communication between the design and the business sector.

AUSTRIA

The Austrian Focus group consisted of 6 Business Actors. They are managing directors and co-directors of Austrian based companies who are both nationally and internationally orientated in their sales. In their SMEs approx. 7–50 people are

employed. They have a high design affinity in common. The objectives of the focus group interviews were to find out their opinion on the topic of what are the expected competencies of designers and what is a good design.

On the question if they knew how and in what way design can improve their business activities, they answered that they believed that it can be done through improvement of product development, improvement of business communication, through using design as a tool for creating a unique selling proposition. The Business Actors also believe that innovation is crucial for staying competitive and design is crucial for creating innovation, and that designers should contribute to optimizing production by finding economical and saving processes of production. Austrian entrepreneurs put emphasis on the importance of energy saving and the urgent need of rethinking in the usage of non-renewable resources. During international business cooperation some of the participating (design) managers had the assumption that design from Austria is of high quality and imparts a prestigious brand image. This is perceived by the business representatives as a chance for designers to introduce economically friendly processes and products to a larger international audience and reinforce the necessity of an eco-friendly turn in the production business practice.

On the question: What kind of competencies and skills can improve collaboration and communication between designers and the business sector? – the Business Actors said that leading managers tend to be rather sceptical in cooperating with external designers and prefer working with internal personnel. This has three reasons: 1) Trade and company secrets shall stay strictly confidential within the company. Internal staff is perceived as more loyal and more confidential towards trade secrets; 2) Internal (design) staff is also seen as more committed to the company since their engagement with the other co-workers with the business culture is more frequent and more intense;

3) Marketing and managerial understanding is seen as a key factor for a successful cooperation between designers and (or in) small and medium enterprises. Instruments like customer research, personas and target group research, the creation and continuous use and development of customer demands analysis and a professional access to fact proven insights in consumerism are not necessary to be surveyed by the designers, but the necessity of the understanding and learning from this data is approved. The higher the consciousness of the value of design and its importance of being incorporated in all relevant fields, the closer respectively the more frequent is the cooperation with the (same) designers.

On the question if they have ever had a bad experience in their cooperation with their designers, they replied that bad experience with co-workers or employees (external or internal staff) usually comes from similar reasons and are regardless of the profession itself. The ability to see and communicate tasks in the holistic, solution-orientated perspective is crucial. Discrepancies are seen as decelerating and annoying. In general, business people prefer team-oriented people. In a functioning team, individual characters, skills and preferences should be well-balanced and enrich the whole design process from the analytical phase to the final outcomes and evaluations. They do not perceive a slow work style as negative thing per se, but for business managers the ability of designers to adapt in speed and efficiency according to the task is an important factor. They perceive as negative the designers' lack in practical experience, and they believe that designers should be able to create a prototype themselves and be sensitive towards potential weaknesses in order to eliminate them. Business managers think that the shift in the designers' focus from what does the company wants to what does the company's customers need is necessary.

They said that managers prefer self-reliant employees who can work independently as well as in a team when needed.

Customer-orientation will be an important characteristic in the future as well as the ability to think in business terms in order to support the mutual understanding across the departments of a company. This ability applies generally for all employers but is expected of designers in particular. Internally employed staff is preferred because of confidentiality. So called soft-skills are seen as crucial. Customers make decisions to a large percentage because of sympathy and less because of references which can help young designers at the beginning.

They suggested re-asking the question of what kind of access and which detailed information can be provided to entrepreneurs that help them to better apply strategic design management as a catalyst for innovation and successful entrepreneurship.

MACEDONIA

The Business Actors interviewed in the Macedonian Focus group come from production companies (furniture and light metal processing companies) and advertising agencies. Officially, advertising agencies are the biggest design sector employer and they prefer graphic and product design graduates. In general production companies have 1 or 2 designers employed. The average number of employees for production (furniture and light metal processing) companies is 50. The average number of employees for advertising agencies is 15. The companies are focused on production of series of furniture. In this group there are companies whose production is consisted of wood products (tables, chairs, closers, coffee tables etc.) soft furniture (sofas, beds, stools, etc.) and metal parts or entire made out of steel. Most of them achieve direct sales via their showrooms and via distributors abroad.

Production companies are export oriented and the export counts for over 50% of the total annual turnover.

From the point of view of the business sector, the biggest challenge of the design sector and design education is seen in terms:

— Technological development and information is the biggest challenge of the 21st century.
— Crises and rapid changes in terms of economy influence and will in the future influence design thinking. There is no visible investment in research and development due to uncertainty.
— The market saturation is obvious. Every day we just see promotion of useless well-polished products, named under certain brand. These products have absolutely no value. We should be ready to see more of this stupidity on the market, but that is wrong.
— The design has to come back to its primary role, problem solving and not aesthetics.

5 COMPARATIVE ANALYSIS OF RESEARCH ON KEY STAKEHOLDERS' PERSPECTIVES

Considering that the main purpose of this research is to obtain Design Professionals, Design Scholars and Business Actors' opinion on the quality and relevancy of knowledge, skills and competence which design students acquire during their formal higher education, and thus indirectly detect the potential mismatch between the skills acquired in formal design education and skills needed in design current and future practice, comparative analysis is conducted on four levels: comparison of the Design Professionals Surveys and Focus groups from all three countries; comparison of the Design Professors Survey and Focus groups from all three countries; comparison of Business Actors Focus groups from all three countries; comparison of the results of the overall research.

5.1 DESIGN PROFESSIONALS: COMPARISON OF SURVEY AND FOCUS GROUP RESULTS

From the comparison of the results of Design Professionals' questionnaires from all three countries Croatia (HR), Austria (AT), and Macedonia (MK), the first thing concluded is that the Croatian designers in comparison with their colleagues from Austria and Macedonia are the most satisfied with their acquired skills and competencies. On the basis of the results from Croatian questionnaires, a total of 21 knowledge, skills

and competencies were identified as the ones with which Croatian designers are highly satisfied (= 50% > of well and very well statements). Compared to the Croatian, Austrian designers are highly satisfied with 11 skills and competencies and Macedonian designers with 17. Furthermore, in comparison with their colleagues from Austria and Macedonia, Croatian designers are highly dissatisfied with the smallest number of skills and competencies, with 5 of them, while Austrian and Macedonian designers are highly dissatisfied with 6 skills and competencies.

The results from the surveys indicate that there exists common knowledge, skills, competencies and abilities with which Design Professionals in all three countries are highly satisfied or dissatisfied. One with which they are all highly satisfied (on average 63% of the respondents from all three countries), are the ones related to 4 following design thinking skills: analytical thinking, task clarification, concept generation, and critical thinking skills and one related to professional attitude in respect to ability to acquire knowledge and manage the task (See Table 7).

Table 7. Common Knowledge, Skills and Competencies with which Design Professionals from all three countries are Highly Satisfied (= 50% > of Well and Very well statements (Satisfied and Very satisfied))

Design thinking and design process skills	HR	AT	MK
Analytical thinking	78%	70%	59%
Task clarification	78%	57%	54%
Concept generation	75%	52%	55%
Critical thinking	66%	62%	54%
Acquired professional attitude			
Knowledge acquisition and managing them	65%	53%	54%

The results of the surveys show that as for knowledge, competencies and skills with which designers from all three countries are equally highly dissatisfied are the ones related to 3 management abilities: managerial competencies, ability to manage people and entrepreneurship skills (See Table 8).

Table 8. Common Knowledge, Skills and Competencies with which Design Professionals from all three countries are Highly Dissatisfied (= 50% > of Poorly and Moderately statement (Unsatisfied and Very unsatisfied))

Managerial abilities	HR	AT	MK
Managerial competencies	69%	61%	59%
Ability to manage people	62%	63%	52%
Entrepreneurship skills	65%	68%	58%

As for the level of satisfaction with other knowledge, skills and competencies, the results of the surveys show that in all three countries designers are generally satisfied with them (a sum of fairly, well and very well statements equal or above 50% (= 50% >). This does not mean that among these skills and competencies, there is no room for improvement, given that for a large number of them in the framework of the general level of satisfaction, "fairly" statements prevail.

For example, in relation to the working process skills, there is space for improvement of the communication skills in all three countries, considering that in relation to the mentioned skills, a large percentage of designers in all three countries stated that they are more or less dissatisfied. In Austria and Macedonia, there is also a need for improvement of the ability to innovate and grow, particularly in Austria where significant percentage of the respondents stated that they are more or less dissatisfied (48%).

With regard to the Dublin descriptors, there is space for improvement in Macedonia in relation to application of knowledge and insight into a broader or multidisciplinary context and formation of judgement.

In case of design thinking and design process skills there is a need for improvement in Austria regarding the evaluation and refinement, and design synthesis skills where considerable percentage of respondents are dissatisfied (39%, and 43% respectively). Austrian design education institutions should particularly pay attention to design methodology skills, since only Austrian designers are highly dissatisfied with this skill (57% generally dissatisfied respondents).

With regard to visualizing skills, the results of the Austrian and Croatian surveys show that there is a considerable room for improvement of product development skills since there are a high percentage of designers who are generally dissatisfied with those acquired skills, 37% and 40% of them respectively. Furthermore, in Austria there is space for improvement in training in relation to modelling (45% generally dissatisfied), and particularly in 3D modelling where the total percentage of dissatisfied respondents is 60%. Also design education institutions in Croatia should improve their training in 3D modelling, since 50% of respondents answered that they are more or less dissatisfied with this skill.

As for the design management skills, results indicate that in all three countries education institutions should pay much bigger attention considering training those skills, since the largest number of skills with which designers are highly dissatisfied or fairly satisfied belongs to this group of skills and competencies.

Regarding the professional attitude, Austria should improve design students' training in time management since 60% of the Austrian designers are highly dissatisfied with this skill.

As for the specific knowledge that designers acquired through the education process, results show that in Austria there is room for improvement in knowledge of history and theory of design since 39% of respondents are more or less dissatisfied with the acquired knowledge in this field. Also, in Croatia and Austria design education institutions should improve students' knowledge in sustainability, particularly in Austria where 56% of former design students are generally dissatisfied (34% in Croatia). With regard to the knowledge of involvement of the design profession in the socio-economic flows, in Croatia and Macedonia there is a necessity for enhancement of the students' knowledge in this field (Croatia 44%, Macedonia 39% of generally dissatisfied respondents).

As for the preparation for a professional career, results from all three surveys indicate that only Macedonian former design students are generally dissatisfied with all listed issues (on average 55% of the respondents are generally dissatisfied). This should be an important indicator for Macedonian design education institutions for improvement in this matter.

Respondents from surveys in all countries strongly believe that additional competencies should have been taught in school. Also Design Professionals from all three countries strongly believe that internship/apprenticeship is generally useful for a professional career and that it should become an integral part of the design education. Results of the surveys shows that only in Croatia, the majority of respondents (84%) did not have internship/apprenticeship activities as an obligatory part of their study program. This represents important information that Croatian design education institutions should seriously consider changing. The highest percentage of respondents in all three countries considers the Bologna graduate five-year-program to be the best model for acquiring the basic design skills and competencies. Finally, the results of the surveys

indicate that in all three countries Design Professionals as former students are generally satisfied with their education, particularly in terms of broader design knowledge, especially the design thinking and design process knowledge and skills.

MAIN CONCLUSIONS FROM THE DESIGN PROFESSIONALS' FOCUS GROUPS

Several main conclusions can be drawn. The first conclusion, according to the information generated from the Designers' Focus groups is that designers are generally satisfied with the level of knowledge they were provided with, during their studies in terms of broader design knowledge, especially design methodology and design thinking knowledge and skills.

In regard to knowledge skills and competencies for which designers think that are necessary but not provided through their formal education, Croatian designers stated that these concern knowledge regarding financial performance, marketing, knowledge of intellectual property, product development and placement on the market, design management, design production, information and skills in writing EU funded projects, business plans and market analyses and information about legal help. Macedonian designers stated that they lack technical knowledge and resources, information about materials and techniques, knowledge of economy and business, presentational skills in terms of organization of their own portfolios, knowledge in negotiation techniques and project management.

In regard to the practical aspect of education, all of the designers think that practical education should gain much bigger space in formal design education. Therefore formal design education should pay more attention to technical knowledge and practical skills.

Strengthening the collaboration with the business sector and all other stakeholders is important for all interviewed designers. They all believe that educational institutions should

take the role of a facilitator between the two sectors in conveying the advantages of exposure to business management topics to the students of design. Or in other words, the designers, the business sector and other stakeholders need to learn each other's *languages* in order to achieve more productive communication.

Specific types of knowledge, such as design research, critical design, design fiction, socially engaged design, exist in very narrow design circles. Since professional designers contribute to sustainable design, their knowledge is crucial in the entire design process. However, their knowledge should include profound market research in order to understand and accept market-based concepts including customer-orientation and environmental requirements.

Future challenges. Participants of the Croatian focus group all agree that the future of design does not only lie in the advanced technologies, but on the contrary, in a good balance between old techniques, and smart implementation of new technologies. For the Croatian designers the question and the role of the designer as a provider of knowledge in creation of more complex tasks, and not only that of a facilitator of the production industries, was mentioned as one of the key elements in understanding the role of the designer for the future. Austrian designers see innovation as a crucial factor in the survival of design practice in the future. Also they see travelling, following technological innovations and a constant interest in development as crucial in their forthcoming as design professionals.

5.2. DESIGN PROFESSORS: COMPARISON OF SURVEY AND FOCUS GROUP RESULTS

Comparing results from Design Professors' surveys the conclusion can be made that Macedonian professors seem to be most satisfied with the knowledge, skills and competencies that they provide to their design students. On the basis of the results from Macedonian Design Professors' questionnaire, a total of 36 knowledge, skills and competencies are identified as ones with which Macedonian professors are highly satisfied (= 50% > of well and very well statements). In comparison, Croatian professors are highly satisfied with 22 skills and competencies and Austrian professors with 20.

Comparing the results of all three countries, 14 common types of knowledge, skills and competencies with which Design Professors from all three countries are highly satisfied were identified. (See Table 9.)

As for knowledge, competencies and skills with which Design Professors from all three countries are equally highly dissatisfied, the results of the surveys show that there is no such situation, as it was in case of the results of Design Professionals' surveys. In fact, only in case of Austria, professors are highly dissatisfied with skills in relation to product development, manufacturing, ability to manage people and entrepreneurship (= 50% > of poor and moderate statements).

As for the level of satisfaction with other knowledge skills and competencies, the results of the surveys show that in all three countries Design Professors are generally satisfied (the sum of fair, well and very well statements are equal or above 50% (=50% >). But, this does not mean that there is no room for improvement of these skills in all three countries.

Table 9. Common Knowledge, Skills and Competencies with which Design Professors from all three countries are Highly Satisfied (= 50% or > of Well and Very well statement (Satisfied and Very satisfied) %)

	HR	AT	MK
Working process skills			
Research and analysis	50%	62%	71%
Concept development	70%	63%	71%
Communicative skills	60%	62%	86%
Dublin descriptors			
Knowledge of and insight into the profession	57%	50%	50%
Application of knowledge and insight	50%	60%	83%
Design thinking and design process skills			
Analytical thinking	62%	50%	67%
Task clarification	86%	62%	83%
Design synthesis	50%	50%	60%
Design methodology	75%	50%	83%
Visualizing skills			
Sketching	50%	62%	83%
Model making	62%	50%	67%
Acquired professional attitude			
Knowledge acquisition and managing them	50%	50%	80%
Specific knowledge			
Knowledge of history and theory of design	62%	50%	60%
Knowledge in sustainability	50%	62%	60%

For example in respect to the group of working process skills, results show that the largest percentage of the Croatian professors (40%) are fairly satisfied with their students design skills, unlike their colleagues in Austria and Macedonia. There is also a need for improvement of the students' capacity to grow and innovate especially in Croatia and Austria since they have a large percentage of fairly satisfied respondents concerning this skill. As for managerial competencies, the largest percentages of respondents in all three countries are fairly satisfied.

With regard to the Dublin descriptors, only Croatian professors, unlike their Austrian and Macedonian colleagues, are not highly, but fairly satisfied with students' formation of judgement ability. On the other hand, in the case of communication and long-life learning abilities, only the Austrian professors are not highly, but fairly satisfied with students in respect to those abilities.

In respect to design thinking and design process skills in Austria, there is a need for improvement of the evaluation and refinement skills, given that 50% of professors stated that they are fairly satisfied with students in relation to this skill. In Croatia there is a need for improvement of the critical thinking skills since 38% of the professors stated that they are fairly satisfied with students in relation to this skill and 13% are dissatisfied.

With regard to visualizing skills the results from the Austrian and Croatian surveys show that there is considerable room for improvement of product development skills since in Croatia 57% of the respondents are fairly satisfied and in Austria 50% of them are highly dissatisfied with students regarding this skill. Furthermore, results show that in all three countries there is considerable room for improvement of manufacturing skills, since 43% of Croatian and 33% of Macedonian respondents are fairly satisfied, and 50% of Austrian respondents are generally dissatisfied.

As for the design management skills in relation to the ability to manage people, there is also significant room for improvement in all three countries, particularly in Austria where professors are highly dissatisfied with this students' ability. In regard to ability of the students to communicate their results, and ability to manage design action, results show that in Croatia, design institutions should pay more attention in relation to these abilities, since 43% of the professors stated that they are fairly satisfied with those two skills. As for the ability

to take initiative, results show that only Croatian professors are highly satisfied, while Austrian (37%) and Macedonian professors are mostly fairly satisfied. Also, for Croatian and Austrian design education institutions there is a necessity for enhancement of the students' ability to organize work, since a large percentage of respondents in those two countries are fairly satisfied (71% and 42% respectively). In regard to students' ability to display overall skills in execution of design process, only Macedonian professors are highly satisfied. Particularly, Croatian design schools should pay more attention to the students training in respect to this ability (83% of fairly satisfied respondents). As for entrepreneurship skills only the Austrian professors are highly dissatisfied.

Regarding the professional attitude that students obtain through their formal education, the results show that in regard to expert behaviour in dealing and handling the design problem, only Austrian professors are not highly satisfied, while only Croatian professors are not highly satisfied with students' dedication and motivation to become good designers (50% of fairly satisfied statement). Only Croatian professors are not highly satisfied with students' ability to work in teams and their ability to run the task smoothly (62% of "fairly" statements). Also Croatian and Austrian professors are fairly satisfied with students' time management ability.

As for the specific knowledge that designers acquired through the education process, results show that in regard to the knowledge of involvement of the design profession in the socio-economic flows, there is a necessity, in all three countries, for enhancement of the students' knowledge in this field (Croatia 43% fairly satisfied, Macedonia 50% fairly satisfied, Austria 25% fairly satisfied and 37% dissatisfied).

Regarding the questions about Design Schools' conditions for internship/apprenticeship, professors from all three countries strongly believe that internship/apprenticeship is

generally useful for the professional career of design students and that it should be an integral part of the design education. Results of the surveys show that only in Croatia design schools do not have internship/apprenticeship activities as obligatory part of the study program. This represents important information which Croatian Design Education Institutions should seriously consider changing. In Austria and Macedonia the highest percentage of respondents consider the Bologna graduate five-year-program to be the best model for acquiring the basic design skills and competencies, while in Croatia an equal percentage of them think that it is the Bologna graduate five-year-program and the Pre-Bologna study program.

Information obtained from the Focus groups can be classified into several topics:

PRACTICE BASED LEARNING

Professors from all Focus groups strongly believe that practice based learning is an imperative in design education and one of the main design education mechanisms which provides technical skills and knowledge that enhances the ability of designers to react to their immediate environment. But, this is still not recognized in all countries, since in Croatia there is no consensus in establishing the culture of internship, which is also being confirmed by the results of the Croatian Design Professional's survey. Also, professors believe that during 3 years of design undergraduate studies it is very hard to provide/acquire all the necessary knowledge to students.

COLLABORATION WITH EXTERNAL STAKEHOLDERS

In general, there are many examples of successful integration of collaboration with the real life sector in all three countries, but for example, in Croatia professors argued that working environments, especially clients in the production

sphere still do not understand the design processes, and they still perceive design as an exclusive discipline. In other words, there is general lack of understanding of the design culture, and its potential benefits for the business environment.

NECESSITY OF MUTUAL EDUCATION AMONG DESIGNERS, CLIENTS AND SOCIETY AT WHOLE

There is a clear consensus between participants in the Focus groups from all three countries that there is an obvious need to work on educating clients-companies so they could understand what can be obtained with the help of designers. But before that, designers need to learn the *business language*, and Austrian professors emphasized that it should be kept in mind that the popularity of Economic Studies in design curricula among students is questionable. Therefore there is a need for finding more effective ways of transferring economic knowledge to design students. Furthermore, Austrian professors suggested, that designers and Business Actors should educate themselves about the role of design in the context of technological development, marketing objectives and production scale/economy of scope. It is also argued that entrepreneurial thinking goes hand in hand with design thinking when it comes to identifying demands in the beginning to develop product and service solution.

MULTIDISCIPLINARY APPROACH TO DESIGN EDUCATION

There is also consensus about the need for integral approach to design education. Croatian participants believe that it is high time to start observing the design discipline integrally, outside of the isolated categories of product and graphic design, to educate design thinkers that can understand their environment and the context – especially due to the fact that the design discipline in terms we know it today will probably very soon disappear. Austrian professors believe that

strengthening individuality and individual approaches to the design profession is an important factor and recommendation of lecturers regarding the success designers' careers. Macedonian professors also believe that general global knowledge and utilization of information is essential in order to survive as a designer today and even more in the future. If a designer has a general overall knowledge he/she can easily be positioned on the market and can always find an industry to apply his/her knowledge. It was also argued that the future of design education lies in fostering students' innovation capacity, since today, and especially in the future, it will be possible for designers to survive only if they link their design thinking to particular industries and solve particular problems. There is an overall consensus that the purpose of the design schools is not to make perfect workers but to develop design thinking, alongside with the development of design knowledge and competencies. Therefore, design education should be formulated in a way to stimulate innovation and not just aesthetics, especially bad aesthetics. Austrian professors also support this opinion through their opinion that for design education in the future, the key trend will be intensifying students' individual independence and originality. In the Austrian Focus group, the trend of massiveness of the design education is recognized in regard to the issue that a large number of design graduates need to find their niche for the professional practice. Also design education will collapse if it is not able to follow the trends and development of technology.

PROBLEMS REGARDING MULTIDISCIPLINARY APPROACH

Macedonian professors admitted that interdisciplinary cooperation has not provided the desired results. In practice the cooperation is not possible because each institution pulls the strings towards their position, regardless of the sector they represent. In Croatia, besides the lack of financial resources,

they see legislative requirements as one of the main problems which somewhat obstruct the multidisciplinary nature of the design education. These legislative limitations as a result of the transition to the Bologna program had an impact on reducing the number of external experts' teachers, thus creating a situation where it is very hard to keep the level of quality in each course, given the fact that all the teachers have to be full time employed. Therefore, this situation created the gap, or lack of professionals from other specialist disciplines, who are able to transfer their knowledge to designers. Concretely, in Croatia there is lack of personnel to adequately teach marketing and design management at School of Design. The main conclusion was that the bureaucratic nature of the Bologna process does not allow a lot of changes on yearly bases, which is not in accordance with today's society and the changing nature of design that needs a constant redefinition. Also one important conclusion was that in order to make all involved stakeholders aware of the value added through the inclusion of other stakeholders in the process, multidisciplinary approach in designing education programs should be unconditionally introduced. Each stakeholder should put enough efforts to understand the needs of the others so the synergy could be jointly achieved. For that purpose, examples of good practice are needed, with the help of the media and cooperation among various educational institutions, etc. Furthermore, stakeholders should advocate for a multidisciplinary approach and collaboration between designers, business and education sectors, and clearly communicate problems in the implementation of this cooperation. Exposure and hearing each other views and opinions, and mutual respect of diversities are not easy approaches, but the most rewarding one in terms of achieving higher level of practicing design through multidisciplinary teams. Good examples of cross-sectorial cooperation and efforts in linking technology, design and business – multi-disciplinary teams should be and are encouraging.

FUTURE CHALLENGES FOR THE DESIGN SECTOR AND DESIGN EDUCATION

In terms of future visions, participants are aware of the role of design as an important factor for economic development. Therefore upgrading research base in design is needed, and an effective cross-border design policy on a European scale must be implemented and consequently developed and promoted in order to ensure long-term competitive capability of SMEs as well as freelance designers. Also they agree that design schools bear the responsibility to communicate the core values of a strategic design management and need to support entrepreneurial thinking. Furthermore, professors believe that development of design in the future goes in direction of the digital. Within a few decades there will be less material used for all objects we will have. All products will become digital or will be integrated in a human body. Minimal form and functions will be dominant. Design will be imaginary. But currently there is a huge gap between design, and technology on the other side.

5.3 BUSINESS ACTORS: COMPARISON OF FOCUS GROUP RESULTS

By comparing information obtained from the Business Actors Focus groups it is possible to make several conclusions regarding the following issues.

COMMUNICATION AND KNOWLEDGE PROBLEMS BETWEEN PROFESSIONAL DESIGNERS AND BUSINESS ACTORS

From the Croatian Business Actors' view, the biggest problem in regard to implementation of design into businesses lies in the fact that the business sector is altogether undereducated on those terms. Also from the business perspective, the

biggest problem in conducting the cooperation with designers is designer-client communication. Therefore, it was concluded that it is especially needed that design faculties educate newcomers that will also be able to educate their direct environment about the importance of design in a broader socio-economic context, especially their clients, who often do not really know what they need in terms of design. Austrian participants said that business people should be asked what kind of access and what detailed information can be provided to entrepreneurs that help them to better apply strategic design management as a catalyst for innovation and successful entrepreneurship.

DESIGNERS' DEFICIENT KNOWLEDGE AND SKILLS FROM BUSINESS PERSPECTIVE

In Croatia marketing, business knowledge, communicational and presentational skills, design thinking, brand development, product distribution, time management, entrepreneurial psychology and teamwork were indicated during the talk as necessary skills that designers should have in today's society. Also, it was indicated that designers lack knowledge in contemporary technologies, and technological processes altogether. Austrian Business Actors see marketing and managerial understanding as key factors for successful cooperation between designers and (or in) small and medium enterprises. Instruments like customer research, personas and target group research, the creation and continuous use and development of customer demands analysis and a professional access to fact proven insights in consumerism are not necessary to be surveyed by the designers, but the necessity of the understanding and learning from this data is approved. From their opinion the ability to see and communicate tasks in the holistic, solution-orientated perspective is crucial. Also ability to think in business terms and the so-called soft-skills are seen as crucial for productive communication between designers and Business Actors.

PRACTICE BASED LEARNING

All the participants have agreed that designers, upon leaving the design school, lack practice and understanding of entrepreneurship skills, and that they need additional training in order to understand the ways in which this world is functioning. It was also mentioned that they understand that part of the problem lies in the fact that those skills and knowledge were not transferred to designers during their studies in a structured and understandable way. They perceive as negative the designers' lack in practical experience, and they believe that designers should be able to create a prototype themselves and be sensitive towards potential weaknesses in order to eliminate them. The Business Managers think that the shift in the designers' focus from what does the company want to what does the company's customers need is necessary.

CHALLENGES FOR DESIGN PROFESSION IN THE 21ST CENTURY FROM BUSINESS PERSPECTIVE

Macedonian Business Actors put emphasis on technological development and information as the biggest challenge for design of the 21st century. They believe that rapid changes in terms of economy, which brings intense uncertainty, will in the future influence design thinking. The market saturation in relation to design is from their point of view obvious. The market is full of useless well-polished branded products, which have absolutely no value. Therefore, the main challenge for the design is to regain its primary role, which is problem solving and not aesthetics. Austrian Business Actors also believe that, since design is seen as crucial for creating innovation, designers should contribute to optimizing production by finding economical and saving processes of production. They also put emphasis on the importance of energy saving and the urgent need of rethinking in the usage of non-renewable resources. For them, one of the main future challenges for product design

lies in introduction of economically friendly processes and products and reinforcement of the necessity of an eco-friendly turn in the production business practice.

5.4 COMPARATIVE ANALYSIS OF THE RESULTS OF THE OVERALL RESEARCH

In line with the main purpose of this entire research which is to articulate opinion of Design Professionals, Design Professors, and Business Actors on the quality and relevancy of knowledge, skills and competencies which designers acquire during their education, as well as to detect the potential current mismatch of the skills which designers obtain in their formal education and skills needed in their current and future practice, the first thing that is visible is the fact that the Design Professors are much more satisfied with the level of knowledge, skills and competencies they provide to their students, than Design Professionals with the level of knowledge skills and competencies they acquired during their design studies.

This mismatch is to the greatest extent present in the Macedonian survey results, given that from the results of the Design Professors survey a total of 36 skills and competencies were identified, with which Macedonian professors are highly satisfied, while in the case of the Macedonian Design Professionals this number is 17. Results also show that Macedonian professors are not highly dissatisfied with any knowledge, skills and competencies listed in the questionnaire, and Macedonian designers are highly dissatisfied with 6 of them, where three of them are the ones with which Macedonian Design Professors are highly satisfied. Those competencies are: managing design action, overall skill displayed in execution of process and entrepreneurship skills. Also Macedonian designers are

not highly but fairly satisfied with the following, skills and competencies: 3D modelling, model making, product development, communicative skills, with acquired capacity to grow and innovate, with their of and insight into the profession, with the application of and insight, with their evaluation and refinement, design synthesis, and design methodology skills and with their expert behaviour in dealing and handling the design problems, dedication and motivation to be a good designer, and of sustainability. They are also, as we mentioned, mostly dissatisfied with their design management competencies, with which Design Professors are highly satisfied.

In respect to the Austrian surveys the mismatch between designers' and professors' opinion regarding quality of provided, skills and competencies is also considerable, given the fact that from the Austrian professors' survey a total of 20 skills and competencies were identified with which Design Professors are highly satisfied, and in case of the designers' survey the number of such skills and competencies is 11. Unlike their colleagues in Croatia, and Macedonia, Austrian professors identified 4 skills and competencies with which they are highly dissatisfied, while the Austrian designers identified 6 of them, where two of them, design methodology and of sustainability are ones with which Austrian Design Professors are highly satisfied. Also, Austrian designers are not as the professors fairly satisfied, but highly dissatisfied with managerial competencies, and with overall skills displayed in the execution process. As for the , skills and competencies with which the Austrian designers are fairly satisfied, and Austrian professors highly satisfied they are the following: research and analyses, concept development, communicative skills, of and insight into the profession, design synthesis, model making, dedication and motivation to be a good designer, team work ability and ability to run task smoothly, of history and theory of design. Both survey groups are highly dissatisfied with provided or acquired

ability to manage people and entrepreneurship. In the opposite case, where Austrian professors are fairly and designers highly satisfied with certain skills and competencies, these are communication skills and concept generation ability. Furthermore, Austrian professors are not as the designers – fairly but highly dissatisfied with provided product development and manufacturing skills. This information certainly should be important for Austrian design schools, as these two skills represent the primary product designers' skills.

With regard to Croatian surveys, the mismatch between designers and professors' statements is a bit smaller at least in respect to the number of total knowledge, skills and competencies with which both survey groups are highly satisfied. From the results of the Croatian Design Professors' survey, a total of 22 skills and competencies were identified with which Croatian Design Professors are highly satisfied with, while in case of the Croatian Design Professionals this number is 21. As in the case of Macedonian surveys, the Croatian professors are not highly dissatisfied with any knowledge, skills and competencies listed in the questionnaire, and Croatian designers are highly dissatisfied with 5 of them, where one of them concerning 3D modelling is the one with which Croatian Design Professors are highly satisfied. Furthermore, designers are not as the professors fairly satisfied, but highly dissatisfied with their managerial competencies, manufacturing skills, their ability to manage people and with their entrepreneurship skills. Also Macedonian designers are not as the professors highly, but fairly satisfied with the following knowledge, skills and competencies: oral and visual presentation skills, communicative skill, sketching, expert behaviour in dealing and handling the design problem and knowledge of sustainability. On the other side, professors are not as the designers highly, but fairly satisfied with students' design skills, their capacity to grow and innovate, critical thinking, model making skills,

their dedication and motivation to be a good designer, their responsibility for outcomes and their formation of judgments.

As to the coincidence of students and professors' attitudes on the level of all three countries the only matching is related to a high degree of satisfaction in relation to the three following skills and competencies: analytical thinking, task clarification and knowledge acquisition and managing tasks.

In addition, based on the information from the Focus groups, it is possible to identify additional skills and competencies that are not mentioned in the survey and which are mostly related to designers' professional practice and which are not provided through designers' formal education or if they are, they should be improved. Those are as follows: knowledge of financial performance, marketing, intellectual property rights, product development and placement on the market, design production information, skills in writing EU funded projects, business plans and market analyses, information about legal help, technical knowledge and sources where and how to find information about materials and techniques, knowledge how to make presentations and how to make and organize a portfolio, knowledge of negotiation techniques and project management, communication and presentation skills, design thinking, brand development, product distribution, time management, entrepreneurial psychology and team work abilities.

Regarding the practice based learning all survey and Focus groups strongly believe that practice based learning is a crucial mechanism for the creation of a good designer. The practice based learning proved to be an important issue, given that participants from the Business Actors Focus groups argued that designers, upon leaving the design school, lack practice and understanding of entrepreneurship skills, and that they need additional training in order to understand the ways in which this world is functioning. Participant from all three Focus groups in all countries also strongly believe that

design students should gain additional competencies, especially ones concerning the business and social environment. Furthermore, information from the Focus groups indicates that there is consensus in the opinion that designers, the business sector and the other stakeholders need to better educate each other in order to achieve more productive communication. Therefore, it was concluded that it is especially needed that design faculties educate newcomers that will also be able to educate their direct environment about the importance of design in a broader socio-economic context, especially their clients, who often do not really know what they need in terms of design. Also the need for multidisciplinary knowledge and integrative approach to design education is emphasized. As for the main challenges for the design profession in the 21st century there is consensus in opinion that innovations, functional quality, and social and economic friendly approach represent crucial factors in the survival of the design practice in the future.

Taking into account the results of all the research, it can be concluded that Design Professionals and Design Professors are generally satisfied with the received /provided design education. Although, professors in somewhat greater extent, given that they are highly satisfied with the larger number of students' knowledge, skills and competencies, and that except in the case of Austria, did not express high level of dissatisfaction with any knowledge or skills listed in the questionnaire. In the case of Austria for this there may be two reasons. One is that the Austrian professors, in comparison with Croatian and Macedonian colleagues, are more self-critical and have higher standards, and the other is that results reflect the real situation.

As far as knowledge, skills and competencies that in regard to design education should be improved or in a greater extent introduced, the following knowledge, skills and competencies were identified:

Knowledge and competencies with which designers in all three countries are highly dissatisfied belong to the group of design management and social skills and they are related to:

— Managerial competencies
— Ability to manage people
— Entrepreneurship skills

In addition to these skills, designers are also highly dissatisfied with the following skills:

— Design thinking and design process skills: design methodology (HR), manufacturing and 3D modelling (AT).
— Design management skills: overall skills displayed in the execution process (HR, MK), managing design action (MK).
— Dublin descriptors: knowledge of and insight into profession (MK)
— Specific knowledge: knowledge of sustainability (AT)

On the basis of the information given by all three Focus groups the following lacking skills and competencies that are not mentioned in the survey were identified: knowledge of financial performance, marketing, intellectual property rights, product development and placement on the market, design production information, skills in writing EU funded projects, business plans and market analyses, information about legal help, technical knowledge and sources where and how to find information about materials and techniques, knowledge of how to make presentation and how to make and organize a portfolio, knowledge of negotiation techniques and project management, communication and presentation skills, design thinking, brand development, product distribution, time management, entrepreneurial psychology and team work abilities.

PART IV: CONCLUSIONS AND GUIDELINES FOR FURTHER ACTION

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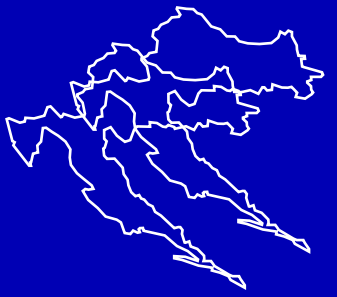

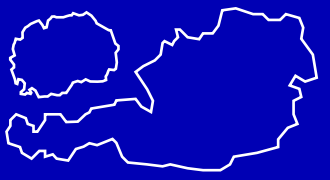

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PART IV: CONCLUSIONS AND GUIDELINES FOR FURTHER ACTION TO BE CONSIDERED

Given that the purpose of this Study is to investigate and establish the current challenges facing the design education today and on the basis of research results, in the form of additional competencies, knowledge and skills, propose appropriate guidelines for the improvement of education, in the final part of the Study main conclusions of previous parts of the Study were rehearsed and drawn together based on which a set of suggested guidelines were presented.

PART I CONCLUSIONS

The first part of the Study explores effects of a new socio-economic context brought with paradigm shift to Knowledge Based Society on design profession and the design discipline itself. Those challenges are directly connected to certain knowledge, skills and competencies which designers have to possess if they want to have successful carriers in today's changing environment. The results of the research conducted for the purpose of the first part of the Study indicate several conclusions, elaborated bellow.

The first one concerns technological challenges. The *Zeitgeist* – the spirit of our time is expressed through continuous innovation and application of innovation. Consequently the rising expectations from design that as a creative discipline contributes to social and economic well-being brought increasing pressure to design profession to continuously innovate. To be able to do that, designers have to understand the changing pattern of innovation, to cope with constant technological changes, to continuously develop new skills, and to possess the ability to understand technological opportunity and act upon it. But, exploring possibilities of new technologies also brought challenges of underestimating the importance of the core skills and knowledge required to be a great designer, ones related to true craftsmanship. In other words, instead of how to know to do sketches and make 3D presentations, designers have to know how to do projects in a comprehensive way. Otherwise as John Heskett (2009) had said, they will remain

as visualizers of other people's ideas or incremental improvers of existing products.

The second is related to the challenge manifested in the fact that the Knowledge Economy acts in a network order. Consequently, designers must function within institutional structures of various kinds that enable and constrain their endeavours. The *Zeitgeist* is also manifested through growing spread, use and sharing of knowledge and new matrices of knowledge creation and application. Therefore, designers must be able to connect to, collaborate with and be inspired by different disciplines – architecture, material science, business, marketing, ethnography, ecology, philosophy, sociology and more. Only in that way designers will be able to create the great user experiences they aim for. So the design industry should demonstrate that it is able to create communication strategy with different stakeholders, to induce concrete initiatives, and to encourage cross-disciplinary and cross-institutional dialogue as well as synergies from joint research, educational modules and development projects. Therefore, it is expected from designers to possess excellent communication skills, multidisciplinary attitude and knowledge, and willingness to cooperate and continuously learn from all relevant stakeholders important for their projects.

The third conclusion is related to necessity of mutual education between designers and Business Actors. The lack of productive and meaningful communication is emphasized in the opinions of many who think and talk about this issue. The prevailing opinion is that design graduates emerge from schools without the skills necessary to thrive in the real world. But designers are no pure artists. Specifically, product designers cannot exist by themselves in an isolated world, and therefore they have to be able to articulate ideas and their value to clients, as Gropius did. To be able to do that they have to understand the main terms and principals concerning the business world

before they finish their education. They have to know how to articulate the value of their ideas and work to the client, and to truly understand the needs of their clients.

The fourth conclusion is related to social challenges. Terms such as: user friendly design, production friendly design, environmental friendly design, community friendly design, design for all, tell us that the design community is aware of the great importance of user-centred approach, or in other words, meeting the real needs of people and society as whole for the designers' community represents an important challenge. Design should promote involvement, inclusion and coherence for all human beings and it should also focus on interactive, more human use in the public sector, in the sense of reduction or elimination of barriers between the individual citizen and public services/spaces. In order to succeed in this, designers must essentially understand the existential, cultural and social needs of their environment.

The fifth conclusion is related to environmental and sustainable development challenges. The one negative but unfortunately main characteristic of our time is the massive environmental pollution that threatens to jeopardize the health of all living species and the health of our planet. Since the lifetime of most products is shortened to an average of two years, a huge amount of discarded old products represent a growing problem for the ecosystem of our planet. The responsibility of design in this context is extremely great, since designers are in a position to control or partially control the selection of materials and methods of product creation and their production. It is believed that one of the most effective ways of achieving sustainable and eco-friendly design is to create products that are more meaningful to the individual and that are kept and cherished rather than disposed of and replaced long before their functional lifetime has come to an end. Furthermore, literature on this subject emphasizes that the contribution of

design in terms of new innovative solutions, better material choices and smarter manufacturing processes could be seen through setting new standards within product categories or with regard to how we solve any given problems. As such, design in close collaboration with technological innovation and production companies can help in substituting harmful processes and materials.

The sixth conclusion is related to the contemporary perception of the economic value of design. In economic context, design is expected to build the capacity to innovate and deliver world-class brands, products and services, to strength competitive positions of national economies, and to improve the understanding of firms regarding design methods and their utilization. Also there are challenges considering expanding design awareness of corporate management, design professionals and the public sector through education and training, challenges concerning the use of design as a strategic tool for innovation, and challenges regarding articulation of the value of design, and its importance to social and economic success. Finally there is a question of efficient protection of value of design since forthcoming and new technologies such as 3D printing, brings great challenges in regard to efficient protection of intellectual property rights relating to design.

PART II CONCLUSIONS

The second part of the Study explores possible directions of design education in the future, detects the main challenges and main dilemmas facing the design education, and identifies the possible mismatch between competencies and skills provided in current design education and the ones needed in the market. The main conclusion of this chapter is that as a response to the pressures and challenges of the new socio-economic paradigm, the higher design education is currently undergoing some substantial realignment. In principle, this

adjustment has to do with the most basic characteristics of the paradigm of Society and Economy Based on Knowledge, with the preconditions and ways in which this paradigm evolves and operates: more pronounced complexity of the functioning of the system; intensive communication between the actors of the system; openness to receiving and sharing information and knowledge, the network matrix of learning and innovation with intensive collaboration in knowledge production, multidisciplinary and comprehensive way in observing and problem solving, integration of thinking and acting, taking into account the needs and expectations of all interested parties for certain outcomes of the activities of the system; integration of theory and practice, the need for both specialization and generalization. In regard to the changes, possibilities and expectations which contemporary age brought to design education, the design community leads intensive discussions concerning the future direction of the design education. The design education is seen as one of the main mechanisms through which designers will be enabled to respond to challenges in the future and therefore it should be tailored accordingly to the needs of the future. Design curricula should address the future by engaging a platform of ethics and focusing education towards social ecology and service to humanity. Design education must be enhanced with new knowledge that embraces diversity, multiculturalism, and collaboration. From the perspective of public policy, the design education represents the main mechanism through which designers should be equipped with commercially oriented and international design competencies, which should lead to improved competitiveness of businesses and to the improvement of the quality of life. Also the focus of public policy is on building a multidisciplinary approach and collaboration between design, business and others schools, and on fostering interaction among design managers, organizational executives and managers, educators, and public policy makers.

Generally observed, one of the first things that can be noticed in relation to the direction in which the design education institutions are currently going, is that actually, despite the existing curricula, there is no completely clear course, or at least consensus, about how and what to teach future designers. The global design community, especially the academic one, leads an intense debate about whether higher education institutions in the field of design should remain independent and stay outside of the universities and in that way retain their autonomy concerning creation of design curriculum, or they should be integrated into a university complex where they will have greater resources, but less autonomy. Design academic community also debates about the essential purpose of design education as well as the very purpose of design as a discipline, about the philosophy and values on which the content of design curriculum should be based, and the ways of knowledge transfer to students. Also there is an intensive debate about what combinations of three design discipline archetypal elements – art, science and technology, should be applied in structuring the content of design curriculum, and how those curricula should be defined. In addition, there are doubts regarding general versus specialist education, and conceptual versus realistic approach to design as a discipline. Furthermore, there is an important question concerning the establishment of balance between designers' skills and competencies required by the job market, and their education on the issue of ethical and value principles which have to reflect many levels of responsibility arising from designers work in the real world. All these pressing issues suggest that this discipline is undergoing intense reviewing of the very purpose of the design as well as the purpose of the structure and content of the design curriculum.

The general impression is that the educational design institutions embarked on the race with the changes which are not possible to follow but only to acknowledge. Despite

the general impression of disorientation of design discipline, it is possible to observe the trend towards the integration of educational content and towards a holistic and multidisciplinary approach to design education. But because of the speed of changes, and limitations regarding financial resources and length of bureaucratic procedures, additional skills and competencies are not included fast enough into formal design education. Massification, diversification, internationalization, and "Academic Capitalism" make it increasingly hard for high educational design institutions to not succumb to the quantity at the expense of quality of design education.

PART III CONCLUSIONS

In the third part of the Study, results from the empirical research conducted through surveys and Focus groups in Croatia, Austria and Macedonia were presented and analysed. The main purpose of this research was that, together with the theoretical research results, it creates a base for defining and proposing appropriate guidelines for the improvement of current Design Education and the content of the design curriculum, in form of deficient design knowledge, skills and competencies. Those guidelines should help bridge the gap between the designers' educational and working environment. Research is carried out involving three stakeholders' groups: Design Professionals, Design Scholars, and Business Actors with the intention to obtain their opinion on the quality and relevancy of knowledge, skills and competencies which designers acquire during their education, as well as their opinion on the potential current mismatch of the skills which designers obtain in their formal education and skills needed in their current and future practice. In the questionnaires intended for designers and professors, in addition to other questions that are projected to determine the level of practice based learning, there are questions related to 40 different knowledge and skills competencies.

Taking into account the results of the research, it can be concluded that both Survey groups, Designers and Design Professors are generally satisfied with the received /provided Design Education. Although, professors in somewhat greater extent, given that they are highly satisfied with the larger number of students' knowledge, skills and competencies, and with the exception of Austria, did not express a high level of dissatisfaction with any knowledge or skills listed in the questionnaire. In the case of Austria for this there might be two reasons. One is that the Austrian professors, compared to Croatian and Macedonian colleagues, are more self-critical and have higher standards, and the other is that results reflect the real situation.

As far as knowledge, skills and competencies that in regard to design education should be improved or to a greater extent introduced, the following knowledge, skills and competencies were identified from the survey results: managerial competencies, social skills, managing design action, entrepreneurship skills, overall skill displayed in execution process, design methodology, manufacturing and 3D modelling, knowledge of and insight into the profession, knowledge of sustainability.

On the basis of the information given by all three Focus groups, the following lacking skills and competencies that are not mentioned in the survey were identified: knowledge of financial performances, marketing, intellectual property rights, product development and placement on the market, design production information, skills in writing EU funded projects, business plans and market analyses, information about legal help, technical knowledge and sources where and how to find information about materials and techniques, knowledge of how to make presentations and how to make and organize portfolios, knowledge of negotiation techniques and project management, communicational and presentational skills, design thinking, brand development, product distribution, time management,

entrepreneurial psychology and team work abilities.

Results of the research also show that all survey and Focus groups strongly believe that practice-based learning is a crucial mechanism for the creation of a good designer. The practice – based learning proved to be an important issue, given that participants from the Business Actors Focus groups argued that designers, upon leaving the design school, lack practice and understanding of entrepreneurship skills, and that they need additional training in order to understand the ways in which this world is functioning. Participant from all three Focus groups in all countries also strongly believe that design students should gain additional competencies, especially the ones concerning the business and social environment. Furthermore, information from Focus groups indicate that there is consensus in opinion that designers, Business Actors and other stakeholders need to better educate each other in order to achieve more productive communication. Therefore, it was concluded that it is especially needed for design faculties to educate newcomers that will also be able to educate their direct environment about the importance of design in a broader socio-economic context, especially their clients, who often do not really know what they need in terms of design. Also, the need for multidisciplinary knowledge and integrative approach to design education is emphasized. As for the main challenges for the design profession in the 21st century there is consensus in the opinion that innovations, functional quality, and a social and economic friendly approach represent a crucial factor in the survival of the design practice in the future. Finally, it can be concluded that the results of empirical research largely confirm the arguments presented in the theoretical part of the research.

2 GUIDELINES AND SUGGESTIONS FOR FURTHER ACTION TO BE CONSIDERED

Taking everything in account the following guidelines could be proposed:

— Design education should be carried within a multidisciplinary context, which will embrace all necessary knowledge, skills and competencies needed for future successful professional practice.

— Empirical evidence of this Study shows that skills, competencies and knowledge mismatch is mostly related to the problems and demands of real life design practice and designers professional work and to a lesser extent with practical design knowledge and competencies. It is not only the responsibility of the educational design institutions, but also of the policy authorities who need to find a way to bring them into the formal design education programme. Those skills, competencies and knowledge are particularly related to: general managerial knowledge, social skills, entrepreneurship skills, ability to display overall skill in an execution process, knowledge of financial performance, marketing, intellectual property rights, product development and placement on the market, design production information, skills in applying and information on public grants, business plans and market analysis, technical knowledge and sources on where and how to find information about materials and techniques, knowledge of how to make a presentation and how to create a portfolio, knowledge of negotiation

techniques and project management, communication and presentation skills, design thinking, brand development, product distribution, time management, entrepreneurial psychology and team work abilities.

— Design education should be more practice-based oriented and educational institutions should establish close and more intensive cooperation with external environment, with the aim of providing students with work on specific projects. This in particular concerns Croatia, because design schools in this country do not have internship/apprenticeship activities as an obligatory part of their Study program. Also, research and development collaboration with the industry is the key factor for methodological exercise in design studies. This approach enables students to experience solving real-world product design problems, working as a part of a multidisciplinary team, and communicating their work in written and oral form.

— Since the evidence suggests that educational institutions in their attempts to provide additional skills and competencies are faced with financial and bureaucratic constraints, which create the gap, or lack of professionals from other specialist disciplines, design education institutions should consider finding alternative sources for financing those specialist and alternative ways of training students in deficient disciplines or skills. For example, international projects related to the exchange of teaching stuff, and collaboration with vocational design organizations which may be carriers of these training and which possess the ability to respond and adjust faster to the changing nature of design which nowadays needs a constant redefinition.

— There is a need for finding more effective ways of transferring economic knowledge to design students. Design students cannot be expected to be equally interested in

economic issues, like students of economy are. Therefore, the transmission of economic and business knowledge should be strongly linked with the context of design, with a lot of practical and interesting examples from design business practices.

— Designers, business representatives and relevant stakeholders use different *languages* to find a way to express themselves professionally. From the business client's perspective, ability to think in business terms and the so-called soft-skills are seen as crucial for productive communication between designers and Business Actors.

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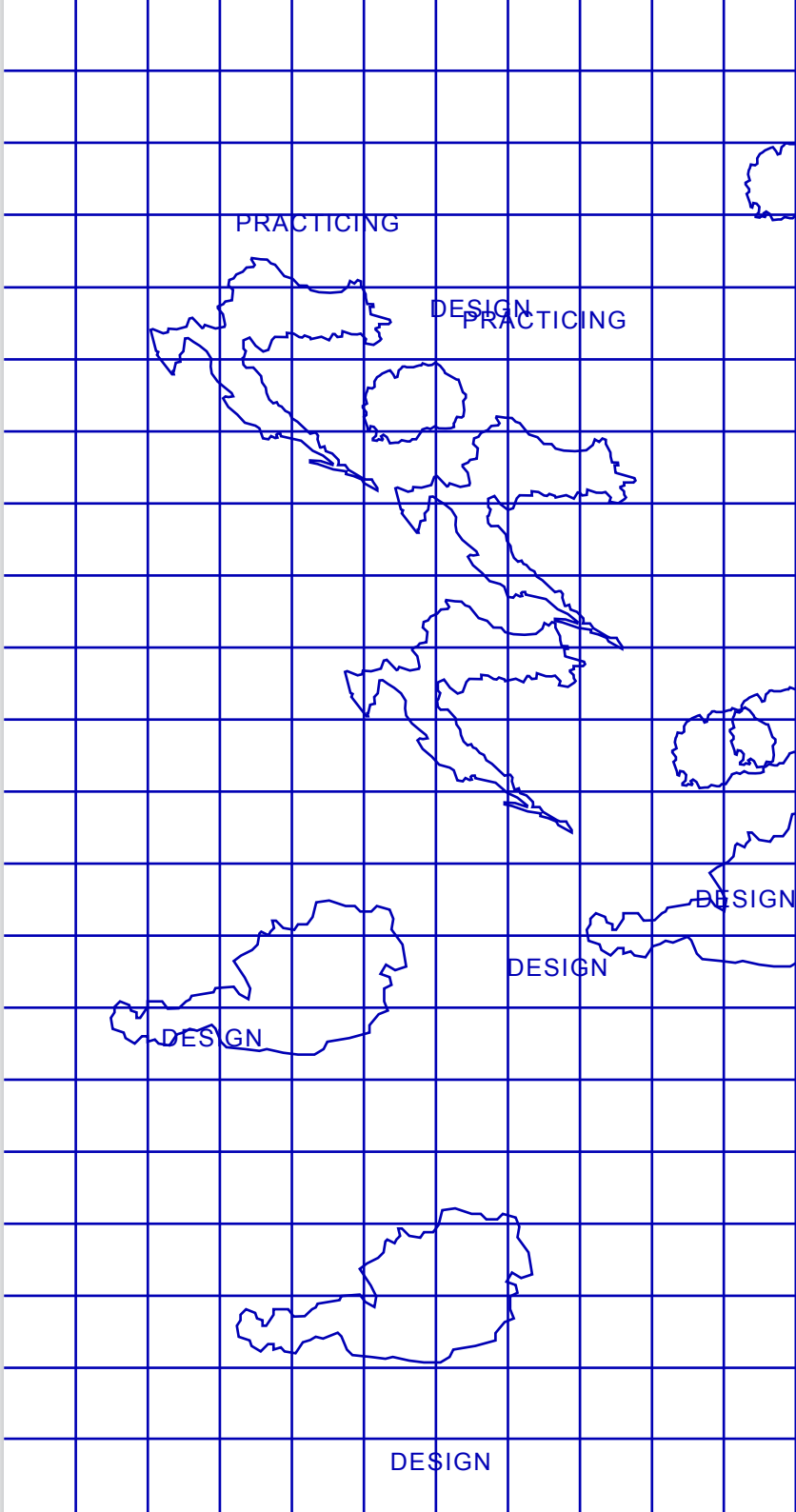
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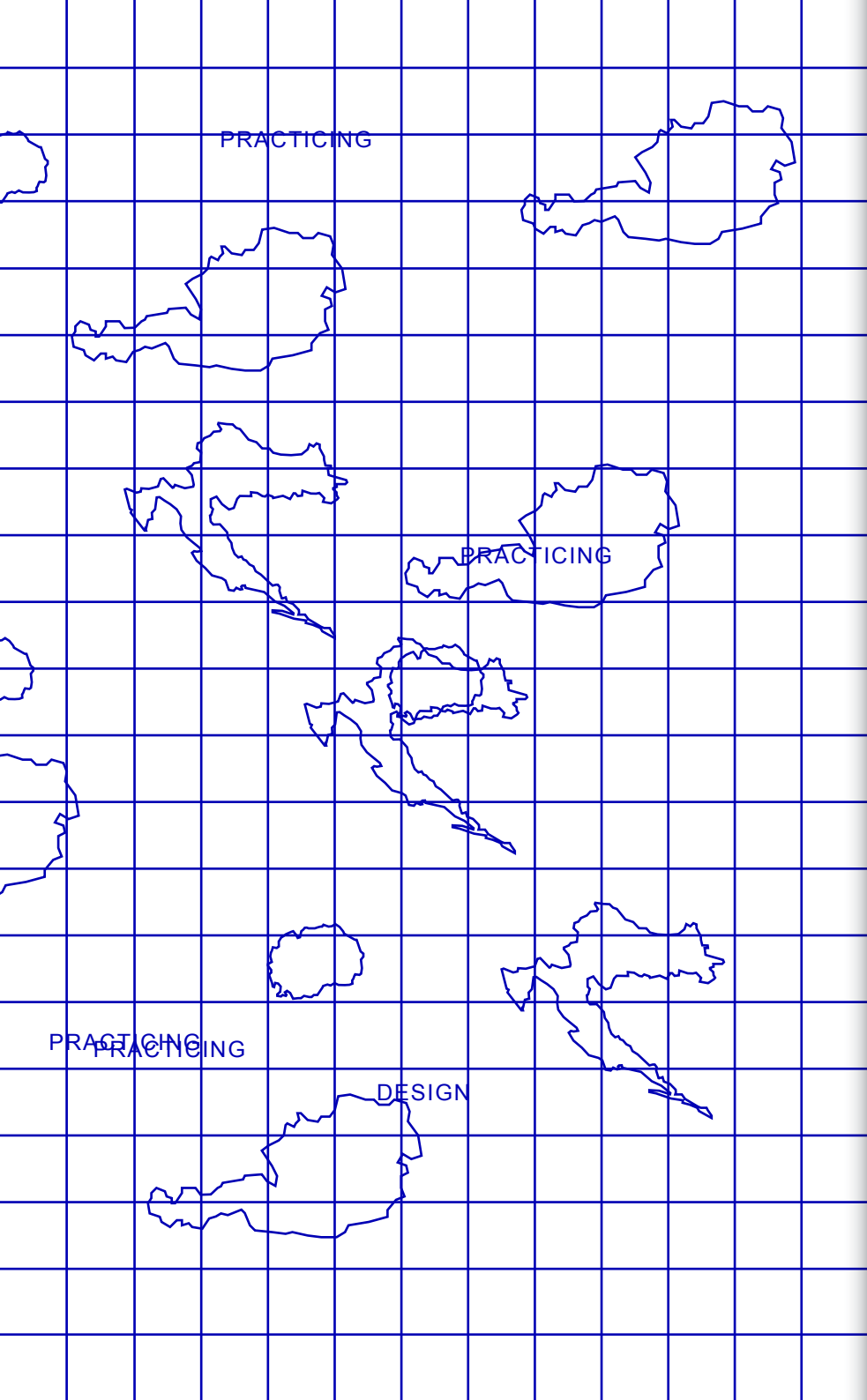
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