

EDULEARN²³

**15TH INTERNATIONAL CONFERENCE
ON EDUCATION AND NEW LEARNING
TECHNOLOGIES**

**PALMA (SPAIN)
3RD-5TH OF JULY, 2023**



CONFERENCE PROCEEDINGS



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Published by
IATED Academy
iated.org

EDULEARN23 Proceedings

15th International Conference on Education and New Learning Technologies
July 3rd-5th, 2023
Palma, Spain

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DOI: 10.21125/edulearn.2023
ISBN: 978-84-09-52151-7
ISSN: 2340-1117

Book cover designed by J.L. Bernat

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These proceedings are published by IATED Academy. The registered company address is Plaza Legión Española 11, 46010 Valencia, Spain.

Bibliographic Information

Book Title 15th International Conference on Education and New Learning Technologies	Book Series EDULEARN Proceedings	Editors Luis Gómez Chova Chelo González Martínez Joanna Lees
Publication Year 2023	Publisher IATED Academy	Publisher Address Valencia, Spain
Book ISBN 978-84-09-52151-7	Series ISSN 2340-1117	DOI 10.21125/edulearn.2023
Conference Name EDULEARN23	Dates July 3rd-5th, 2023	Location Palma, Spain
Copyright Information This work is subject to copyright. All rights reserved.	Topics Education Educational Research Educational Technology	

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Preface

Welcome to the conference proceedings of EDULEARN23. This compilation of papers and research findings were written by a diverse array of education experts and scholars who participated in the 15th EDULEARN conference, held in Palma, Spain from the 3rd to the 5th of July 2023. The conference brought together academics and researchers from the field of education to exchange knowledge, inspire new ideas and share their insights.

The theme of EDULEARN23 covers the fields of education and educational research. EDULEARN23 provided different keynote speeches, parallel thematic sessions, networking activities, workshops, and interactive sessions. The extensive number of international experts who attended the conference allowed attendees to network and share innovative ideas, promoting cross-country collaboration. The keynote speeches are available at IATED Talks (iated.org/talks/).

The EDULEARN23 Proceedings, which are exclusively in English, include the accepted contributions presented at the EDULEARN Conference, which will be included in the IATED Digital Library (library.iated.org). They represent the collective efforts of the authors to advance knowledge in their field. The EDULEARN23 International Program Committee is composed of lecturers and researchers from many different countries. A blind peer review process was followed in order to guarantee the quality and relevance of the final publication. During this process, the following points were evaluated: information content, relevance to the educational field, general structure, clarity of contents, originality, and relation to the conference topics and disciplines.

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We extend our sincere gratitude to all the authors who submitted their valuable work to these EDULEARN23 Proceedings. We also wish to express our gratitude to all participants and attendees for their engagement, dedication, and passion for education.

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EDULEARN23 Keynote Speakers

Keynote Speakers

Ashok K. Goel – *Georgia Institute of Technology, United States*

Donald Clark – *Wildfire, United Kingdom*

Ashok K. Goel – Georgia Institute of Technology (USA)



*Keynote speech:
Teaching and Learning in the Age of AI*

Millions of adults of various ages need reskilling and upskilling in our technological society. These millions of adult learners offer a new, large, and diverse challenge to education. Given that many adult learners cannot leave their jobs or families, online education offers a medium for reaching them where they live and work. Online education also provides access to unprecedented amount of data on learners and learning. Our vision at the National AI Institute for Adult Learning and Online Education (AI-ALOE) is to develop novel AI cognitive assistants that work with this data to enhance the quality of adult online learning through personalization of learning. Successful realization of this vision requires progress on understanding the motivations, needs, and capacities of adult learners, participatory design of AI cognitive assistants, human-AI collaboration, large-scale learning analytics, and an infrastructure for deploying the AI cognitive assistants, collecting and analyzing the data on learning, and feeding the results to the cognitive assistants, teachers, and learners alike. I will describe the research program at AI-ALOE in some detail.

Biography:

Ashok K. Goel is a Professor of Computer Science and Human-Centered Computing in the School of Interactive Computing at Georgia Institute of Technology, and the Chief Scientist with Georgia Tech's Center for 21st Century Universities. For more than thirty-five years, he has conducted research into cognitive systems at the intersection of artificial intelligence and cognitive science with a focus on computational design and creativity. For the last decade or so, much of his research has focused on AI in education and education in AI. He is a Fellow of AAAI and the Cognitive Science Society, an editor emeritus of AAAI's AI Magazine, and a recipient of AAAI's Outstanding AI Educator Award. Ashok is the Executive Director of the recently established National AI Institute for Adult Learning and Online Education.

Donald Clark – Wildfire (UK)



*Keynote speech:
AI changes everything!*

Generative AI will change the way we work, therefore what, why and how we learn. Its profound impact on both work and learning will be presented showing that the consequences are both profound and unexpected. The role of the teacher and upskilling will also be explored.

Biography:

Donald Clark is a Learning Tech Entrepreneur, CEO, Researcher, Blogger and Speaker. He was CEO and one of the original founders of Epic Group plc, which established itself as the leading company in the UK online learning market, floated on the Stock Market in 1996 and sold in 2005. He has been involved at all levels of investment – angel, VC, growth, PE and IPO. As well as being the CEO of Wildfire an AI learning company, he also invests in, and advises, EdTech companies.

An investor and board member of learning companies Cogbooks (sold in 2021 to Cambridge University) and Learning Pool (sold 2021 for \$200 million), he was also on the Boards of City & Guilds, Learn Direct, University for Industry and the Brighton Dome and Festival. Wildfire delivers AI products and consultancy. He has published 3 books, the first on AI, second on Design for technology and the third, published next month on Learning Technology. His fourth book on Learning in the Metaverse has just been commissioned.

Donald has over 37 years' experience in online learning, video, games, simulations, adaptive, chatbot, social media, mobile learning, virtual reality and AI projects. He has designed, delivered and advised on online learning for many global, public and private organisations. An evangelist for the use of technology in learning, he has won many awards, including the first 'Outstanding Achievement in E-learning Award' and 'Best AIM Stock Market Company', 'Most Innovative Online Product', 'Best Online Learning Project and 'JISC EdTech Award'.

An award winning speaker at national and international conferences, he has delivered keynotes in the UK, Europe, US, Africa, Australia, Middle and Far East.

..... also a regular blogger (15 years+) on learning technology.

Conference Tracks & Sessions

The EDULEARN23 conference program is available online at <https://iased.org/edulearn23>

ORAL SESSIONS MONDAY

Technology-enhanced Learning
Computational Thinking Skills for the Digital Age
Soft Skills & Socio-Emotional Learning
Adapting Education in the Post-Pandemic Era
Programming and Computer Science Education
Experiences in Primary & Secondary Education
Experiences in Tourism Education
Technology-Enhanced Mathematics Education
Virtual Reality in Education
Creativity & Critical Thinking
Assessment and Evaluation Strategies (1)
Impact of COVID-19 on Education
Integrating Robotics and Programming in Educational Settings
STEM Education in Schools (1)
Technology-enhanced Language Learning
Teaching STEM Subjects
Generative AI for Innovative Teaching and Learning
Game-Based Learning
e-Assessment
Innovative Tools for Learning
Experiences in Engineering Education
Inclusive Education
Language Teaching and Learning
Experiences and Innovations in Mathematics Education (1)
AI in Education
Project and Problem Based Learning
Assessment and Evaluation Strategies (2)
Videos for Learning
Digital and Media Literacy
Supporting Special Education
English for Special Purposes & English as a Medium of Instruction
Experiences and Innovations in Mathematics Education (2)

POSTER SESSIONS MONDAY

Pedagogical Innovations and Trends in Education
Emerging Technologies in Education

ORAL SESSIONS TUESDAY

Social Media & Digital Skills
Plagiarism and Academic Dishonesty
e-Portfolios & Reflective Assessment
Experiences in Higher and Further Education
Professional Development of Teachers (1)
Student and Teacher Wellbeing
Experiences in Business Education
Service Learning & Community Engagement
Integrating Virtual Reality in Education
Learning Analytics (1)

International Projects & Mobility Experiences
Workplace & Lifelong Learning
Professional Development of Teachers (2)
Student Support
Experiences in Health Sciences Education
Education for Sustainability (2)
Virtual & Augmented Reality
Learning Analytics (2)
Active and Experiential Learning
Internships and Work-integrated Learning
ICT Skills among Teachers
Educational Management (1)
New Technologies in Health Sciences Education
STEM Education in Schools (2)
m-Learning
e-Learning Experiences
Gamification and Game-Inspired Learning
Personalized and Self-Regulated Learning
Teacher Training
Educational Management (2)
English as a Foreign Language
Innovations in STEM Education
Chatbots & AI in Education
From Face-to-Face to Remote Learning
Blended & Hybrid Learning
Entrepreneurship Education
Pedagogical Innovations
University-Industry Cooperation
Education for Sustainability (1)
Professional Development of STEM Teachers

POSTER SESSIONS TUESDAY

Experiences in Education
New Challenges in Education and Research

VIRTUAL SESSIONS

DIGITAL TRANSFORMATION OF EDUCATION

Data Science & AI in Education
Learning Analytics & Educational Data Mining
Digital Transformation
Digital and Media Literacy
Educational Programming & Robotics
Computer Games and Educational Software

INNOVATIVE EDUCATIONAL TECHNOLOGIES

AI, Chatbots & Robots
Virtual & Augmented Reality
Social Media in Education
Technology Enhanced Learning
Videos for Learning
Simulation & 3D Technologies

DIGITAL & DISTANCE LEARNING

Distance Education in COVID-19 Times
Challenges and Practices during the Pandemic and Beyond
Blended & Mobile Learning
Open Educational Resources
Learning Management Systems & Virtual Learning Environments

ACTIVE & STUDENT-CENTERED LEARNING

Gamification & Game-based Learning
Experiential & Cooperative Learning
Problem & Project-Based Learning
Flipped & Hybrid Learning
Pedagogical Innovations
Creativity & Critical Thinking

ASSESSMENT, MENTORING & STUDENT SUPPORT

Assessment & Evaluation
Mentoring & Tutoring
Student Support & Motivation
Developing Soft and Transversal Skills

TEACHER TRAINING & ED. MANAGEMENT

ICT & Digital Skills
Professional Development of Teachers
Educational Management

QUALITY & IMPACT OF EDUCATION

Quality in Education
Experiences and Challenges in Curriculum Design
Sustainability & Social Impact of Education
Links between Education and Research
University-Industry Collaboration
Mobility & International Projects

EDUCATIONAL STAGES & LIFE-LONG LEARNING

Early Childhood & Primary Education
Vocational Education
Transition to the Job Market & Entrepreneurship
Life-Long & Workplace Learning

MULTICULTURALITY & INCLUSION

Multicultural Education
Diversity Issues
Special Educational Needs
Inclusive Education

DISCIPLINE-ORIENTED SESSIONS

Architecture & Interior Design Education
Health Sciences Education
Computer Science Education
Business & Tourism Education

LANGUAGE LEARNING AND TEACHING

Foreign Languages
Language Learning & Translation Studies
New Technologies in Language Learning

STEM EDUCATION

Mathematics & Statistics
Engineering Education
STEM Experiences

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PACKAGING DESIGN AS A CONTAINER OF COMPLEXITY: DEFINITION OF PRACTICAL FRAMEWORK FOR A CO-DESIGN PROCESS

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Abstract

The period of technological and generational transition that the manufacturing world and beyond is witnessing represents a growth opportunity for companies, which are called upon to constantly adapt to an increasingly fluid and dynamic system. The speed of these changes necessitates a change of perspective, that is, a shift from the pursuit of rigid and well-delineated plans to the adoption of dynamic and adaptive strategies that can accommodate and synthesize the challenges that the market presents to companies. In this context, design presents itself as a discipline capable of managing the complexity of a project, strategically bringing in valuable resources for different realities. Its approach within a company makes it possible to establish a design culture capable of observing the development of new products and services from multiple points of view, in order to enable - on the part of the end user - an increase in the company's perception and its products on the market. Among the products that best embody this complexity and dynamism, packaging certainly plays a prominent role. In its apparent simplicity, it represents one of the first touchpoints with which the company interfaces with the user of the contained product. It can be considered an industrial product, the design of which must meet the criteria of ergonomics and usability. Today more than ever, its design represents a strategic asset to increase the perceived quality of a company in the market. The application of the typical methodology of design, during the design process of a packaging, is therefore essential to establish moments of dialogue and confrontation between the different players and to experiment with new meanings and new forms of communication "of" and "about" the product.

Design becomes, therefore, the guarantor of a fluid process, managed with different players, to bring innovation in increasingly complex systems-products: the new relationships that are activated between different stakeholders become the strategic asset to compete in open markets. In such a scenario, the conversation between corporate reality and academia can trigger significant innovation processes. From the fruitful conversation between two distinct realities can arise approaches that are able to lead the company toward new design processes that create innovative and disruptive products/services, while, on the other hand, they can enable the academy to apply the design methodologies developed during the research that is carried out internally, obtaining feedback from the professional sector.

Through a shared project management process, design is able-through moments of confrontation and co-creation to generate consensus at every stage of project development. These "co-design" practices represent real training tools to bring those business realities that do not have an in-house design center closer to innovation processes. The objective of this paper is to verify, through the case study of Comelit S.p.a, how academic methodologies can bring systemic change within the corporate culture, creating new value and dictating useful guidelines for the development of an internal research center. Thanks to joint research work between corporate reality and the Polidesign, consortium of the Politecnico di Milano, the co-creation of a design method was shaped and then translated into the practical dimension in a new packaging model.

Keywords: Synergy, innovation, codesign, university/industries, technology transfer, pre-competitive research.

1 INTRODUCTION

The speed of increasingly sharper generational changes, coupled with a greater fluidity of ever-evolving technological progress, presents companies with a changing and dynamic complexity [1]. Indeed, many firms are seeking to innovate their products and services in order to identify new market opportunities [2]. Through various processes within the production realities, brainstorming activities are initiated that address new design opportunities and bring into play the different capabilities of each member of the organization. However, a major problem is found in the lack of professional figures trained in the design culture of design [3]. For example, the absence of a design centre within the company makes the design of new products-and their entire ecosystem difficult to approach. For this reason, many companies

interfacing with these problems seek partnerships and collaborations with universities [4], which, thanks to versatile and innovative approaches, seem to be able to provide the right support in manufacturing [5]. In this sense, the discipline of design can optimally manage the complexity and dynamism of a project [6]. Through a cross-disciplinary approach and by fostering a multidisciplinary dialogue, the role of the designer is well suited to manage "ill-defined" problems [7] resulting in a strategic asset for different business realities that are interested in the search for new strategies to make innovation. The design approach enables the establishment of a design culture capable of observing the development of new products and services from multiple points of view, to enable - on the part of the end user - an increase in the company's perception and its products in the market. The purpose of the paper is to describe the actual innovation brought by a project that adopts typical design strategies, focusing on the collaboration between the corporate reality and the academic environment, which aims to identify new market niches. This strategy is based on a research method typical of the design discipline, which involves different stakeholders from the earliest project steps through the creation of workshops, designing a dynamic and resilient schedule. In this regard, the case study of a joint research work between Polidesign, consortium of Politecnico di Milano, and Comelit s.p.a, an Italian multinational in the field of video door entry systems, is presented, with the aim of integrating an approach derived from human-centered design (HCD) in the development of innovative products [8]. This collaboration has the aim of bringing innovation to the company through the application of design and, by establishing methodologies increasingly related to this discipline, aims at the creation of an in-house design center in Comelit that would act as a core unit for all-round research and development activities. Having to structure a new approach and research methodology, the phase of identifying market trends and studying the end user required special attention. Through the use of an HCD-oriented approach, the project focused on creating new packaging that would be consistent with the needs of end users and, at the same time, in line with the ideals of "closeness, care, and quality" of the company's vision. The key drivers, within which the design activity took place, can be divided into four: strategy, values, recycling, and product system. The design of new packaging was identified as a key strategic asset for the company, capable of conveying the tangible and intangible values of quality, care, and closeness to the user, already communicated through the products. Through an overall vision and systemic innovation, it is intended to emphasize that attention to the life cycle and the different actors in the product chain, can play a privileged role.

2 SUSTAINABILITY IN PACKAGING DESIGN

Sustainability is strongly connected with product and system innovation [9], which is why more and more companies are seeking this aspect in their offerings. However, it is not always clear how to apply and translate the concept of sustainable development into a system/product [10]. Linked to this concept is the concept of packaging. Indeed, the design of a sustainable product cannot be dissociated from the design of its container. According to Klooster [11], the different functions that packaging must fulfill can be easily encapsulated in 3 macro-categories, namely the concept of protection, transport/distribution, and aesthetic value and use. These are of fundamental importance for the creation of packaging that can broaden the perception of the product contained within it. Today, therefore, it no longer represents a simple graphic and advertising artifact, but its evolution has led it to be considered on a par with an industrial product, the design of which requires knowledge of notions linked to its ergonomics and usability. Increasing awareness of the quality of the products purchased and the evolution of consumer needs have led different companies to consider key aspects such as the sustainability of their product packaging. The strategic importance of focusing on packaging design is justified by the analysis of the target market. This predicts that the annual growth rate for packaging for electronic components, in paper and cardboard, will reach 70% in 2030 [12], underlining the importance at the company level of the role of packaging. Studying the ergonomics of packaging, from the end-user's point of view, is necessary in order to achieve an environmentally, economically, and socially sustainable design output. In this dimension, packaging takes on particular importance as it is considered a product-service capable of shaping new behaviors and increasing user awareness of the various possibilities it contains.

3 METHODOLOGY

The study of the literature and the analysis of the reference markets highlighted which design methodologies were most suitable to achieve the project objectives, addressing a schematic approach to complexity and indicating the most efficient tools to direct the process. In this scenario, a collaboration between actors - who by DNA operate with different methodologies and tools (industry/academia) - is considered a key element for good design. Sanders and Stappers [13] define Co-Design as an act of

collective creativity (between designers and people) applied to the entire design process, involving people directly in the delivery of products, services, etc. The potential of this design practice is represented, on the one hand, by the possibility of aligning ideas and needs of the different participants in the process; on the other hand, by being able to exploit transversal and peculiar competencies according to who is involved in the activities [14]. The methodological process used was of fundamental importance in structuring the joint activity between Polidesign, consortium of Politecnico di Milano and Comelit. The adoption of a shared framework made it possible to identify several salient moments that can be summarized as a research phase, a scenario construction phase, and a final concept design phase (Fig.1). The method adopted during the dialogue between these two realities derives from a punctual reworking of the 'double diamond' model, i.e. a schematization of design thinking first introduced by the British Design Council [15]. It is a re-adaptation of the divergence and convergence model proposed by the American linguist Béla H. Bánáthy in 1996. Through the cross-disciplinary methodology adopted, it was possible to divide the design process into four phases, two of which are convergent and two divergent, leading to the implementation of the final idea [16].

METHODOLOGY

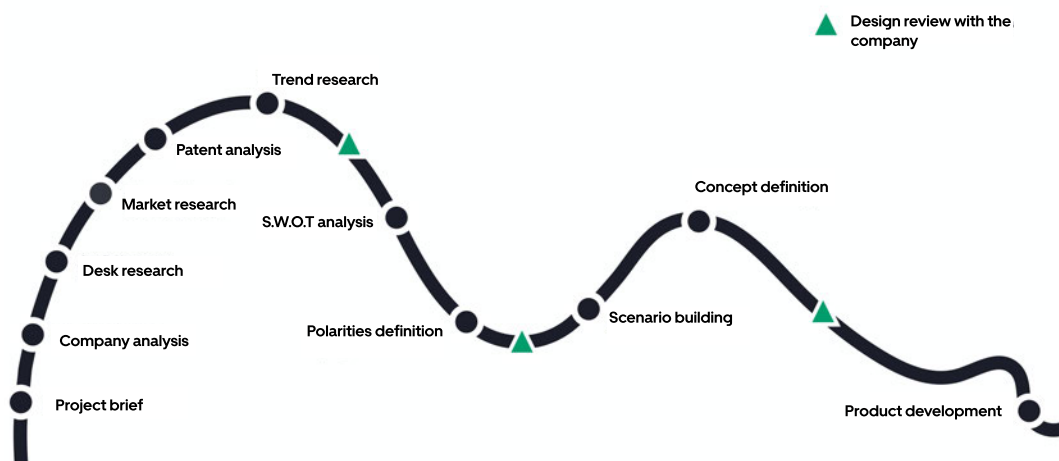


Figure 1. The diagram shows the different project steps, emphasising the moments of codesign with the company (green triangles), in order to give a summary of the project process followed.

3.1 Methodology Phases

3.1.1 Divergent (discovery) research phase

This first phase coincides with the analysis and understanding of the company, its assets, and socio-anthropological trends outside the corporate world, and is characterized by direct observation or through statistical data received during desk research. This first phase started with the company sharing the project brief, followed by internal and external research phases, including the analysis of patents registered in the packaging field.

3.1.2 Data synthesis phase (definition)

We move on to the identification of the company's internal strategic assets and the project opportunities derived from the observation of behavioral patterns or increasing trends. This phase is useful for identifying the 'real problem to be solved' and coincides with the strategic reinterpretation of the brief carried out with the company using the swot analysis tool. This tool made it possible to highlight guiding concepts to serve as a reference during the project activity, identified as polarities.

3.1.3 Conceptualisation phase

Coincides with the scenario building and concept creation phase. It aims, once a clear project framework - scenario - has been identified, to propose multiple solutions without focusing on their actual feasibility in the first instance.

3.1.4 Prototyping phase

The design stage coincides with the refining of the ideas considered most suitable to respond to the company brief. In this design stage, the first product layouts were proposed in order to create an open discussion table with the company.

3.1.5 Application phase

The phase of vertical development and testing on the product and on the various prototypes realized.

This approach made it possible to create moments of confrontation with the various company departments, stimulating constructive dialogue on both the marketing and technical department's sides. The goal of this framework was to achieve effective compromises that made it possible to look at the development of new packaging at a systemic level, combining aesthetic-communicative requirements with ergonomic-functional aspects.

4 RESULTS

4.1 Phase 1: Brief and Research

The starting point for this joint collaboration between Comelit S.p.A and Polidesign, (consortium of Politecnico di Milano) was the sharing of the company's project brief. The latter emphasized the company's desire to embark on a new line of research and development concerning the packaging of its video intercoms. The designated objective for this joint research activity was the practical translation of numerous reflections on the life cycle of packaging as an integral part of the product offering, and its possible interaction with the main supply chain players.

Since the assignment of the brief, the research activity was divided into several sub-phases. A first exploratory round focused on the pre-competitive analysis of the company's assets and the strategic schematization of the company's product portfolio. Through the interpolation of this data, it was possible to identify the type of market favored by the company. Comelit operates in what is defined as the B2B (business-to-business) market, interfacing directly with the major distributors in the sector and installers. The clustering of the reference market made it possible to identify the different products and their packaging, analyzing the design choices made. In this phase, the possibility of observing the different types of packaging at firsthand made it possible to highlight their criticalities and strengths. Among the positive aspects of the packaging system is the strategic use of color as an element of continuity and stylistic uniformity. This design choice made it possible to identify green as the corporate color used for communication, without however supporting the creation of a strong and defined brand identity. The repetition of the company logotype in various positions takes on a redundant character, with the consequence of complicating the reading of the packaging.

The family feeling suggested by the use of the color green is lacking for different types of products but still linked to the B2B market. A strong criticality observed during the field research activity concerns the choice of materials used for the realization of the packaging: the use of air as an insulating material is often substituted by the coupling of inhomogeneous materials, in the name of theoretical better protection. This choice has important implications within the classification of the packaging itself, disfavoring the mono materiality of the latter. All these reflections and observations were collected and summarised during a workshop involving Comelit's various business units. This approach allowed the brief to be multifaceted according to parallel planes of interpretation, considering the different insights obtained in a S.W.O.T analysis. The matrix, used as a guide, made it possible to highlight the strengths and opportunities not yet explored by the company in terms of its design approach to products and the ecosystem that gravitates around them (Fig. 2).

<p>Strengths The recent rebranding operation undertaken by the company, allows it to dare to redesign of a new packaging model</p>	<p>Weaknesses Production dependence on external companies limits the possibility of control over supply chain processes</p>
<p>Opportunities Recognisability and attention to the 'family feeling' between the different video door phones produced</p> <p>Uniformity of the packaging offered by competitor companies</p> <p>Improvement in the recovery of materials used to create the packaging</p>	<p>Threats Minimal end-user appreciation of packaging</p> <p>Stagnating market niche</p>

Figure 2. SWOT analysis template compiled after the first co-design session

4.2 Phase 2: Scenario building and Concept generation

The identification of this salient information, derived from the conduct of the first workshop, made it possible to prioritize the research carried out and define project clusters that summarise the complexity of the project and identify an appropriate strategy. These clusters were defined through the 5 pairs of project polarities: User (Installer / Counterman); Interaction (finished / in progress; durable / temporary; easy to use / easy to dispose of); Technical development (Single-material / separable). The identification of these pairs of adjectives led to a precise definition of the characteristics associated with the world of packaging. The synthesis of the preceding research into project polarities represents a strategic step, which allows us to focus on particular aspects of the process. The adoption of this *modus operandi* created a moment of collective planning within Comelit, allowing the intensive collaboration of different company areas - including the research and development department and the marketing department. What emerged was a systemic interpretation of packaging as an industrial product and the reflections were condensed into the creation of various design scenarios. By means of the concise schematization shown here (Fig. 3), it was possible to compare the various alternatives in a panoramic view in order to investigate the "Help-packaging" scenario.



Figure 3. Scheme scenario matrix generation

The latter, starting with its identifying name, emphasizes a world in which the importance of packaging as the facilitator of end-user activity is emphasized. The first phase of focusing on one scenario led to the identification of six keywords that serve as design drivers for the identification of the first product layouts (Fig. 4). These concepts are called design drivers, as they guide the proposal of the different concepts and, at the same time, are useful tools for discerning the different alternatives presented.

They are :

- Reuse: a design driver that summarises the focus on extending the life cycle of packaging, designing possible secondary uses for the packaging once its primary function has been fulfilled;
- Counter: a keyword that emphasizes the importance of packaging to the salesperson in order to implement the characteristics linked to the on-shelf recognisability of Comelit packaging;
- Installer: driver that intends to enhance the ergonomic and usability features of packaging in order to make the end user's work routine easier;
- Identity: packaging intended as an extreme corporate prosthesis capable of communicating the tangible and intangible values of the products it contains and of the company itself;
- Modularity: a peculiarity that enhances the modular composition of the packaging in order to make it easily reproducible, separable and storable.
- Visibility of content: this characteristic has been identified as a plus that enhances the perception of the contained product, as it is not mediated by illustrated representations, but gives the end user a direct view of the product.

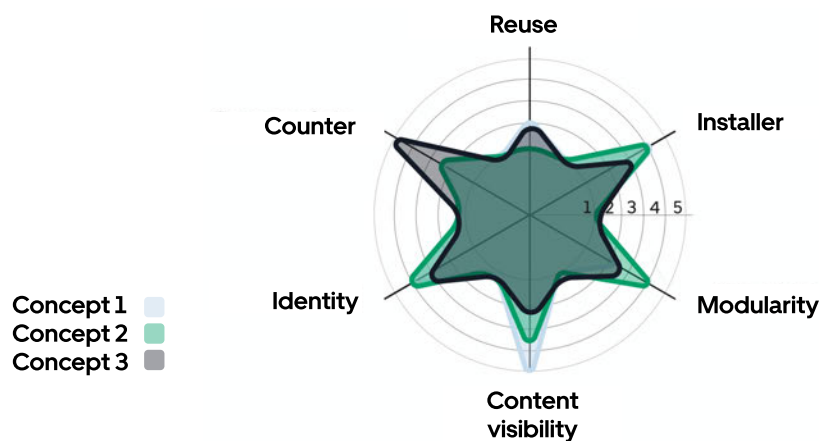


Figure 4. Synthesis of proposed concepts through radar diagram

Thanks to the radar schematization proposed during the co-design moment in the company, it was possible to prioritize and identify the strengths of each of the alternatives advanced.

The result of this co-design exercise led to the hybridization of three different concept proposals, which reason not only on the technical and material innovation of packaging but also take into consideration the ecosystem that gravitates around this product. The first focuses on reducing the material used upstream, seeking to fulfill the protective function of the packaging, exploiting shaped corners and strategic points of the product itself, in order to protect it without concealing its view. The second proposal is a further development of the first concept, focusing on the aspect of modularity. Standardized and equal-sized cardboard templates have multiple pre-cut sections so that individual packages can be adapted to a multiplicity of products. The third proposal takes the concept of 'zero volume' to the extreme by giving the possibility of returning to the two-dimensional configuration once its primary function has been fulfilled. Added to this is the study of minimal graphics placed at strategic points in order to create various shelf patterns, taking into account the possible packaging configurations in the warehouse (Fig. 4). The overlapping of the three advanced concepts led to the definition of an MVP (minimum viable product) characterized by the peculiarities highlighted in the first workshop. These were condensed into the design drivers of Identity, Modularity, and Reuse. This output was achieved by interpolating different visions: the more analytical one, typical of the research and development department, and the more systemic one of the marketing and sales department. The result was crystallised through the creation of a new packaging model, summarising the systemic focus on the different actors in the production chain,

and through the design of an ad hoc tracking system. In addition, the communication aspects were of fundamental importance, to represent a solid corporate image, and the enhancement of the end user, implemented through ergonomic expedients in the geometry of material. The new packaging is made of micro-corrugated cardboard with a nominal thickness of 1.5 mm. Corrugated cardboard actually refers to a family of very heterogeneous materials with different mechanical and physical properties. Micro-corrugated makes it possible to combine discrete mechanical strength with a high degree of printing ease in a single material [17]. The packaging was designed from consideration of the European FEFCO standards [18], looking at the 0509 standard, which identifies a telescopic packaging consisting of two elements, from which it takes its inspiration, defining itself as a carton packaging with dimensions of 180 mm of the packaging.

4.3 Phase 3: Product definition and further development

The hybridization of the three concept proposals led to the definition of a new packaging model. Compared to Comelit's current packaging, it has a strong identity component, aimed at building a solid image, but also a marked focus on the interaction component with the installers themselves. The reflections that emerged during the research phase were materialized in the various design choices implemented, starting with the choice order to give the packaging structural rigidity, a triangular section has been given to the internal structure, which gives it geometric stability and allows the intercom to be disengaged and suspended in several directions. Attention to the life cycle of the product itself has been taken into account from several points of view, trying to minimize the volume of air transported and the amount of paper contained within each package. In fact, much of the volume was reduced by dematerializing paper instruction manuals. A second spin-off of the LCA (Life Cycle Assessment) considerations influenced the visual identity of the packaging. A vehicle of the company vision, it has resulted in the use of minimal graphics, applied at strategic points in the packaging, in order to create bi-colored patterns and with reference to Comelit's logo [19].

The innovation of this type of packaging does not only reside in the dimension of the individual product but also brings change at a systemic level. Packaging becomes the promoter of new communication between the different players in the supply chain. This servitization of an asset of its own allows Comelit to offer a new ad hoc monitoring service, with the aim of closing and monitoring the circle of packaging materials and promoting a recovery economy. The practical translation of these reflections came to life through proposals for interactive dashboards that could make the various players in the production and recovery chain visualize the quality and quantity of materials produced, used, and discarded.

5 CONCLUSION

The joint work between Comelit and Polidesign, consortium of the Politecnico di Milano, has led to the definition of a new packaging model for the company. The fruitful dialogue between these two realities made it possible to develop a brand new project for the company and at the same time to confirm the effective dialogue between the academic and production worlds, in which design plays a key role, as a strategic lever and activator of relationships that bring new values and meanings.

The management of this shared project has led to greater dialogue within the company, allowing the project specifications to be faceted according to different planes of interpretation. The complexity brought about by the multiple interpretations has in fact made it possible to manage the evolution of the design process through the creation of value by all the players who, in a structured and constructive manner, have built a new meaning for the entire product system. But that is not all. The process (Fig.5), mediated by designers, has guided the company towards the adoption of a more human-centered point of view, which brings with it a more careful qualitative analysis of the users and the target market [20]. And all these elements become guidelines for a new way of doing innovation within the company: the approach adopted has in fact made it possible to lay the foundations for the creation of a design center, which can act as a research center, but at the same time represent a pole capable of adding value to the company's projects. The desire to create an in-house research center testifies to how fruitful the collaboration with the university has been, to the point of creating an in-house body for design support and all-round technological scouting, which can be independent of the existence of future collaborations.

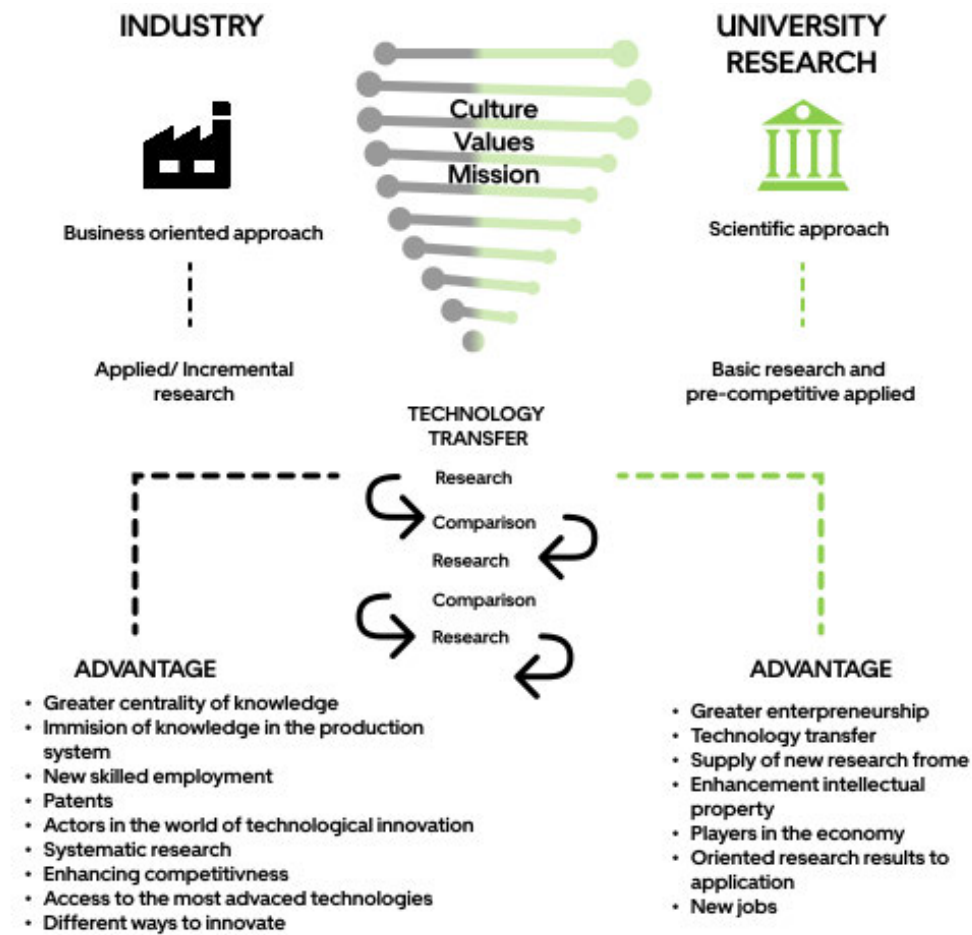


Figure 5. Industry-company collaboration scheme

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