The 16th International Conference on Virtual Learning
VIRTUAL LEARNING – VIRTUAL REALITY

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Notice!

All papers were presented during conference according to the schedule.
All papers were checked for plagiarism.
However, there is no perfect software to certify "free of plagiarism".
All papers were reviewed for scientific value and relevance.
The responsibility for the results presented in this book is assumed by authors.

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About ICVL 2021

ICVL Project intends to explore and propose innovations in education in the perspective of the Knowledge Society. The International Conference on Virtual Learning contributes to the development of both theory and practice in the field of Virtual Learning having the following objectives: creating a framework for a large scale introduction of the eLearning approaches in teaching and training activities; assisting the teachers, professors and trainers in the use of innovative teaching technologies both in formal education and life-long learning; stimulating the development of eLearning projects and software for education process and systems; promoting and developing scientific research for eLearning, educational software and virtual reality.

Participation is invited from researchers, teachers, trainers, educational authorities, learners, practitioners, employers, trade unions, and private sector actors and IT industry.

The ICVL committee accepts academically robust papers, topical articles and case studies that contribute to Virtual Environments for Education and Training (VEE&T), Virtual Reality (VR), Computer Vision (CV), Information and Knowledge Processing (I&KP), and presenting, as well, practical results and original applications. The education category includes:

- The use of Web Technologies, Computer Graphics and Virtual Reality / Augmented Reality Applications;
- New tools, methods, pedagogy and psychology;
- Case studies of Web Technologies and Streaming Multimedia Applications in Education;
- Experience in preparation of courseware;
- Design and Development of Massive Open Online Courses (MOOCs).

The main sections and related topics are (http://c3.icvl.eu/):

- **Models & Methodologies (M&M):** Innovative Teaching and Learning Technologies; Web-based Methods and Tools in Traditional, Online Education and Training; Collaborative Virtual Learning, E-Pedagogy; Design and Development of Online Courseware; Information and Knowledge Processing; Knowledge Representation and Ontologism; Cognitive Modelling and Intelligent systems; Algorithms and Programming for Modelling.

- **Technologies & Virtual Laboratory (TECH):** Innovative VR and Web-based Teaching and Learning Technologies; Advanced Distributed Learning (ADL) technologies; Web, Virtual Reality/AR and mixed technologies; Web-based Education (WBE), Web-based Training (WBT); New technologies for e-Learning, e-Training and e-Skills / e-Competences; Educational Technology, Web-Lecturing Technology; Mobile E-Learning, Communication Technology Applications; Computer Graphics and Computational Geometry. Intelligent Virtual Environments.

- **Software Solutions (SOFT):** New software environments for education & training; Software and management for education; Virtual Reality Applications in Web-based Education; Computer Graphics, Web, VR/AR and mixed-based applications for education & training, business, medicine, industry and other sciences; Multi-agent Technology Applications in WBE and WBT; Streaming Multimedia Applications in Learning; Scientific Web-based Laboratories and Virtual Labs; Software Computing in Virtual Reality and Artificial Intelligence; Avatars and Intelligent Agents.

- **Intel® Education - Innovation in education and research (IntelEdu):** Digital Curriculum, collaborative rich-media applications, student software, teacher software; Improved Learning Methods, interactive and collaborative methods to help teachers incorporate technology into their lesson plans and enable students to learn anytime, anywhere; Professional Development, readily available training to help teachers acquire the necessary ICT skills; Connectivity and Technology, group projects and improve communication among teachers, students, parents and administrators.

From the first edition in 2006, ICVL has published 15 volumes (one volume per year), and awarded 13 papers, as shown in the following table (http://c3.icvl.eu/).

Order Number	ICVL edition	ICVL Location	Received papers	Published papers	Awarded papers
1	2006	Bucharest	55	34	--
2	2007	Constantza	45	35	2
3	2008	Constantza	64	44	2
4	2009	Iassy	103	52	2
5	2010	Targu-Mures	134	78	2
6	2011	Cluj-Napoca	145	85	--
7	2012	Brasov	146	67	3
8	2013	Bucharest	104	55	2
9	2014	Bucharest	155	70	--
10	2015	Timisoara	121	69	--
11	2016	Craiova	101	55	--
12	2017	Sibiu	116	74	--
13	2018	Alba iulia	124	82	--
14	2019	Bucharest	144	87	--
15	2020	Bucharest-ONLINE	123	77	--

The 2021 edition of ICVL was planned for October 30, 2021. However, the death of the leader of the ICVL Project, associate professor **Dr. Marin Vlada**, in the last decade of September 2021, led to the postponement of the event for November 20, 2021.

Organized on this day, in two parallel sections, all 28 articles accepted by the program committee have been presented online using the ZOOM platform. This volume contains all these works in the final version for publication after their improvement by the authors following the recommendations submitted by scientific reviewers. Some articles were directly rejected either because of plagiarism, or because of poor contributions to one of the conference's topics, or because of the inappropriate subject for the ICVL.

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First, our thoughts go to **Marin Vlada**, the initiator of the ICVL project, who, year after year, managed not only the electronic platform of the project, but also the coordination of all tasks necessary for the conference, almost every time, in another city in Romania. In parallel with the ICVL, the National Conference on Virtual Education (CNIV) was held with the large participation of teachers and students from the pre-university environment in Romania. Marin Vlada thought of the ICVL and CNIV projects as high-profile events that would bring added value in the field of learning with the help of modern technologies.

The success of a rigorously conference asks for strong efforts of many parties like chairs, reviewers, and contributors. Fair and detailed feedback was sent to authors by the Technical Program Committee based on reviewers' recommendations. Despite the time pressure imposed by the new conference deadlines, authors did their best to supply camera ready version in time before the conference. Finally, the volume has been processed according to the ICVL standards.

We are extremely grateful for efforts of all mentioned parties. Below, the lists of Chairs, Scientific committee/Technical Program Committee/Reviewers and Contributors are given.

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Education in Functional Details of Space

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Abstract

The role of design is to create a product with the help of innovation and existing postulates. Effectiveness of design education is one of the deciding factors in the success of a product development. Decisions to own a product are primarily based on the design, i.e. the appearance of the product itself, because a good product design is the starting point for analyzing the function of that product which also provides quality, good performance, ease of use and reliability. The design also allows for product differentiation and clearly conveys the function of the product itself to the user. Its main purpose is to provide a creative and innovative design that will be economical, understandable, and easy to use and easy to maintain.

Keywords: Design, Concept, Idea, Product

1 Introduction

Design, as it is known, means applied art, and then science and philosophy, whose main goal is to adapt to man, so that it becomes more functional and aesthetic. Design is an art, because you must have a great sense of beauty and creativity (Ilieva et al., 2019).

Design is a science because it can be learned to some degree, yet not everyone can create aesthetically valuable products (Baudrillard, 1996). Design is also a philosophy, because you can always discuss things whether they are beautiful or not.

Product design means the exterior of the product that is experienced with the sense of sight, and part with the sense of touch, through the shape and texture. The main feature of the design is that it should be constantly changing, although it may appear the same in certain elements, in essence it should always be different. Design is an art or procedure for presenting an idea, function, or way of working on a certain object, through a plan or drawing.

Product design represents the process of efficiently and effectively generating and developing ideas to create new products. Product design includes all the engineering and industrial work that goes into the development of a product from the original idea to its production. When creating a new product, the final appearance of the product will depend primarily on the time and resources invested in researching the development needs of the

new product, then on the product design which is caused by the structural, functional, and aesthetic features (Čikič, 2006).

Good product design must meet the requirements of product usability, ergonomic flexibility, technical and economic safety, and aesthetic sensibility. Product design is a broad concept, which is essentially the efficient and effective generation and development of ideas through a design process that leads to new products. Thus, it is a major aspect of new product development.

2 Product design

Product design is defined as a process that consists of a set of tactical and strategic activities that starts generating ideas to commercializing space and creating product design. In other words, product designers develop and evaluate ideas, turning them into reality and useful products (Dimitrov et al., 2016). The role of the product designer is to keep abreast of science, technology, and the arts to innovate new products that people can use for their practicality and aesthetics.

Product design as a word: a set of properties of an artifact, consisting of discrete properties of form (i.e., the aesthetics of the material good and/or service) and function (ie its possibilities) together with the holistic properties of the integrated form and function (Dimitrova, 2020). Product design is the process of identifying a market opportunity, clearly defining the problem, developing an appropriate solution to that problem, and validating the solution with real users.

When designing a product, designers must understand the business objectives and be able to answer the following questions (NSAD, 2021):

- ✓ What problem are we solving?
- ✓ Who has this problem?
- ✓ What do we want to achieve?

"Answering these questions allows design engineers to understand the user experience of the product, not just the interaction or visual part of a design" (NSAD, 2021).

Research - to develop a deeper understanding of the consumer audience, research must be conducted and collected to obtain data on potential customers for whom the product / service is designed
Definition – creates a point of view that is tailored to the needs and insights of users.
Insights – to generate a wide range of potential solutions, you need insight sessions during this phase of product development.
Prototype – A prototype (or series of prototypes) is built to test a hypothesis. Creating a prototype allows the designer to discover if they are on the right track, and often provokes different ideas that would not have come up in a different way to further streamline product development.
Test – testing of potential customers, i.e., the creation and building of great products and great brands depends on their further implementation. Product designers need to give their products an aesthetic and functional advantage over their competitors, while maintaining relevance in a world where technological advancement never sleeps.

Figure 1. Steps of product development (NSAD, 2021)

The design expression of a product comes from the combined effect of all the elements that are in the product itself. The tone of the color, the shape and the size should direct the thoughts of the people towards buying that product. Therefore, it is in the interest of the product designer to consider the needs of potential consumers who will probably be the final consumers of that product.

One solution is to create a product that, with its designed look and function, will express a person or tell a story. Products that carry such attributes are more likely to give a stronger expression and attract more consumers.

It is important to keep in mind that the expression of the design refers not only to the appearance of the product but also to its function. The product may look attractive, but if it does not follow its function, it is likely to reduce consumer interest.

The term product means any object, service, or idea, which arose because of human work, to meet certain goals or needs of the user (Ilieva et al., 2020).

The purpose of the design on the one hand is that the product is adapted for mass consumption for human needs, and on the other hand to meet the demands of the market and the economy of production and thus provide benefits and freedom of human society.

3 Division of aesthetic components

The aesthetic components of the product can be divided into five groups as follows:

- ✓ Harmony factors: proportion-connection, rhythm-structure, module-whole, syntax, arrangement of the elements;
- ✓ Cultural factors: habit, knowledge, culture, religion;
- ✓ Social factors: meaning, appearance, identity, symbol, fashion, degree of communication;
- ✓ Functional factors: shape / function, durability, flexibility, comprehensibility, justification of the invested funds;
- ✓ Historical and technological factors: historical context, time context and technical development.

Cultural factors – Our aesthetic perception is relative and depends on the cultural system. The way of understanding and feeling depends on habits, knowledge, culture, and religion.

Social factors – Today's socio-cultural tendencies can be classified because the behavior and lifestyle of an individual are related not only to his material power, but also to the acceptance of social values, rules, tradition, and reaction to social political and economic events in society. The items purchased are signs and lifestyle and they classify the individual into a certain group in the society. This conscious choice allows the individual to create a set of rules and principles that become the model by which he seeks to identify. The dynamic nature of socio-cultural tendencies requires constant monitoring and adjustment of trends. These studies enable greater product diversification.

Functional factors – The functional dimension of the product is one of the basic factors for its aesthetics. The relation of the shape and function of the object derives from its purpose or from numerical calculations.

Architecture is a typical example of the relationship between form, function, and budget. In the "Charter of Industrial Aesthetics" written by Jacques Viénot, he sets out two basic

principles: The principle of usability and functional values - industrial beauty have only items that are perfectly adapted to their function (and technically recognized value). Industrial aesthetics include harmony between the functional character and the external appearance of the product.

The principle of harmony – between the exterior and the use - between the creations that satisfy the principle of industrial aesthetics, there is never a conflict, in them there is always harmony between aesthetic and practical pleasure.

The notion of clarity – the notion of clarity is extremely important because it is not enough for the product to satisfy only its function. It is necessary for the product to communicate with the user, i.e., the appearance of the product must be clear and logical. There is a visual connection between the function of the product and the presentation of the function itself. The function and perception of the user are very important in modern products, which are becoming more complex to operate and manage, due to the shorter lifespan of a particular technology on the market. If the function is not properly presented in the form, the product is not easily recognizable and noticeable, and thus its aesthetic impression is less.

Product development cycle – New product development is a huge part of the production process. All products have a limited lifespan because of innovation and rapidly changing technology. New products need to be constantly evolving, with manufacturers investing time, effort, and financial resources to ensure that their new products will be successful.

Design forecasting – The process of creating a design product in its pre-manufactured part involves 3 stages: Forecasting, planning, and designing. Forecasting is usually said to be the prediction of the development of the material environment in the future, the frameworks of which are conceived relatively conditionally on the color of the introduced data and on the suspected development processes. Two of the initial stages in design, planning and design are also tied in certain ways in the future. Projects that look to the near future have an empirical character, while those that look to the distant future have a prognostic character. Design forecasting refers to analysis, risk forecasting, technique, and architecture. At the same time, it is observed relatively often the availability of feedback - avant-garde design ideas can cause and especially in terms of technical progress. The most fantastic ideas have never been questioned, i.e., accepted in principle at some point when it comes to their socio-economic. When it comes to the works of the constructivists of the day when they created the new prestigious and graphic language of modern ethics, it undoubtedly facilitated the emergence of great masters.

4 Stages that make up a product design

The steps in developing a new product are: Generating ideas; Selection of ideas; Concept development and testing; Business analysis; Product development; Market testing; Commercialization; Launch of the new product.

Product life cycle management the life cycle management of a particular product covers the process from the initial idea, through engineering design and production, to service and disposal. It includes the following stages:

Imagination – idea, plan, innovation. This phase involves defining the product requirements and the scope of the project. The original design is used to define the

aesthetics and the main functional aspects. The transmission, i.e., the presentation of the idea is done with the help of a sketch. The sketch can be presented on paper or with the help of technology, i.e., software or 2D or 3D model. Technology today is mature enough for production and is an important part of this phase.

Design, description, definition, development, testing, analysis, validation – this phase involves detailed product design and development. 3D printers and CNC prototyping machines also play a role in this phase. The phase includes engineers from many disciplines, such as: mechanical engineering, electrical and electronic engineering, software development, and if necessary, architecture, aerospace engineering and automotive engineering. Simulation, validation, and optimization tasks are performed, which may include stress analysis, FEA finite element analysis, kinematics, dynamics, and mechanical event simulation.

Realization – preparation for production, production, construction, procurement, sale, delivery.

The third phase defines the production method, including a variety of design tools. The process of defining the method includes conception, molding and modulation and formation, while analyzing them. More modern production methods, such as 3D printers and CNC machines, can be used for shorter production processes, which saves even more time.

Service – use, handling, maintenance, support, communication, management, collaboration, and maintenance This phase is the communication between the user and the product. At this stage, the graphic design plays a big role, which simplifies the way of using and managing the product, but also the way of maintaining it.

5 Conceptual development concept for switches

Small details called serious function make the interior perfect. When it comes to refinement in the choice of an individual and high aesthetic criteria, the emphasis is always on the small functional details without which space has no function (Lefteri, 2006).

The main source of that is light (Rodkin, 2003). When with minimal effort we press and get emotion for the evening image of the space. In the next moment they are a factor for the intensity of the light. Strongly expressed or ambient, again the choice is ours. Combinatorics is the basic model of thought which is the starting point for the function called switch. The small closed functional format should be boldly worn in a different stylistic interior expression.

A complete view of the whole concept is the elaboration of pure geometric shapes where serious attention is paid to the compositional solution, i.e., the idea that with one line everything can be achieved, broken down into a pure function which in a small, closed format in strictly defined dimensions. Design is art or procedure to display an idea, function, or way of working on a certain object, through a drawing.

Product development is represented by the conceptualization, design, and marketing of newly created products, as shown on Figure 1. The whole presentation is conceptual solutions for switches and different variations that are presented in interiors with Renaissance admixtures to show the impact of small segments with a large function that in our opinion should be small modern relief surfaces.

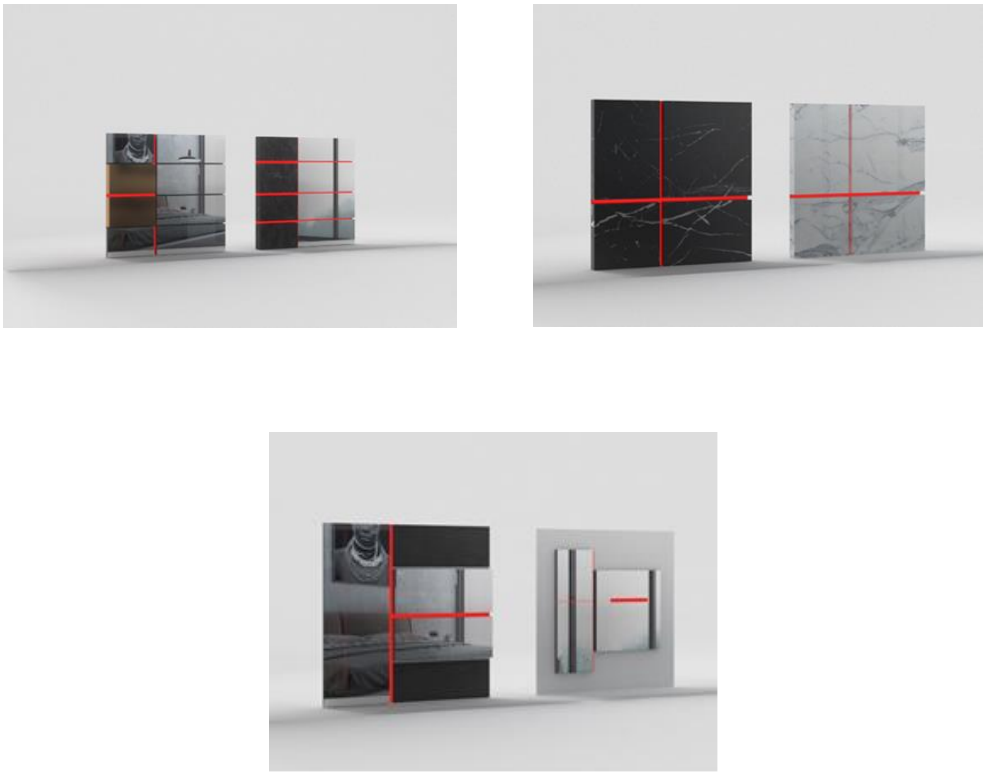

Figure 2. Concepts of switches
(*https://www.canvarto.at/en/pg/canvas-prints/p/modern-4-piece-canvas-print-red-frames-222300*)

Combinatorics is an expression in switches where there are light sources to combine primitives with the possibility of many variations.

Their division should be in the category of switches for residential and residential buildings where they should not be neglected in space, on the contrary, they should emphasize a sophistication that should be possessed by the buyer.

As part of the whole way, it is stated that the textures where the roughness is expressed should be used in the universal design, i.e., people with a high percentage of impaired vision.

The choice of materials according to your choice can be adjusted, but at the same time we wanted to play with the expression of the forms from the 60s of the last century in one of the solutions and the combination with the new futuristic materials that would initiate a completely different approach to switches.

6 Conclusion

Good and successful design start with a big concept. So, what happens if you have a visionary spirit is crucial for the designer. The designer must know the process of creating the concept.

The creation can be perfectly shaped but if there is no message, i.e., if it does not communicate with the customers in the right way, the creation will not be successful and will meet the needs of the target group. One of the most accurate and well-established definitions of design is that design is the shaping of objects and environments that meet human needs. The keyword of the definition is needed. Product design represents the process of efficiently and effectively generating and developing ideas to create new products.

Product design includes all the engineering and industrial work that goes into the development of a product from the original idea to its production. The goal is to get a product that meets the functional and aesthetic requirements, while being economical to produce and explaining that the small details called a serious function are part of the great architecture.

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