iCERi 2023

16TH INTERNATIONAL CONFERENCE OF EDUCATION, RESEARCH AND INNOVATION

CONFERENCE PROCEEDINGS

13-15 NOVEMBER 2023
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ICERI2023 Proceedings
16th International Conference of Education, Research and Innovation
November 13th–15th, 2023
Seville, Spain

Edited by
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Book cover designed by J.L. Bernat

Bibliographic Information

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Preface

The ICERI2023 Conference Proceedings contain the papers presented at the 16th annual International Conference of Education, Research and Innovation, which took place in Seville from the 13th to 15th of November 2023.

ICERI is an annual event whose aim is to provide a platform for lecturers and to share valuable research and information about education, pedagogical technologies, and educational innovations. This year, participants from over 80 countries took part in networking activities, plenary sessions, parallel thematic sessions and workshops. Keynote speeches were delivered by global educational experts. You can see their talks at IATED Talks (iated.org/talks/).

ICERI2023's focus included the following topics: Pedagogical Methods and Innovations, Technology in Teaching and Learning, Inclusive Learning, Special Education, Emerging Technologies in Education, International Cooperation, Teacher Training and Educational Management, Curriculum Design, Accreditation and Quality in Education, University-Industry Cooperation and Open Educational Resources.

The ICERI2023 International Program Committee is composed of lecturers and researchers from all around the world. A blind peer review process was followed to guarantee the quality of the final publication. During this process, the following points were evaluated: the content, relevance to the field, general structure, clarity of contents, originality, relation to the conference topics and disciplines.

ICERI2023 aims to publish conference proceedings which contain high-quality original research articles, meeting the expected ethical standards. The copyright transfer form was signed by all authors featuring in these Proceedings. IATED guarantees the high technical and professional quality of the publications, and that good practice and ethical standards are maintained. More information about our publication ethics is available at: https://iated.org/publication_ethics.

Lastly, we wish to extend our most sincere thanks and best wishes to all members and delegates who have contributed to the ICERI2023 Proceedings.

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ICERI2023 Keynote Speakers

Cristobal Cobo – Senior Education Specialist (Chile)

Keynote speech:
Unlocking the Potential: How Can Higher Education Lead the Way in a Changing World?

In the post-pandemic world, higher education institutions have a new, crucial role to play in addressing the global "poly-crisis," which includes climate change, demographic transformations, and the automation and datification of education, among other challenges. These challenges raise important questions about the future of higher education. During this presentation, we will explore a series of institutional and interpersonal capacities that need to be developed and consolidated in the context of higher education. These capacities include:

a) Addressing sustainability and climate change literacies as cross-cutting and multidisciplinary capacities embedded in the institutional agenda and future professional development.

b) Reinventing andragogy and hybrid learning for lifelong learners, creating opportunities for individuals of any age or background in a world of increased mobility and expanding life expectancy.

c) Addressing the datification of education and cognitive automation by developing "algorithmic awareness" to navigate a world increasingly filled with smart technologies, which brings both opportunities and challenges.

Thriving in future-proof higher education institutions will be the result of proactively responding to the global poly-crisis and facing major disruptions. Universities are more crucial than ever, and reflecting on these challenges will be instrumental in shaping their future.

Biography:
Cristobal Cobo (PhD) is a Senior Education Specialist (Technology). He served as the founding Director of the Center for Research - Ceibal Foundation in Uruguay from 2014 to 2019. He is also an associated researcher at the Oxford Internet Institute, University of Oxford, from 2009 to 2019. Cobo works at the intersection of the future of learning, a culture of innovation, and human-centered technologies. Cristobal has been distinguished by the British Council of Economic and Social Research (ESRC) and is an associate research fellow at the Centre on Skills, Knowledge, and Organizational Performance, University of Oxford. He was a professor and director of Communication and New Technologies at the Latin American Faculty of Social Sciences, Mexico.

He has served as an external evaluator for the Inter-American Development Bank, the National Science Foundation, and MIT Press (US), the International Labour Organization (UN), and the International Development Research Centre (Canada). He holds a PhD in Communication Sciences from Universitat Autònoma de Barcelona, awarded "cum laude". His latest book, edited with Axel Rivas, is "The New Digital Education Policy Landscape: From Education Systems to Platforms" (Routledge, 2023). Previously, he wrote "I accept the terms and conditions: Uses and abuses of digital technologies" (in Spanish, Portuguese, and English) published by Santillana in 2019, "Innovación Pendiente" (Penguin Random House, 2016), and "Invisible Learning" with John Moravec (Universitat de Barcelona, 2011). He has been a speaker in more than 30 countries, including 4 TEDx events.

Currently, Cristóbal Cobo is a Senior Fellow for The Inter-American Dialogue. He has been featured in CNN, Deutsche Welle, El Pais, Le Monde Diplomatique, the Wall Street Journal, and the World Economic Forum.

Pooja K. Agarwal – Berklee College of Music in Boston, Massachusetts (USA)

Keynote speech:
Teaching might be an art, but learning is a science!

Dr. Pooja K. Agarwal shares practical teaching strategies—based on 100 years of research—that dramatically improve student learning. Equipped with scientific knowledge and evidence-based tools, turn your teaching into POWERFUL teaching and unleash the science of learning in your classroom.

Biography:
Pooja K. Agarwal, Ph.D., is a cognitive scientist, conducting research on how students learn since 2005. She is the author of the book Powerful Teaching: Unleash the Science of Learning and an Assistant Professor of Psychology at the Berklee College of Music in Boston, teaching psychological science to exceptional undergraduate musicians. Dr. Agarwal is also the Founder of RetrievalPractice.org, a source of research-based teaching strategies for more than 15,000 teachers around the world.

Dr. Agarwal's research has been published in leading peer-reviewed academic journals; featured in The New York Times, NPR, Scientific American, and Education Week; recognized by the National Science Foundation; and highlighted in numerous books, podcasts, and videos.

Dr. Agarwal received her Ph.D. from Washington University in St. Louis. Her love of learning formed at the outset of her career as a 4th and 5th grade teacher in St. Louis, Missouri.

Website: retrievalpractice.org
Twitter: @RetrieveLearn

Conference Tracks & Sessions

The ICERI2023 conference program is available online at https://iated.org/iceri2023

ORAL SESSIONS MONDAY

Immersive Experiences
Internships and Work-integrated Learning
Curriculum Design Experiences
Access (and Barriers) to Education
Hybrid & Blended Learning
Workplace & Vocational Training
Student Engagement and Motivation
Multilingualism and Language Learning
Architecture and Design Education (1)
Research on Virtual & Augmented Reality in Education
Virtual & Augmented Reality in Vocational and Workplace Learning
Pedagogical Innovation and Research
Educating Individuals with Intellectual Disabilities
Personalized Learning Environments
Continuous & Life-Long Learning
Student Support
Language Learning Experiences
Architecture and Design Education (2)
Virtual & Augmented Reality Educational Best Practices
University-Industry Cooperation
Educational Leadership and Management
Inclusion of Learners with Disabilities
Learning Analytics
Life-Long Learning
Student Health and Wellbeing
Education for Sustainability
New Technologies in Architecture & Design Education
Virtual & Augmented Reality in Health Sciences Education
Game-Based Learning
Professional Development of Teachers (1)
Inclusive Education
MOOCs & Open Educational Resources
Lifelong Learning, Work-integrated Learning, and Higher Education in a Digital Era
Students and Teachers Wellbeing
English as a Foreign Language
Arts & Humanities Education

POSTER SESSIONS MONDAY

Pedagogical Innovations and Trends in Education
Emerging Technologies in Education

ORAL SESSIONS TUESDAY

AI in Education (1)
Assessment and Evaluation Strategies (1)
Quality in Education
Diversity and Equity in Education
Mobile and Multimedia Learning Experiences
Gamification
Service Learning

Robotics Education
Computational Thinking & Coding Skills
Generative AI Experiences in Education (1)
Assessment and Evaluation Strategies (2)
Professional Development of Teachers (2)
Inclusion of Refugees and at-Risk Students
Online Learning Experiences (1)
Developing Soft Skills
Project and Problem Based Learning
Emerging Technologies in Engineering Education
Programming in Higher Education
AI in Education (2)
e-Assessment
Pre-service Teachers
International Cooperation
Digital Literacy
Creativity & Design Thinking
Active Learning in Engineering Education
Mathematics Education
Computer Science Education
Generative AI Experiences in Education (2)
Mentoring & Tutoring
ICT Skills among Teachers
Lessons learned from the COVID-19 pandemic
Innovative Tools for Learning
Pedagogical Innovations
Active & Experiential Learning
Teaching Mathematics
Active Learning in STEM
AI in Education (3)
Student Selection and Admission
Professional Development of Teachers (3)
University and Society
Online Learning Experiences (2)
Exchange and Mobility Programmes
Early Childhood Education
Flipped Learning
Teaching STEM

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 Technologies and Resources for Learning under Lockdown
Digital Transformation
21st Century Skills
Educational Programming & Robotics

DIGITAL & DISTANCE LEARNING
Distance Education in COVID-19 Times
Blended & Mobile Learning
e-Learning Experiences
Learning Management Systems & Virtual Learning Environments
Post-Pandemic Scenarios in Education

INNOVATIVE EDUCATIONAL TECHNOLOGIES
AI, Chatbots & Robots
Virtual & Augmented Reality
Social Media in Education
Technology Enhanced Learning

TEACHER TRAINING & ED. MANAGEMENT
ICT & Digital Skills
Pre-service Teachers
Professional Development of Teachers
Educational Management

ACTIVE & STUDENT-CENTERED LEARNING
Gamification & Game-based Learning
Problem & Project-Based Learning
Flipped Learning
Collaborative & Team-based Learning
Active & Experiential Learning
Pedagogical Innovations

QUALITY & IMPACT OF EDUCATION
Quality in Education
Experiences and Challenges in Curriculum Design
Sustainability & Environmental Awareness
University-Industry Collaboration
Social Impact of Education
Education and Research

EDUCATIONAL STAGES & LIFE-LONG LEARNING
From Pre-school to Secondary Education
Transition to the Job Market
Developing Entrepreneurship in Education
Life-Long & Workplace Learning

MULTICULTURALITY & INCLUSION
Multicultural Education
Diversity Issues
Special Educational Needs
Inclusive Education

ASSESSMENT, MENTORING & STUDENT SUPPORT
Assessment & Evaluation
Mentoring & Tutoring
Developing Soft and Transversal Skills
Student Support & Motivation
Student Wellbeing

STEM EDUCATION
Mathematics & Statistics
Engineering Education
Computer Science Education
STEM Experiences

LANGUAGE LEARNING AND TEACHING
Foreign Languages
New Technologies in Language Learning
Language Learning & Translation Studies

DISCIPLINE-ORIENTED SESSIONS
Architecture & Interior Design
Health Sciences Education
Business and Marketing Education

STRATEGIC DESIGN FOR UNIVERSITY-INDUSTRIES COOPERATION FOR A COLLABORATIVE NETWORK DEVELOPED THROUGH WORK-BASED LEARNING AND KNOWLEDGE SHARING

D. de Spirito, G. Pontillo, I. Fiesoli, G. Lotti

University of Florence (ITALY)

Abstract

This contribution reflects upon the complex relationship between University and Enterprise, understood as the world of Research and Industry. It seeks to understand the real base to organise this interaction so that it can create a dynamic and continuous transfer responding not only to the needs of all users involved but also to current and future challenges. In this way, research leads us to understand the importance of this territorial network, capable of fostering processes of innovation and highly qualified work, between the academic, training and business worlds. Furthermore, we also dwell on which approaches and methods, typical of the discipline of Design, can contribute to cooperation between the different nodes and users, from students to entrepreneurs. Specifically, the discipline of Design - given its nature and capacity for mediation - could play the role of providing the appropriate tools, such as to guarantee concrete continuity in this interchange and positive territorial spin-offs, thus also triggering social changes. In order to show the concrete effects of these reflections and the methodologies used to make them concrete, this contribution mainly analyses two case studies: the first is a strategic hub project *NOTLab - Network of Living Laboratories for materials* (University of Florence, Department of Architecture); the second is SMOX® - a smart container for the transport of biosynthetic matrices in the health sector.

Keywords: knowledge sharing, networking, strategic design, co-design, Industry 5.0, work-based learning, collaborative system, research and development, active cooperation.

1 INTRODUCTION

The collaboration between University and Enterprise, between the world of Research and Industry needs a solid systemic structure and active communication in order to transfer dynamic and beneficial connections for multiple purposes. Analysing and improving the interactions, between University and Enterprise, can become the strongest point to develop a network capable of fostering innovation processes (transfer from research to application) and highly qualified work (transfer from training to practice) that are continuous over time and therefore not limited to a single project phase [1]. The main objective is to move Enterprise and University from an individualistic to a cooperative approach, and we ask ourselves what the role of the designer can be in facilitating this process. We also dwell on which approaches and methods, typical of the discipline of Design, can contribute to cooperation between the different nodes and users (students, researchers, professionals, collaborators, entrepreneurs). Specifically, could the discipline of Design - given its nature and ability to mediate - play that role in providing the appropriate tools, such as to guarantee concrete continuity in this interchange? The impact of this reticular interchange can generate benefits that involve, from a micro to a macro scale, both the individual user and the entire community for a new idea of university, enterprise, transfer and, above all, can contribute to the achievement of a new model of society. If, for example, we look at European policies, in particular Industry 5.0, we recognise the power of entrepreneurship to achieve social goals and become resilient providers of prosperity by ensuring that the production of goods and services respects our planet and puts the well-being of the worker (human-centric approach) at the centre of the processes, between increasing technological innovation and creative human potential. In order to achieve this widespread well-being, which we could also define as 'social' or even 'global', and to respond responsibly to the emerging challenges, there is an even clearer and more urgent need to make every node active in a continuous system of exchange, connection, collaboration and positive confrontation. In this balancing act, it is a priority to transmit a critical approach - typical of the world of Research - to Business in terms of creativity, sustainability, human dignity, privacy and work ethics in order to be able to respond to the global challenges of the present and the future.

As mentioned in the report '*From Research to Innovation: Exploring the Translation Journey with OpenInnoTrain*', it is not enough to encourage the flow of high-quality research to generate a positive impact and foster societal progress. Rather, it is essential to build mechanisms to exchange knowledge

and promote the construction of beneficial channels for active cooperation between universities and companies [2]. The report emphasises the importance of overcoming institutional and corporate boundaries by activating information flows through processes that unite, not only physically, people (researchers, professionals, companies and entrepreneurs) on the one hand and, on the other hand, the approaches and tools characteristic of their own discipline or work context in order to find a common language and activate an exchange.

By doing so, it is possible to generate monetary and non-monetary benefits, through specialised figures able to disseminate and share results that could be applied. Among these benefits - as we will see in the case studies that follow, thanks to multidirectional and non-linear knowledge flows - is the involvement of the university world and the possibility, for example through students at all levels of further education, to build transfer connections between University and Enterprise. In addition, we take into account the importance of, for example, a specific project phase of research, prototyping and testing. By increasing the flow of relations and interactions, the collaborative relationship with companies could, in a prototyping phase, immediately highlight design discrepancies. In this way, research could also direct companies to new theories, research and visions that would allow the company to present innovative solutions to its target customers [3]. As already mentioned in the introduction, with reference to the Industry 5.0 guidelines, we can see that a highly active role is sought in companies to provide solutions for society, including resource conservation, climate change and social stability [4]. In fact, European policies argue that industry must drive innovation towards the digital and green transition if it is to continue as an 'engine of prosperity'. Industry 5.0, at the same time, aims to go beyond the sole purpose of production. Its aim is to adopt strategies that shift the focus from production value to the value of people and stakeholders, strengthening their role. The red thread of Industry 5.0 is the well-being of the worker as the focus of the production process, thanks to new technologies that will support a human-centred approach. There will be an eco-system that puts people and the planet at the centre and that, thanks to a technological interchange, is able to generate innovation at the service of emerging transitions. We thus see that even European policies, on the wave of innovation, favour a network of people that fosters the work profile of each employee and encourages knowledge flows and exchanges, with the support of digital and technological tools.

Below, we will consider two case studies, which, in a timely manner, will report direct experiences related to the topic of contribution. Firstly, we will analyse *NOTLab Network of living laboratories for materials*, a strategy of competence sharing between territory, education and enterprises. Secondly, we will analyse SMOX® (patent no. IT2020000556), a collaborative project between universities and an innovative start-up for the transport of biosynthetic matrices.

2   METHODOLOGY

In this context, we analyse how co-creation methodologies and tools can be strategic in promoting an open and equal exchange in which all stakeholders are equally involved. This allows, both in the world of research and business, to have a vision based on cooperation and to build shared ideas. As mentioned, the aim is to move businesses and universities from an individualistic approach to a cooperative one through the tools and methods of Design, providing them with a vision and a critical approach, typical of the world of research. University and Enterprise, starting, by nature, from approaches driven by different objectives, need democratic and customisable tools to be able to explore and deepen their fields of reference reciprocally. We have selected, as process drivers, some tools and methods belonging to the Design Discipline - such as, among others: open design, open innovation, co-design, strategic design, design driven, and design for and with territories - as they are able to create an equal dialogue and to develop a shared language that hybridises the competences and points of view of very different actors. These methodologies were combined with needs and requirements that emerged in an initial analysis phase and allowed interactions between the various nodes, belonging to the academic world and the multiple forms of entrepreneurship.

2.1   "NOTLab Network of living laboratories for materials" Case study

Starting from some critical issues that emerged in the field of education, a wide-ranging analysis was activated with regard to the topic of Materials and the need to allow students, enrolled in advanced courses, to deepen their practical knowledge of typical Italian supply chains, more specifically from Tuscany, ranging from wood to ceramics, from crystal to marble. Starting from this context, the research group of the University of Florence, Department of Architecture DIDA activated a first phase of dialogue and analysis with the companies in the area of the Florentine Plain, closely connected to the University

Design Campus (Calenzano, Florence), in order to trace emerging needs and criticalities. At this stage, it was noted that there was little dialogue between the companies belonging to the same territorial context and, therefore, very low exchange flows. Moreover, it was possible to acknowledge the lack of a strategic vision, particularly with regard to the possibility of taking part in a network that would activate new forms of business, the sharing of skills, external collaboration and new corporate visions. It is within this framework that the **NOTLab Network of Living Laboratories for materials** project is set, tracing the need, both for the academic community and for business realities, to create a physical and territorial reference. Therefore, the research group considered the possibility of developing a solution that would respond to the criticality relating to training on the one hand and to those of companies and the territory on the other. Thus, a second research phase began with respect to the needs of the university on one side and of enterprises on the other. The analysis was first carried out on each individual context and then intersections and points of contact between the two worlds were traced. In fact, with a view to the construction of a territorial network, we hypothesised services dedicated to the university community and to businesses and which, at the same time, could put them in contact. Three thematic areas of services were defined: training, support for research and experimentation, dissemination and communication. The company has the opportunity to take part in the network through three types of cooperation with the university, ranging from a standard to an advanced level depending on the number of activities (internships, workshops, talks, in-company experiences) to be carried out within the cooperation programme. In order to allow greater continuity of interaction and connection, a project steering committee was set up through a strategic hub located on the Design Campus (figure 1), which can play a role, firstly as an informant (archive and library), and then as a mediator to foster a direct connection with companies, research centres, craft workshops and associations. On the one hand, we have the designer who guides the strategy for the territory with a design-driven approach, on the other, the community and stakeholders are guided through participatory design and co-design tools.

Thanks to the sharing of skills and the interactions initiated, it is possible to structure a collaborative and interdisciplinary model by placing people at the centre of a shared system.

Figure 1. Hub - NOTLab Network of living laboratories for materials (Calenzano, Italia)

2.2 SMOX® Case study

SMOX® (Smart Box) is the result of a collaboration between local companies and Italian universities, in a research and development project proposed by the innovative start-up Carpitech Srl. The project was conducted in collaboration with various university departments across the country, bringing in transversal competence ranging from IT, materials and telecommunications engineering to biomedicine. These skills were integrated through an interdisciplinary approach that fosters knowledge exchange. In addition, design played a key role not only in the design of the container but also in the management of the conceptual, development and advancement phases of the designed payload, in accordance with the work phases and the state of the art (figure 2)

Figure 2. SMOX® thermo-regulated smart container

SMOX® is an original, patented, and 'smart' payload designed to transport biosynthetic matrices. Its main innovation compared to the state of the art is related to the 'matryoshka' system based on health transport regulations. In accordance with the 'Guidelines for the transport of blood and blood component units and related biological samples', the matrix (e.g. blood) is placed in a primary container (e.g. a test tube). One or more of these primary containers is then placed inside a secondary container, which acts as an interposed envelope between the tube or bag containing the matrix and the tertiary container. The latter is the transport device (e.g. a cooler) generally refrigerated by the insertion of eutectic plates (ice charge) [5].

The design team played a key role in coordinating the different skills and designing a geometry that accommodates the various technological and electronic components. These include a board, a battery for operation during transport, and a temperature maintenance system consisting of a bollard and a Peltier cell, specially designed to ensure the balance of the container despite the weight of the transported components and arrays. The design is ergonomic and lightweight to facilitate transportation by operators. In addition, the secondary container is equipped with a station that allows for stackable storage and refilling of containers at various facilities, such as analytical laboratories (spoke and hub) and hospital pharmacies, ensuring SMOX®'s readiness for use.

The SMOX® secondary container is also equipped with a tertiary container, an ergonomic outer shell designed as a protective capsule that can be easily transported by traditional road transport as well as by innovative and sustainable means (figure 3). Future developments of the project focus on the scalability of the container on different means of transport, such as e-bikes, for which a temperature-controlled container system specifically designed for transport on electric bicycles (Cybell), or medical drones for urban air transport (MUD) [6], is being developed. These projects integrate aspects such as environmental sustainability and the specificities of territorial networks to ensure fair and widespread access to life-saving care and goods in all conditions.

Figure 3. Possible areas of application of the SMOX® project

3 RESULTS

The NOTLab Network currently involves the university community (students, researchers, professors) and various local realities, including research centres, laboratories and enterprises. The control room, the central hub, is managed by young researchers and offers services to the entire network to co-design, test or activate collaborations and new projects between research and industry. The NOTLab is currently characterised by a physical space housing an archive of materials (paper, glass, wood, recycled plastic, metals, ceramics, textiles) (figure 4) and a library enabling students to have a first practical approach to materials, production processes and physical characteristics. The signing of memorandums of understanding with the various types of companies favours the growth of the NOTLab Network, which is increasingly interested in bringing together the various stakeholders, increasing interdisciplinary processes and facilitating interactions (university-enterprise; enterprise-enterprise; university-university; university-territory; enterprise-territory). The NOTLab provides services dedicated to enterprises and students, enabling, for example, the former to learn about new training trends and scenarios through students and the latter to learn about company and business dynamics together with production processes, from concept to realisation.

These services, dedicated to students, explore the world of Materials and Design not only through the central Hub but also through dedicated training opportunities, such as seminars, workshops, laboratory activities and in-company experiences. Thanks to the skills that companies and research centres provide during these meetings, students experience a new learning model. In fact, following the interdisciplinary model, it is possible to get to know professional figures and skills in one big event.

Other types of 'connecting meetings' where students and researchers meet companies are also being tested, such as, for example, the 'career day' - where companies meet students, and vice versa, for possible new jobs - or activities to initiate and support the writing of new research projects (figure 5).

The aim is to develop an increasingly broader and multilevel network involving many different skills, characterised by universities, research centres, craft workshops, companies, territorial facilitators and associations. Finally, the NOTLab wants to be the promoter of a new model capable of feeding itself, thanks to the contribution of each active stakeholder in the network, and able to keep tradition and innovation in an egalitarian, responsible and strategic manner.

The SMOX® project has significant relevance in the context of the reference context as it focused on the aspect of the transported material rather than the simple act of transport itself. In order to achieve this, it was crucial to acquire an in-depth knowledge of the entire integrated healthcare logistics chain, including traditional transport methods, guidelines governing both the containers used and critical parameters such as time and temperature.

The SMOX® project aims to bring healthcare closer to people, especially in high-risk contexts and areas. In conclusion, it is believed that what has been described here contributes not only to enriching the panorama of experiences in the field of healthcare logistics but also to demonstrate the crucial and proactive role that design methods and techniques, in particular design-driven design, can play in the conception and creation of new tools and artefacts.
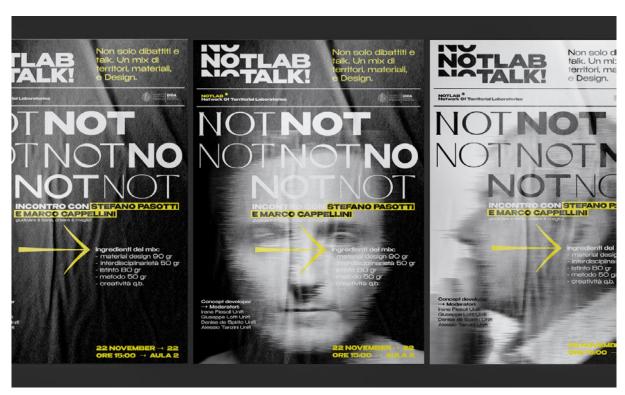

Figure 4. Educational talks organized and events by NOTLab.
The events involve students, companies and professionals.
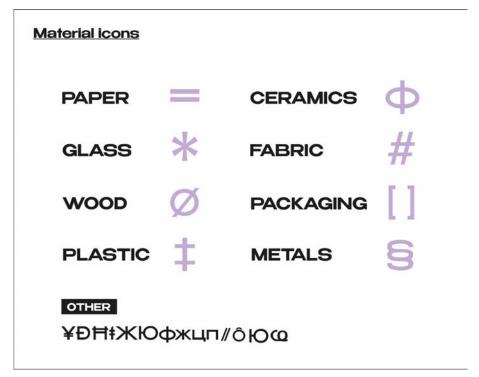

Figure 5. NOTLab, Materials Icons. Study on communication and visual identity,
of each material chain, for the cataloguing of the physical and digital archive.

4   CONCLUSIONS

The overall outcome of the research was the confirmation of how exchange and active co-design are essential for knowledge sharing within complex systems, such as that between research and enterprise. In fact, it is precisely the network connotation that influences organisational, productive and social systems: continuous production, process acceleration, increased productivity, fragmentation and delocalisation of production activities are some of the most evident characteristics [7]. The obtained results indicate that the role of Design, through an interdisciplinary approach, is central.

These results also indicate a poor understanding of the evolution that the discipline of Design has had, which is mainly associated with the industrial product, keeping at the margin advances and changes that have been developed through research and training.

In fact, in addition to the role of designers, emerges the ability to interpret very diversified skills and coordinate different players in all the different project phases (ideation, development, testing and realisation).

On the other hand, the university world does not always recognise and attribute to companies the ability to become providers of prosperity and change not only in entrepreneurial and production terms but also socially, between technological innovation and creative human potential.

There is an urgent need, therefore, to activate more continuous exchange networks and to transmit a critical approach in terms of creativity, sustainability, human dignity and work ethics for a new idea of university, enterprise, transfer and society. The above considerations appear significant for the Italian context, which is traditionally characterised by small and medium-sized enterprises, grouped in districts that with their evolutions - mainly incremental innovation - require specific approaches. In addition, there are specificities in Italy for the development of a more contemporary relationship between businesses and research: points of contact between the territorial model and the circular economy (cf. the PNRR - PE11 Made in Italy Circular and Sustainable project), the role of intermediate structures in technology transfer, interest not only in the product, which has always been central but in the Product System as a whole [8].

A toolkit is currently being designed as a solution and a result of the various research phases that have followed one another. With reference to the toolkit, testing and validation phases are planned to be tackled by the internal research group of Designers and researchers/professors from other departments, in line with the interdisciplinary vision.

Following validation, we will tackle co-design sessions with some companies in order to provide a democratic and customisable tool, thus contributing to an open research vision between companies and universities. Indeed, we are aiming for a tool that can be shared, reinterpreted based on different needs, and disseminated again to the scientific community in order to further consolidate the tool and strengthen its contribution to research.

In addition, it will be important to investigate the aspect of new technologies and digital tools in order to be able to expand the *NOTLab* Network to an ever larger scale of users and, therefore, to connect nodes located in different places in the world thanks to digital and collaborative tools. In fact, we envisage a phase of analysis and experimentation with different digital media and technologies in order to understand which of them might respond positively to the need to extend the Network.

Initial results show us that in order to generate a real positive impact, it is a priority - especially given the local and global challenges we are facing - to design transfer bonds and interactions. A network, a connected and resilient community to try to contribute to the well-being of people and the planet.

- **Companies**
  - *Carta Bianca S.R.L.*
  - *Marioni S.R.L.*
  - *Soldidesign S.R.L.*
  - *Associazione OMA - Osservatorio dei Mestieri d'Arte – OMA*
  - *JDEvents S.R.L.*
  - *Smashing Plastic S.R.L.*
  - *Litocart S.R.L.*
  - *Carpitech S.R.L.*
  - *Nexus TLC*

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