Manual

Art
Science
Technology

N. Castillo-Rutz & P. Purg (eds.)

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Art
Science
Technology

Education for Innovation through Social Values

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& P. Purg

AKADEMIJA UMETNOSTI
SCHOOL OF ARTS

MAST Project - Partners

For more, visit mastmodule.eu/partners/

University of Nova Gorica School of Arts is a higher education institution rooted in the regional environment. It unites the academy with researchers and experts from diverse research departments and external institutions. The School of Arts has successfully led large-scale and award-winning international projects such as ADRIART, HiLoVv, IDEATE, etc.

Madeira Interactive Technologies Institute (M-ITI) is a research and innovation center located in Portugal. This institute has at its cutting-edge core research in the areas of Human-Computer Interaction and Digital Creative Media.

Graz University of Technology (TU Graz) is focused on scientific bachelor programs and research-oriented masters and PhD programs grounded in engineering and science fields. One of its seven faculties, the Faculty of Architecture (FA), centers its instruction on developing spatial solutions and the impact on social dimensions of space.

Kersnikova Institute serves as an institutional frame for three progressive venues: Kapelica Gallery, the hackerspace Rampa, and the BioTehna laboratory. This institute seeks to give contemporaneity form and meaning through the collaboration with international centers dealing with investigative arts, science, and cutting edge technologies.

Culture Action Europe (CAE) is a European network of cultural organizations, artists, activists, academics, and policy-makers. CAE's mission is to raise awareness ,about the contribution of culture to the development of sustainable and inclusive societies by enhancing cooperation and exchange, engagement, and dialogue between various players across the arts and policy sectors.

The Croatian Cultural Alliance (CCA) is a European organization that represents artists, curators, and professional cultural workers. It promotes critical thinking and new forms of cultural policy and management, artistic and intellectual engagement at the intersections of art, culture, science, technology, and society.

Associated partners: EQ Arts, Universidade da Madeira (UMa), Stromatolite, University of Arts Belgrade, Institute for Development and International Relations (IRMO,; Hakan Lidbo Audio Industries, European Creative Business Network (ECBN), European Digital Art and Science Network, Kitchen Budapest (KiBu).

Abbreviations

ASET	Art Science Engineering Technology
AST	Art Science Technology
CCI	Cultural and Creative Industries
CCS	Culture and Creative Sector
CDG	Career Development Guide
DIP	Discourses in Practice
DITO	Do It Together
DIY	Do It Yourself
HEI	Higher Educational Institution
HIA	Hybrid Interfacing Academy
IA	Interfacing Academy
ILE	Intensive Learning Event
LVL	Learning Velocity Lab
LVE	Learning Velocity Experience
MAP	Media Arts and Practices
MC	MAST Challenge
MCL	MAST Challenge Lab
MFA	Master of Fine Arts
MIC	MAST Innovation Cycle
MMI	MAST Module Implementation
MSc	Master of Science
SDG	Sustainable Development Goals
SEV	Social European Values
SIP	Selections in Practice
STEAM	Science Technology Engineering Art Mathematics
STEM	Science Technology Engineering Mathematics
TIP	Techniques in Practice

Preface

The MAST project revolved around how European social values can be woven into interdisciplinary education through a curriculum for innovation combining art, science, and technology. With the help of mentors from across realms, the MASTmodule pioloting students responded to challenge in timely topics such as *The Future of Work* and *Solidarity*. Along with two annual academic cycles of 2018–2020, progressive pedagogical solutions were tested in a cross-disciplinary approach and situated knowledge sharing, attempting to resolve the paradox between technological and social innovation agendas.

Re-imagining innovation in European terms is fundamental to increase the global economic competitiveness of the European Union while preserving its values. Technologies are always political and have a social impact, by codifying certain values into material culture, thus enabling or limiting individual and societal possibilities. Unlike science, technology proves to be a form of legislation outside the traditional space of politics – mostly developed by corporations and governed by the private sector. Technologies are rarely democratic, nor are they transparent. Science is being productively challenged by citizen participatory practices and co-production, and at the same time, increasingly dominated by pragmatism.

Each partner of the MAST consortium consisting of three different universities (digital art, architecture, technology) and three other NGOs (production, networking, policy) contributed to different perspectives. Industry, research, arts, and science as various components entering an experimental pedagogical field brought about a specific blend of activities that combined curriculum co-design, mobility, partnering strategies, teaching methodologies as well as coherent peer criticism.

The Manual represents selected topics and the most valuable, condensed knowledge legacy from the MAST project, gathered between April 2018 and November 2020, on a journey through over 20 events (Intensive Learning, Pop-Up, MAST Symposium, Interfacing Academy, etc.) and over 60 meetings of the project group. Developing a curriculum for rethinking social values, if not completely re-imagining or even practically redesigning the future world, MAST involved over 30 artists, scientists, curators, innovators, activists from across creative and cultural industries, as well as technology and natural sciences, social sciences, and humanities. Another 50 students and alumni have experienced the manifold intensive workshops, symposia, festival events, exhibitions, and critical round tables reaching over thousand project-external stakeholders. Their feedback was affected for the selection of contents for this Manual.

Next to the backgrounds on teaching and research in the (seeming) paradox between social values and the science-based technological progress, the Manual pres-

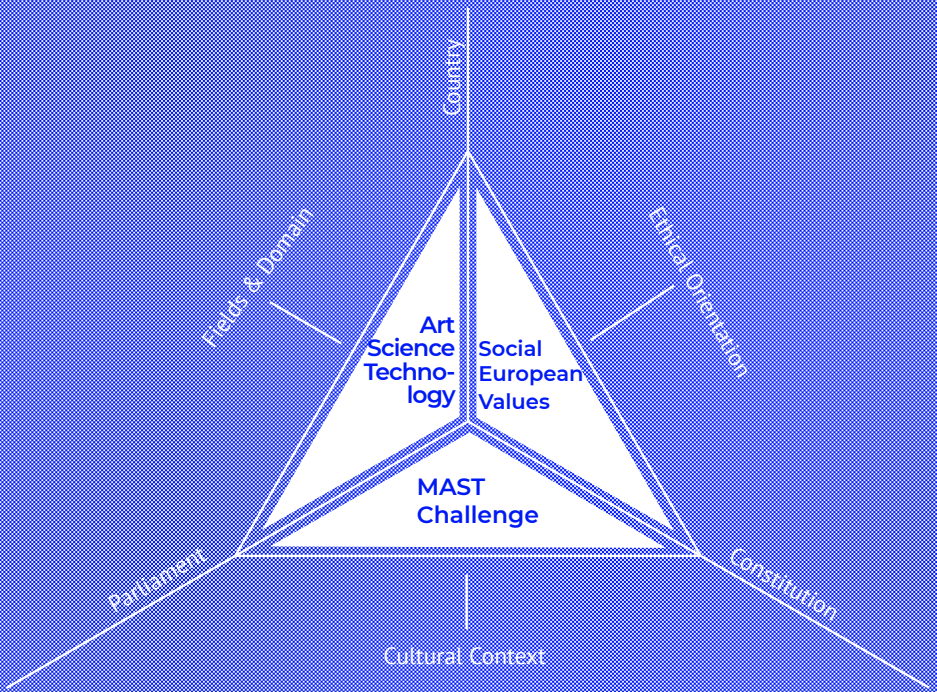
ents the emerging graduate profile of an Innovation Catalyst in ample detail. It embeds it within the developed module syllabus. This profile facilitates the actual innovation process through the MAST curriculum that introduces art thinking as its key stage before design thinking in the innovation cycle structured along ten key stages.

At the University of Nova Gorica, the developed Challenge Lab course presents the core of the Carrier Module developed in the MAST project. At the Madeira Interactive Technologies Institute (M-ITI) that established a physical Challenge Lab Space, the module is implemented along with a mentoring curriculum, leading to the final thesis; while at the Graz University of Technology (TU Graz), it is implemented as an optional module within different master subjects, encouraging student and faculty exchange through Erasmus+. The involved NGOs, Kersnikova Institute, Croatian Cultural Alliance, and Culture Action Europe, have crucially contributed to the module's development, and strategically embed it in their own continuous activities. Strong and ample synergies across Europe enriched the activities of all these institutions.

The manual's idea was born of the combination of the best practices introductory deliverable made at the beginning of the project and conjunction of lessons learned across the implementation of the project. In particular, during the first Interface Academy in Rijeka 2019, a major collective brainstorm conducted the group into recovering all the information in a reader/text collection, bringing together essential ideas of the MAST project.

The Manual can but must not necessarily be read in linear form. For deeper reading on certain topics, the Manual links in several parts to further documents and documentations (incl. ample video materials from symposia, round tables, lectures, among others) at the mastmodule.eu website. The models, experiments, and inspirations presented in the MAST Manual have particular value for innovation, art, and design educators interested in new methods and tools to develop teaching and learning approaches that involve a broad range of stakeholders of a much-needed novel pedagogy, both innovative in and critical of itself.

Fig. 1
Knowledge in context



1 Introduction

1.1. Forces of MAST

Observing the necessities of today's World for upcoming graduates prepared to confront, any AST education that works toward Social Europe innovations would be a beneficial addition to an existing program. The ideal landscape would naturally be the creation of a full MFA or MSc in-between AST. The future with flexibilty that an established program in any institution might have only one or two courses that can be reimagined or reworked as partial implementations. Thus, the possibility of creating a flexible Master Module surrounding the topics recognizes the many cases in which a university, a school, or a project consortium may not be able to create fully new programs due to political or economical obstacles — an adjustable module to the different programs is then beneficial. The MAST Module can be an add-on or used to build a program anew. So what is necessary for a conjunction of subjects to be considered MAST? A module or new program must be supported by the *three forces* of MAST. These forces may be roughly analogized to political terms:

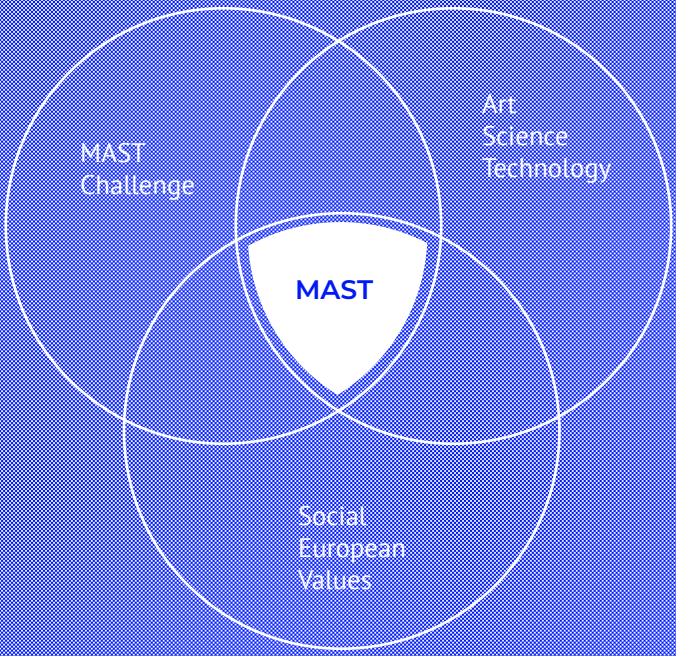
Art, Science, and Technology are the fields that MAST courses and classes must ultimately prepare a student for. Between these three monikers lies a vast space, and many types of classes and concentrations exist within the borders of AST. It could be a computer science course that teaches network theory emphazising on solidarity, or an architecture class that deals with the disabled and the elderly.

Any MAST Module Implementation (MMI) must be built proactively on Social Europe Values (SEV). That means actively trying to frame the implementation to lead to innovations which reinforce Europe's social advantages, work to actively resist those neoliberalism approaches that favor weak labor, disruption, and the erosion of social safety nets.

A MAST Challenge (MC), even if it only takes place in one class for one semester, is another necessary element for an MMI. It provides the conceptual framing, or context of the student and faculty work, bringing the learning process into close contact with the actual *real world issues*. It manifests in courses, workshops, ILEs, assignments and projects, and perhaps finally in a thesis.

MAST is aimed to be a generally appealing (*easy-to-take* as well as *easy-to-teach*) module, an open articulation of a master-level curriculum that may be taken up by almost any institution or consortium of such profile, and implemented in its own variety, topicality, etc. When an institution or consortium plans an MMI, it must care-

Fig. 2
The Forces of MAST



fully combine these three forces, creating a student experience that combines basic principles (SEV), an educational context (MC), and professional training for the field in which they will work (AST).

1.2. Components of a MAST Module

While the *Forces of MAST* are large conceptual categories, the way they are implemented in actual curricula and the way MAST will be governed going forward, will be the result of both an international MAST Working Group, *best practice* model syllabi, and curricula, and coordinated actions and topics (the MAST Challenge).

1.2.1. MAST Challenge Lab (MCL)

MCL is the Module core course designed to introduce students to a subset of methods applicable across AST fields. Students may come into the Challenge Lab (typically the Module's opening class) from one of many undergraduate concentrations (of disciplines, fields, specializations, etc.), but graduate in MAST with a strong sense of the methodological diversity, as well as concrete experience implementing some of these methods and tools.

MCL is a full-semester course (2-3 months) that starts with an articulated MAST challenge related to a concrete topic (e.g., housing, transport, among others.). It ends with a solution in terms of a response to the challenge, gradually covering the courses learning outcomes, and thus of the MAST module. SEV should be properly reflected along the course process, along all the key stages.

More specifically, the MCL will cover the following competencies (*having successfully completed the course*):

>> AST Research: be able to perform background analysis and field (beneficiaries) research for problem finding and solving.

>> Art-thinking: be able to apply art-thinking methods and tools, combining them with design thinking, to develop critical and unconventional breakthrough ,processes, services, and products.

>> Innovation Catalyst: be able to instigate, facilitate, coordinate, lead radical and meaningful innovation through specific combinations of AST stakeholders (individuals, groups, or institutions) and methods.

>> AST Innovation: be able to bring ideas via modeling of innovative solutions to actual applicable services/products that respond to real-world issues with sensible impact and sustainable legacy.

>> Ethics: be able to critically reflect the ethical and broader social aspects of

Fig. 3
The MAST methods
or MAST Innovation Cycle (MIC)

interdisciplinary study and work (preferably under consideration of policies & strategies)

>> Project & Team Work: be able and motivated to participate and contribute in successful and well-managed team projects

The MCL varies in detail across institutions and locations. In an instance of the course taught in TU Delft (NL), perhaps both the relevant challenge topic and the resources available to the course may differ from an implementation at the Academy of Fine Arts in Bratislava (SK). But the module is geared towards being easily implemented at both. Such local variation is both appropriate and desirable. Nonetheless the MAST Board, which determines the challenge, will offer recommendations and model syllabi, as both the legacy of this project, and its sustainable continuation. For example, central to the MCL design is a matrix of methods aggregated from key fields and approaches that contribute to AST. These methods are linked to a central MAST wiki with relevant texts, references, and particular explanations of the various methods. The wiki resource is to be understood and utilized as a living, expanding space for structured online collaboration, representing the interests and contributions of the growing community of institutions implementing the MAST module.

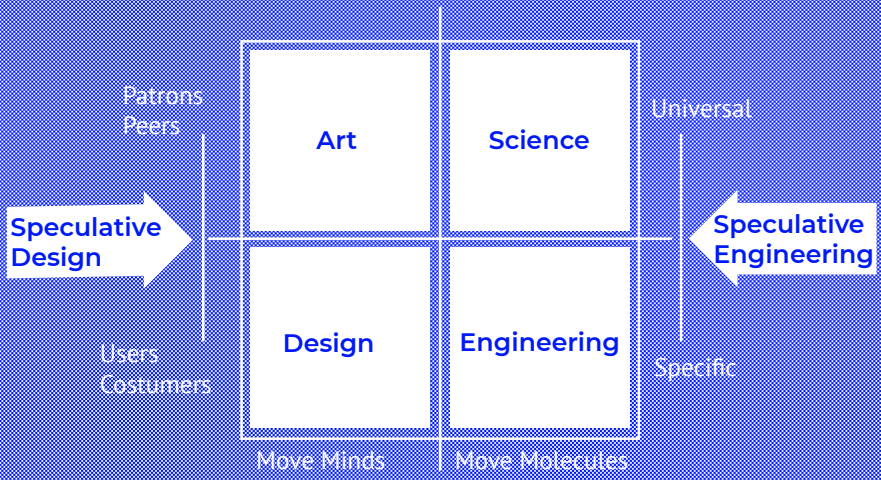
1.2.2. Domain: AST

MAST understands the synergies between Art, Science, and Technology and its influence in historical individuals like DaVinci, or in institutions like the Bauhaus or the MIT Media Lab, and then festivals like Ars Electronica and others. However, we believe there is a lack of a strong interaction between these fields in our current period. In this context, MAST seeks to cultivate and nurture an AST hybrid citizenship and to produce Innovation Catalysts to lead this manifold transformation.

Working in Ubiquitous Computing at the famed Palo Alto Research Center, Scientist Rich Gold, described four key endeavors that contribute to making our world: Science, Engineering, Design, and Art. He put these fields on a matrix chart with three named axes: 1) who receives the work? 2) is it universal or specific? 3) does it serve to move minds or molecules?

Unlike STEM or STEAM, MAST specifically leaves out engineering. It also leaves out or at least defocuses from the currently dominant paradigm of design (thinking). It does so not to diminish their importance, but rather to point out that moving minds (that then move realities, produce better services and innovate) is ultimately more critical to the AST nexus. The artistic methodologies are largely unexplored for this reason. Artists are more likely to practice a form of asymmetric authorship (e.g., Banksy), where their influence far exceeds the resources they leverage, and where they create based on value proposals rather than design briefs. There are many methodological lessons to be learned from art practice, and transformed for a better, more social, and sustainable innovation.

Fig. 4
Rich Gold's quad chart of ASET



(This picture has been reworked from original)

One fundamental tenet of Gold's matrix is that engineers and designers belong to service fields and thus are not accountable to the truth (or ethics or values a priori), but rather to clients. MAST predicates that technology can serve a higher calling. By taking basic research (science) and having artists apply it, rather than engineers, a very different set of material outcomes and options are available for society.

Within the respective endeavors of art and science, there are significant differences in how work is conducted, how value is measured, in funding, in education, and in communication. Nonetheless, Gold's experience and our own, that artists and scientists gravitate toward each other precisely because their goal is some form of universal truth, and their work situation is one of ultimate independence. A scientist team who reports a molecule's weight does not have their funding agency ask them to make it 20% lighter. Likewise, an artist's sculpture may be negatively judged, but no one tells them to change the color to match their living room.

MAST privileges co-equal relationships between art and science; not artists offer scientific visualizations or commentary on science, but rather artists working with scientists both on research and application. In many ways, this puts artists on a parallel track with engineering and applied science, and indeed many practitioners will be working closely with people from these fields — for which the MAST Module is here to prepare them.

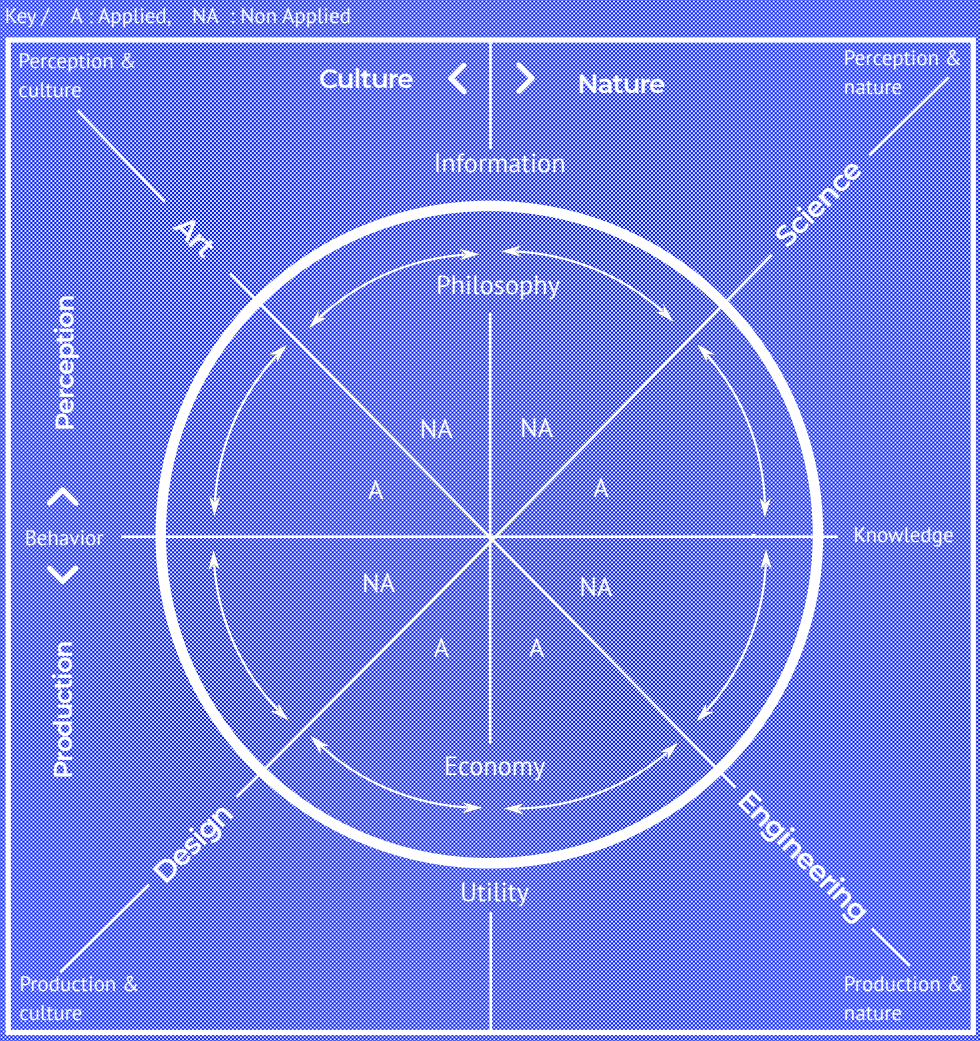
1.2.3. Art Thinking

The key curricular novum in the MAST module is a consistent introduction of art thinking as a core stage in the innovation catalysis process. The key student's objective is to become able to apply art-thinking methods and tools, combining them with design thinking, to develop critical and unconventional breakthrough processes, services and products.

In the first step, the above mentioned *Oxman's Cycle of Creativity* is transformed in the following way: **Engineering** is replaced by **Technology** for the focus on thinking and not design or production. The two circles of the inner structure are introduced to show the predominant processes inherent to Art (**Interpretation** as the key to the protocol of mental **Abstraction**), Design (**Innovation**, in the narrow sense, where Iteration is the key protocol), Technology (**Interfacing**, where Engineering takes place), and Science (where **Invention** happens within the paradigms and methodologies of **Research**):

For Art Thinking to be inserted as the key stage of innovation, abstraction is the *thinking-away* of the unimportant or irrelevant from the artistic perspective, which is inherently pluralistic and can sustain internal difference and diversity as a rigorous intellectual process:

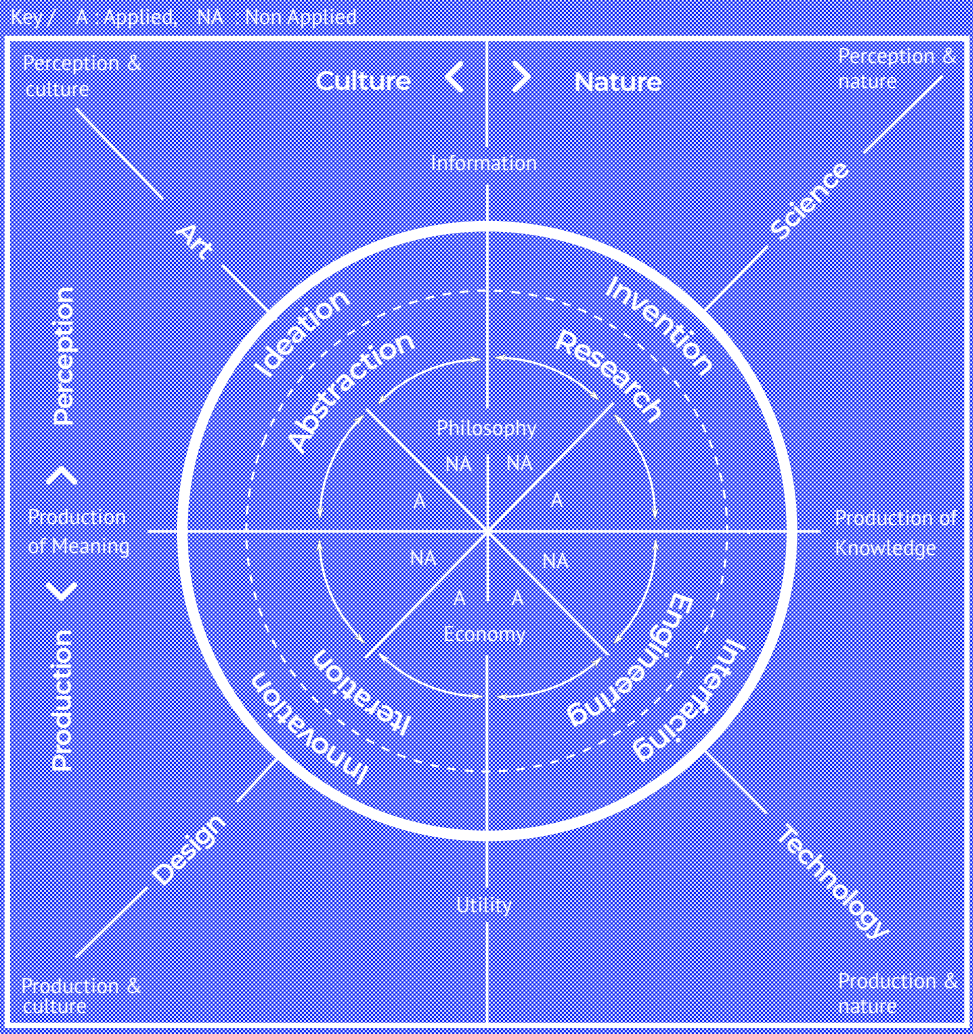
Fig. 5
The original ASET chart



Neri Oxman - Chart of Productivity

Rework from: Oxman, N. (2016) Krebs Cycle of Creativity (KCC). In: Ito, J. Design and Science. Can design advance science, and can science advance design? http://www.pubpub.org/pub/designandscience, last modified date: 13.01.2016

Fig. 6
Adaptation of Art Thinking Diagram



We have taken the Neri Oxman poposal for Art, Design, Science and Engineering (ADSE) interrelations as a source this chart, where we are showing how four practices of human activity are structurally connected. However, we have abandoned the reference to Krebs cycle where aerobicorganisms are generating energy through oxidation, since Krebs cycle is unidirectional, the interrelations betwen the ADSE are pluridirectinal. We have also change the production of behavior as of Art and Design output into production of meaning.

Fig.7 Abstraction in relation.
Fig.8 Art in relation.

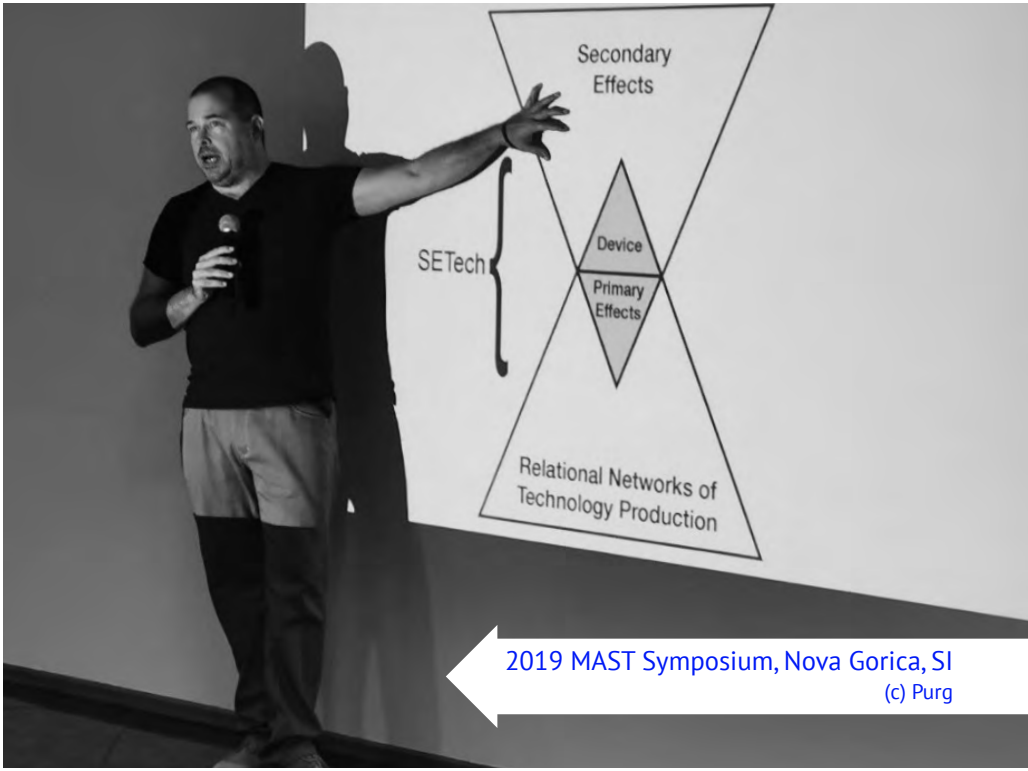
An idea that develops by looking at or thinking about a number of different things.
Cambridge Academic Content Dictionary

Intuition, imagination, inspiration, creativity
spontaneity, abstract sensing, embodiment, over-sensitiveness,
serendipity, investigation, story telling, dedication
over-Identification, fanatism, fatalism, radicalism, consistency

The methods and tools used in the artistic practice are those elements of the innovation process that bring about radical, positively disruptive innovations based on plural views and approaches, they principally consider the individual experience and viewpoint while remaining holistic in terms of the systemic approach:

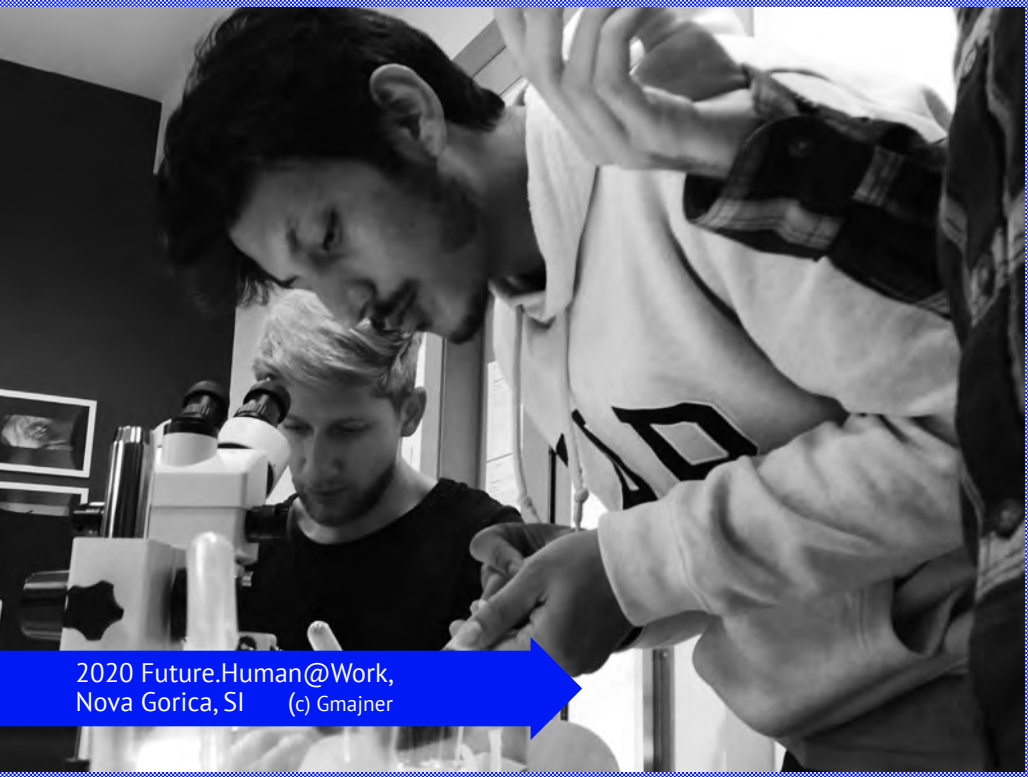
1.2.4. Context: The yearly challenge

A yearly challenge is determined by the MAST working group of the MAST consortium partners[1]. It serves as a context by which to apply the methods of AST, and a broad topic setting for the courses of the module. The next section focuses on the challenge and its applications.



2019 MAST Symposium, Nova Gorica, SI
(c) Purg

1 https://mastmodule.eu/partners/



2020 Future.Human@Work,
Nova Gorica, SI (c) Gmajner

2 The MAST Challenge

An appropriate MAST challenge is a framing or context under which students and faculty work over the span of a year. It affects curricula, directs research and assignments, and includes specific resources. It should work well across disciplines, and be derived from *Pillars of European Social Values*[2] and/or the *Sustainable Development Goals*[3], but can be abstracted from them (not just a single SDG or pillar). Each academic year the MAST challenge changes.

Key features of a good MAST challenge articulation:

>> It is clearly related to SEV and the SDG

>> May reach across different principles (pillars)

>> Should be approachable across different disciplines

>> Should provide general information and resources on social Europe

>> Provides a clear (annual) challenge framework

>> Gives access to a database of relevant links and (excerpted) texts, current research, analytical and critical writing, or other relevant data

>> The challenge definition should be based on sensitivity, self-assessment, and participatory observation. The challenge may also come externally, e.g. from the industry, a creative hub, or perhaps a community in need of a special service.

Yearly the MAST working group will create an online bibliography of relevant materials for the challenge. The process will be coordinated through a bibliographic service (Zotero, among others) and allow for suggestions and contributions from the various schools and community members. Aspects of the bibliography will remain the same from year to year, but most of the material dealing with the challenge itself will change.

2 https://ec.europa.eu/info/strategy/priorities-2019-2024/economy-works-people/deeper-and-fairer-economic-and-monetary-union/european-pillar-social-rights_en (Last seen: 19-01-2021)
3 https://ec.europa.eu/international-partnerships/sustainable-development-goals_en (Last seen: 19-01-2021)

3 Curriculum

The creation of this module entails that it needs to be made not only compatible with the existing master programs at the three Higher Educational Institutions (HEIs) of the current MAST consortium, but also to conform with all the national accreditation requirements; with the Bologna process; and with the European Higher Education Area. While MAST has the Bologna philosophy at its core, there is still a great deal of variability across educational models and fields, so its integration with the existing programs must be carefully considered.

MAST is a module that will complement the existing master programs by embedding the SEV like social justice, strong labor, gender equality, and culture into the fabric of new digital innovations. This requires the integration between the values of art and humanities, engineering, and science, to create a repertoire of techniques. The MAST structure considers 30 ECTS, which is equivalent to a semester-long set of courses. This will enable students engaged in other programs to take the MAST module, either as an intensive semester-long training, which can include mobility between the partners, or interweaved with their existing programs, possibly leading up to a full 2-year master course of 120 ECTS.

3.1. MAST Minimal Competences

The curriculum is being designed to enable any MAST graduate to have a minimal AST experience. *Concluding the module, each MAST graduate should*:

>> Have experienced the CCI real-life environment

>> Have been co-mentored/consulted by relevant people from different disciplines and institutions

>> Have experienced Inter-institutional and/or international mobility

>> Have had (critically reflected) experienced working collectively in multi-disciplinary teams

>> Have taken responsibility for own work and its social effects

>> Have (critically) reflected combining the elements of AST.

3.2. The Module Graduates

The students that participate in an MMI will have the following module-specific competencies:

>> Be able to contribute meaningfully to the crossfield of AST internationally (start-ups, exhibitions, projects, services, products, civil initiatives, etc.)

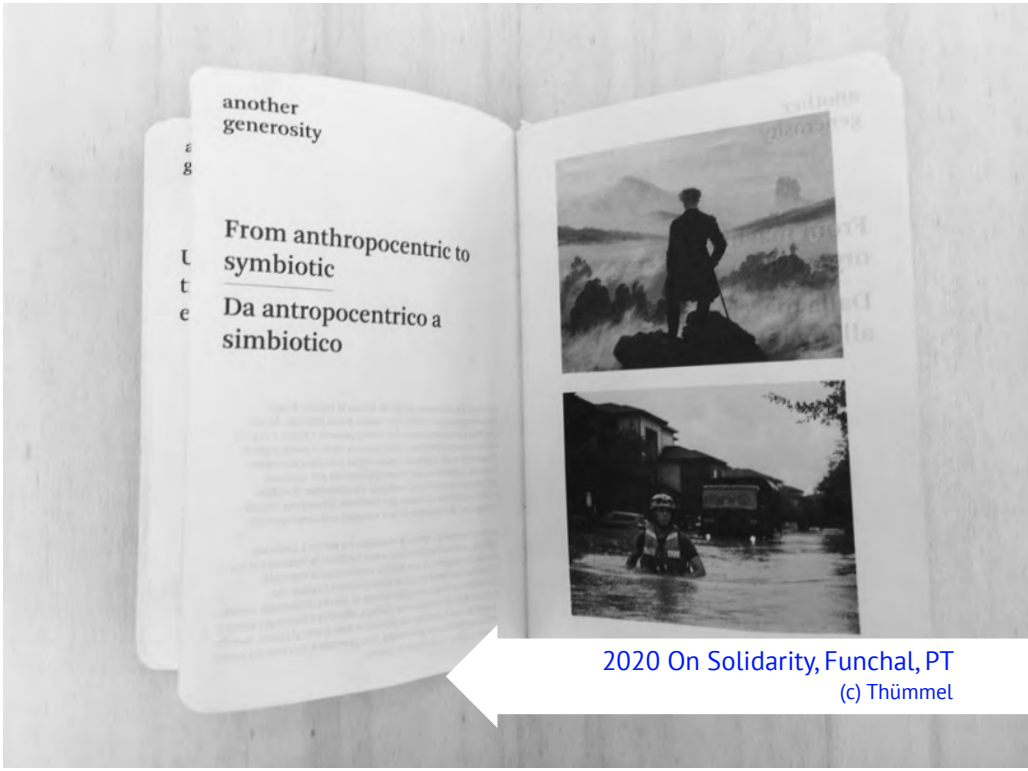
>> Understand the social impact of innovations in a broad sense

>> Be able to work as hybrid profiles in multidisciplinary environments among AST.

In terms of the specific learning outcomes, students that pass through the MAST Module Implementation will acquire the following transferable skills:

>> Be able to critically reflect the ethical and broader social aspects of interdisciplinary study and work across policies and strategies.

>> Conceive, develop, complete and evaluate successfully well-managed team projects



2020 On Solidarity, Funchal, PT
(c) Thümmel

Innovation Culture As Imaginary

The Role of the Innovation Catalyst in Designing

Artist-driven research and experimentation with new and more accessible technologies has been developing and growing since the 1960s. Even though this artistic research was never a part of artistic or cultural mainstream, it greatly influenced the development of modern electronics, which years later became a part of our audio-visual everyday life. *New Tendencies*[1], one of the first large artistic manifestations of new technologies in art, was established in Zagreb (Yugoslavia) in 1961. This platform was used by musicians and artists to present their avant-garde work until 1973.

In 1966 Robert Rauschenberg and Billy Klüver initiated a meeting between a group of artists and engineers from Bell Laboratories in New York. In a period of 10 months they worked on art projects that used high-tech machinery and solutions and in the end they showed their results at the *9 Evenings: Theatre and Engineering* event which took place between the 13th and 23rd October of the same year. Some of the new technologies were used for the very first time: closed-circuit television, television projector, fiber optic camera, infrared television camera, Doppler sonar device, portable wireless FM transmitters and amplifiers to mention a few[2]. A mere three years later, the innovative laboratory Xerox Parc was established. In this lab, visionary engineers were joined by visionary artists and members of humanities and together they worked on creating innovations that were often more than twenty years ahead of their useful applications. Similar avant-garde innovation platforms that also combine artists, science fiction and cultural studies that create inventions and innovations are: MIT Medialab (1985)[3], Nokia Bell Labs (1996)[4] and X - The Moonshot Factory (2010)[5].

In 1979 the Ars Electronica Festival was established in the Austrian town of Linz, and even today remains one of the most important institutions for presenting a cross-section of art, technologies and society and is an excellent example of the mixture of culture and technology. In over forty years of the Linz festival, scientists and engineers reflected upon their inspirational co-operation with artists, while numerous artists created artworks that interpreted and expanded the user's applications beyond their original intent and limitations. The newly formed connections and the often thrillingly conflicting meetings between the experts from various fields changed the Ars Electronica festival into an annual manifestation of transdisciplinary projects, which show the state-of-the-art techno culture of the present moment. With the establishment of the Ars Electronica Futurelab[6] in 1996, Ars Electronica capitalized upon its privileged position, which was built through the hosting of hundreds of artworks at the festival and obtaining an excellent insight into the developing intermedia production with the annual Prix Ars Electronica award in which over

1 https://monoskop.org/New_Tendencies (Last seen: 19-01-2021)
2 https://en.wikipedia.org/wiki/9_Evenings:_Theatre_and_Engineering (Last seen: 19-01-2021)
3 https://en.wikipedia.org/wiki/MIT_Media_Lab (Last seen: 19-01-2021)
4 https://en.wikipedia.org/wiki/Bell_Labs (Last seen: 19-01-2021)
5 https://en.wikipedia.org/wiki/X_(company) (Last seen: 19-01-2021)
6 Ars Electronica consists of the Museum Ars Electronica, AE festival and AE Futurelab.

4000 artworks compete every year. AE Futurelab is the geographically nearest example of cooperation between art, science and industry, which develops speculative and prototype projects through which one can monitor and consider our near future.

Hacking the Nerds

The creative subversion of mainstream technologies, which we have been following through artistic projects for decades, opens an array of interpretations of the various ideologies that were responsible for technological applications as well as a better understanding of the technological and user capacities and potentials that could be released through a different, more emancipated and creative utilization. It is possible to predict the development of technologies through radical artistic projects in which the cohabitation of people (and other living creatures) is brought to the extreme with machines. On the other hand, one can - through artworks in which technology is brought to the unexpected applications - easily notice its' limits and potentials. The cooperation between scientists and engineers encouraged by the intuitive, emotive and spontaneous approach of intermedia artists can be seen in the establishment of creative spaces governed by different, speculative conditions and approaches, which emerge from the special construction of imaginary situations. This situational uniqueness implies exceptional creative frictions, thus the participants in the creative process are challenged to overcome their personal and expert points of view as well as the generally accepted social norms.

The artists are fully aware that new paths open new doors, which is why they systematically create unknown and unverified imaginary territories, which need to be inhabited by new epistemology and hermeneutics that complement the experiential side of artwork. Recognizing emerging processes and phenomena and having an in-depth understanding of them is an entry point for other participants in the innovation process. Successful cooperation between artists, scientists and engineers surpasse the merely mutual servicing of all involved. The cooperation does not develop its full potential if it consists merely of artistic visualizations of scientific experiments, articles or neatly presented engineering solutions on one hand or a technical solution made to suit the artist on the other. We can talk about meaningful cooperation when experts from various fields and provenances focus on the joint creation of either an art project, a scientific invention or an engineering solution. For creative cooperation to be successful, an innovation catalyst needs to establish the conditions and circumstances in which all participants can participate on an equal footing, use a language that they all understand, have an in-depth understanding or feeling of the other's work, and are ready to walk down unknown and often problematic paths. Paradoxically, for true leaps in the thinking and consequentially the innovation process to take place, every creative mind needs to overcome or (temporarily) distance themselves from the values that qualify them as experts. We call this value, which was created in specialized and hermetic

institutions of knowledge[7], research platforms and industrial plants they came from, *situated knowledge*. This knowledge is characteristic of optimized processes that are deterministic and oriented towards productivity (i.e. focused on a product or a concrete effect).

Embracing the Unknown

In artistic research laboratories and situations, the creative cooperation between **artists** (the work of whom addresses the contemporary society saturated with technology), **scientists** (who understand that in pure science, meaning needs to be found outside of the ivory towers of academia) and **engineers** (who know that hard work does not necessarily lead to a better society) has become a synonym for radical creativity. New spaces of visionary thought, which surpass the existing epistemologies, are created through art projects that challenge our senses and mind with new, unusual, scandalous and sometimes ethically questionable works. Over the past twenty years social changes, which are caused by omnipresent technologies, have been occurring overnight and have not been properly reflected upon, at which certain technological applications or services often degenerate into their opposite or are discovered to be an unnecessary consumer dead end. The concept of a consumer- led society, which is not interested in responsible, ethical and sustainable use, is based on desirable products that have not been reflected upon. The history of art projects in which artists used various technologies to hack, subvert, iterate or even invent new technological solutions, teaches us that technology, its scientific roots and industrial potentials should be better understood and incorporated into the lives of individuals and society, as the meaning and importance of including technology into human existence are generated through works of art. This production of meaning (art) through artistic ideations complements the production of knowledge (science) and the production of value (economy).

In the field of information technologies, cybernetics, bionics and biotechnologies, groundbreaking works of art have been emerging for over four decades, which possibly makes the international intermedia art scene one of the most penetrating interdisciplinary practices. Artistic projects that emerge within these frames often push the boundaries of contemporary artistic research, which is verified by their exceptional international success (which is not measured in art-market criteria, but in the numerous invitations to exhibitions and expert panel prizes, received by these projects around the world). However, as a rule, such avant-garde art projects do not have a mass following, which is a result of their non-conformist radicality, explicitness and visionary views that the broader audience finds hard to understand; thus, such exceptional leaps in emotions, experience and thought still largely remain ghettoized to expert circles.

Alongside the successes of the previously mentioned cross-sectorial innovation platforms and the value of technology, culturalization has also been recognized by the European Commission[8], which through various financial mechanisms[9] aimed at art projects, events and discourses encourages connectivity between art, science and industry, with the goal of

7 Such hermetic, strictly purpose and goal-oriented experts are colloquially known as nerds. https://en.wikipedia.org/wiki/Nerd (Last seen: 19-01-2021)

8 ICT ART CONNECT https://ec.europa.eu/digital-single-market/en/news/ict-art-connect-activities-linking-ict-and-art-past-experience-future-activities (Last seen: 19-01-2021)

9 STARTS - Science Technology ARTS (https://www.starts.eu/), MAST - Master module in Arts, Science and Technology ...

improving innovativeness. These mechanisms encourage innovations through numerous consortium projects, in which cooperation methodologies are easily formed. In turn, these should encourage the European economy to improve its' innovativeness in the creation of visionary, ethical and sustainable solutions. Networks and platforms emerge from the most successful project consortiums, which are, as a rule, formed as open institutional organizations with the intent of encouraging sustainable synergies and ensuring a more stable and supportive environment for such innovativeness.

Methodologically, the inclusion of artistic ideations leans upon the tradition of so-called *design thinking*, which has - over the past twenty years - managed to enter the innovative processes throughout the economy. In this context, the most important victory of *design thinking* is that it has managed to occupy a permanent position at the very beginning of the innovation process and not merely just before the product or service needs to be optimized for the market. With their knowledge and experience of end-users, designers are included into the planning of solutions. Designers are good at imagining themselves in the role of users and through their empathy, contribute to the solutions that the users will gladly use or even internalize to the extent that they will become a part of everyday life. Designers have proven to be unmissable in the search for answers to complex questions addressing the reciprocal influence between man and technology.

Since the designers are good at solving questions, the most important observation is where do the key questions originate from? Is a question that arises from a problem, a question ,or merely a symptom of the problem? The online archive of The Atlantis magazine includes Derek Thompson's article: *Google X and the Science of Radical Creativity*[10] which describes the life of an innovative platform. *Design thinking* is at the very core of new invention's; thus, we would like to quote a part of Thompson's text as a key reference to the beginning of the innovation process: *„Moonshots don't begin with brainstorming clever answers. They start with the hard work of finding the right questions"*. At this point, we want to establish the conceptual difference between the creative approach of designers and that of artists[11], as designers strive to find a creative explanation of the answers to the questions, while artists - through the abstraction of the sensory-cognitive, emotional, psychological, material and similar elements - create a space for imaginary worlds, which are not yet symbolically marked, might be never expressed in words and an item of endless interpretations. Artistic creativity leads to the emergence of new, never before seen, heard or experienced spaces, the meaning of which still needs to be found. These imaginary spaces, epistemological white spots, which need to be inhabited with meaning, represent questions in their own right. A question as a space (topoi) of something that has so far not been located and does not implicate direct answers, but encourages us to experience and contemplate, and which arises in us through our perceptions, feelings, emotions, and speculations that are triggered by our senses.

Art thinking is an important and relatively new concept that we want to include in the innovation process. We first came across this syntagma within the frame of the Ars Electronica

10 https://www.theatlantic.com/magazine/archive/2017/11/x-google-moonshot-factory/540648/ (Last seen: 19-01-2021)

11 The difference is truly only conceptual, as the borders between the creativity of a designer or an artist are not strictly separated. Designers also have a highly developed visual intelligence and are not linear in their work, especially when they deal with speculative innovations, the solutions of which often lead to opening new questions as regards the possibilities rather than providing answers.

festival, at the Future Innovators Summit in September 2016, when Hideaki Ogawa and Marcus Scholl presented the methodological approach to co-operation between artists, scientists and engineers. The two authors came up with the *art thinking* while cleverly leaning upon the historic contribution of the syntagma *design thinking*. By linking it directly to the theoretical legacy of *design thinking*, they introduced art into the field of innovation, even though science and economy would usually be quick to reject this (with rare exceptions). The general understanding of art is full of prejudices in regards to it's incomprehensibility, randomness and disruptiveness that confuses people and, if the work of art is *not beautiful and pleasant*, also repulses and scares them. With the invention of the syntagma *art thinking* the entire field of art is tactically trying to become domesticated for possible use in the same way as *design thinking* was used in various ways within the innovative process.

At this point, we will not delve into the characteristics of *art thinking*, but we should keep in mind that it differs from *design thinking* in the fact that it enables the emergence of new questions, and that it, in the process of innovation, most commonly precedes the *design thinking* stage, as the latter is mainly focused on the search of concrete answers to the posed questions and concrete solutions to the problems. The introduction of *art thinking* into the innovation processes brings with it a certain disruption, which places the starting point, i.e. the reason or the need for the innovation, under question. To perform this in the same or at least a similar way as this takes place in artistic research and creativity, we need to establish the methodological consensus amongst the innovators themselves. Within artistic projects, this consensus is usually established spontaneously, as artists form the group of co-workers based on their personal preferences and usually establish a strong personal contact with others in the group. Within the innovation process, we need someone to coordinate, facilitate and moderate the various phases of innovation work. The process that selects the innovators from specific fields to fit the innovation and defines the phases and the expected results is known as *Innovation Design*. This process is led by an innovation catalyst[12], who has a good insight into innovation methodologies, access to experts in individual fields, understands the language of artists, designers, scientists and engineers and is in contact with the development policies and various other social processes that cover an array of stakeholders.

In 2011 the Harvard Business Review published Roger L. Martin's essay *The Innovation Catalyst*[13], in which the transformation of the marketing company that had realized the full strength of participatory problem solving was described in great detail. To a great extent group work combines *design thinking* with pain-storming, brainstorming, fast prototyping, experimenting and quick tests that provide fast feedback in the field. The text does not focus on the profile of the innovation catalyst, rather on the effects of the guided *design thinking* processes, thus the role of the innovation catalyst is described merely as a moderator within the innovation process. Regardless of the undefined starting points, capacities, methodological approaches and other characteristics that the innovation catalyst should have, we believe that this article serves as a gradual entry into the understanding of the role of a facilitator within the innovation process.

12 Catalyst is a synonym for art in non-linear realization within the field of production; it also precisely describes the emergence of works of art, and has been used in the vocabulary of intermedia producers at least since 1994 when the NGO Arts Catalyst (which deals with commissioning, producing and presenting works of art) was established in London,. https://www.artscatalyst.org/

13 https://hbr.org/2011/06/the-innovation-catalysts (Last seen: 19-01-2021)

Other online records use the wording innovation catalyst, however most of these texts on innovations address the encouragement of process modernization within individual companies or industrial platforms[14]. None of these texts differentiate between an innovation catalyst and an innovation manager or a head of the R&D department. The corporate understanding of *design thinking* as the driving force of corporate changes, which wishes to create innovations within the system while taking into account the changing circumstances, cannot be considered as innovation, but merely as an iteration of the same principles, which are, as a rule, limited by the starting points of the very same system. In this view, *design thinking* should be considered in the function of corporate motivational practices, through which employees are encouraged to actively participate in corporate culture. The innovation blast of these innovations is almost negligible, however, they greatly contribute to the working atmosphere within the company.

References linked to the most important innovation laboratories in the world[15], over four decades of avant-garde artworks in the field of new media and bringing culture closer to science and technology, combined with European policies that have recognized the power of artistic ideations in encouraging radical production, service and social innovations in the digital and post-digital age, provide countless possibilities for establishing the profile of an innovation catalyst, who has an active knowledge of the theories and practices of artistic creation and is also acquainted with the various concepts of the economy of social and product innovations. An innovation catalyst will systematically help develop innovative culture by connecting the most creative individuals, who will critically analyze, intuitively and systematically research and create upon the very limits of the possible. The innovation catalyst is thus not seen as the most enthusiastic employee (enthusiastic in regards to innovations) within the company, but as a mission, with all of the necessary professional ethics, theory and activities that will lead to a more thorough, sustainable, secure and ethical innovation.

However, regardless of the attempts to systematize and methodologically define the innovation process, we have to accept the fact that real systemic and breakthrough innovations cannot be simply made to order. The illusion that it is possible to achieve wonderful innovations by putting together a group of experts for two hours has unfortunately become rooted through the practice of short workshops or training sessions within or outside of organizations. If this was true, there would be an endless stream of wonderful innovations whenever and wherever they were needed. Unfortunately, this is not the case. For an innovation to have the opportunity to truly emerge, we have to carefully establish the conditions and circumstances in which experts can, in unusual and sometimes even incomprehensible ways, contemplate, research, experiment and create prototypes, even though this in itself does not ensure that an innovation will take place. At least not within the desired timeframe and in the desired place. We need to accept the fact that the path to true innovation is usually long and risky, which means that we need to provide the innovation team with a feeling of safety and the right to fail. By giving the innovation team the feeling of safety, this inalienable right (which the capitalist machinery, focused on competitiveness and profit, often renounces) improves the working conditions.

The proposal for forming the innovation process is compiled as a map with ten thematic

14 https://www.boardofinnovation.com/blog/5-steps-to-create-an-international-team-of-innovation-catalysts/ (Last seen: 19-01-2021)

15 Parc, MIT Medialab, Nokia Bell Lab, Google X-Moonshot factory, Ars Electronica Futurelab, …

sections, all of which are necessary for the understanding, organization, research, creation, experimentation and evaluation. The open format enables us to establish an innovation design that will suit the challenge, which means that it will be tailor-made to fit the problem or context of the challenge. In this scenario a sequence of individual steps is recommended, however this sequence is not obligatory and even in an ideal situation it is most commonly not implemented linearly or sequentially.

The Challenge

A challenge can arise spontaneously as a reaction to the changed circumstances, as an imbalance or as a problem that emerges from a logical upgrade of the existing situation. This can emerge within a process of spontaneous, intuitive research and creativity (push) in creative research laboratories, or as a commission that addresses a certain social problem or desire for a new product (pull) which the client passes onto the innovation catalyst[16].

In the case that the client is known, the first step of the innovation catalyst is to establish an in-depth understanding of the issues and starting points, for which solutions need to be found (pull). In the event that the ideas emerge from within an existing group of innovators, independently of any demands, the role of the innovation catalyst is to overview the possible scenarios and applications (speculative innovations), find the possible uses or outlets in the real sector and address the possible clients, including the end-users (in a market or any other model).

Working with an established team of researchers and innovators has certain advantages, as the innovation catalyst can foresee the conceptual range of the group. When the creative research platform is comprised of various laboratories, the process of obtaining new ideas is given a great advantage, as the laboratories can complement or even critically evaluate each other. However, the historic experiences of some of the most successful laboratories have taught us that the freshness and sparkle of ideas can be easily suppressed by the pressures of deadlines, the hasty demands for working products and the unrealistic expectations of the market. A quick solution to the large and relatively expensive creative research platforms can be found in teams that are established ad hoc to find solutions to specific challenges. However, even though these usually have the advantage of faster innovation processes, their solutions usually fail to bring lasting and radical ideas and novelties.

Whether the innovation catalyst will engage in an existing research platform from which

16 In this context the client is a rather casual signifier for the place of origin of the challenge, which the innovation catalyst and his team of innovators need to solve through innovation design. The challenge is often an expression of the interests of a group, company or selected decision-makers as representatives of society. Client is thus a topological group which the innovators see as a legal and formal entity (director, mayor, president, ...).

he will select innovators with a laboratory background or he will establish an ad hoc team of innovators also depends on how radical the innovation blast he wishes to achieve. As a rule, an ad hoc group is suitable for less ambitious innovations, which do not cross multiple disciplines or sectors and which demand a lesser level of analysis and interdisciplinary experimentation.

Innovators (The Team)

There are no rules that define how to assemble a good team of innovators, but truly new ideas will emerge if the team consists of expert specialists as well as broad thinkers, who are capable of spontaneous reactions while leaning solely on lateral thinking and intuition. The advantage of specialists is shown in their quick assessment of the existing possibilities that is a result of their expert knowledge of the sector, however, the in-depth specialist knowledge can also be a handicap that makes it impossible for the expert to notice the deeply internalized limitations of their expertise (situated knowledge). On the other hand, the emergence of good ideas can be aided by broad thinkers who have the capability of contemplating large systems from which patterns emerge (emergent knowledge[17]), who can place the specialist knowledge into an entirely new context.

The role of the innovation catalyst lies in the meaningful creation of innovation teams, establishing good chemistry amongst the innovators, knowing how to present the problem that needs to be solved, and then lead the entire process which could take hours or months. The process of assembling a team of innovators can range from hiring existing research-creative laboratories, institutes or platforms in which the individuals know and trust each other, to assembling new ad hoc teams, outside the safe environment of co-thinkers.

Regardless of the situation in which the innovation catalyst facilitates the co-creation process, one of his toughest tasks is to, as a partner in the dialogue, encourage the processes that lead to the emergence of creativity for as long as possible. One of his key tasks is to provide an environment of trust, spontaneity and a feeling of security. His capability of translating the language of artists into a language that can be understood by scientists and engineers and vice versa, is of key importance for the cooperation, as this helps the team surpass the limitations of placed knowledge. To a great extent, the feeling of security can be aided by the capability to embrace the unknown and the assurance that even failure can be treated as success, as even what appears to be a failed step often represents an opportunity to learn new lessons.

17 Emergence is a synonym for emerging patterns that are at first glance or without necessary instructions, apparatuses or even processes, invisible. In the theory of appearance emergence has been recognized in the sense of cheating the view already from the 17th century onwards (teratology), while in newer times we talk about emergence in clinical psychoanalysis or when treating large data samples from which we can deduct useful data for a particular need.

Ethics (principles)

The inclusion of artists and designers into the innovation process implies the inclusion of humanistic sciences, which means that the basic cultural and intellectual standards are taken into account. Similar to morals and laws, which enable social reality, the ethical principles help form the path that reveals new possibilities. Of course, these principles are not unambiguous, as the standards are constantly changing. The dichotomy between morals and ethics gradually changes the values which are not shared by all parts of a global society, thus, it is important to establish a consensus between the client and the innovators in regards to the values and principles that the innovators should take into account in their work. These same rules need to be internalized by the client, who with this acknowledgement and internalization, accepts the responsibility for the execution or use of innovation in accordance to the principles within the frame of which it emerged.

In general, innovators can lean upon the 17 goals of sustainable development[18], which have been advocated by the 2030 UN Agenda for Sustainable Development since 2015. The typology of the principles change in relation to the measures addressed by the future innovation. Thus, it can be political in the broadest sense, or theoretical or philosophical in the more niche examples. Regardless of the size of the problem they address, it makes sense for the principles to be linked. Taking into account the generality of the principles that strive to improve the lives of people globally, the ways of solving problems and the means used to solve these problems can quickly become obsolete and should thus always be considered in the light of the most up-to-date findings of humanist and natural sciences and the most ethically solid practices should be chosen. We need to take into account the cultural environment in which we work, its' absorption capacity and readiness for innovations. This is why it is necessary to also consider the ways of preparing and developing the capacities and potentials of the target society within which we want to spread the innovation.

Mapping

The innovators need to be informed in regards to the existing solutions, similar or identical cases as well as any previous attempts of dealing with such cases, as this could help the innovation team find the lowest common denominator, which can serve as an orientation point when defining the progress of the innovation process.

The second level of mapping, which is of key importance for the understanding of the starting points of the challenge, are the eco-systemic[19] connections, which represent the marginal conditions of the issue. These starting points can be qualitative, quantitative, focused on contents, conceptual, social, material, etc. and they represent the broader picture

18 https://www.un.org/sustainabledevelopment/sustainable-development-goals/ (Last seen: 19-01-2021)

19 In this case, the term ecosystem is used as a synonym for meaningful connections that are complemented, expanded or substituted and not as a reference to the natural ecosystem, in which the survival of the fittest rules alongside the symbiotic connections. Human society (bios) differs from plant and animal life (zoe) by its developed civilizational values upon which the production mechanisms should be based. Unfortunately, neoliberal capitalism often bases the survival of the fittest with the natural order of things, in which predatory species are given a special mention.

into which the solution of the challenge should be placed. In this map one can see the emergence of the possible connections with other categories, which provide new possibilities for solutions or even expansions of the starting expectations.

Alongside mapping , the existing attempts and solutions and the possible ecosystem connections, the innovation catalyst might also want to map the individual experts who can be drawn into the innovation teams (outsourcing).

Defining Common Ground

Prior to the beginning of the innovation process, detailed research will harmonize and unify the numerous starting points which are necessary for efficient teamwork. As a rule, these starting points do not indicate the future solutions, however, they do show what type of solutions will not be offered by the innovators. In this phase, the series of no's that the team of innovators gather during their analysis should be presented to the client as the possible directions in which the solutions will be sought and will depend on the internalization of the frames that have emerged from various analysis and studies. The meeting with the client should not be merely a part of the established protocol, for it should also include a detailed analysis of the activities, production possibilities, work ethics, etc., that are of key importance to the client's company or organization. To have an in-depth understanding or even redefine the problem, a good estimate of the ontological starting points (general analysis) combined with a good understanding of the particular starting points (client) of the problem that the team of innovators will attempt to solve are important. The client needs to be involved in this process, as without precise information from the innovators, the client can easily fail to understand the possible solutions that the innovation process will provide.

At this point the innovation catalyst has the opportunity to evaluate the work performed based on the starting points which he used to set up the team and the innovation process as well as any eventual new criteria that have appeared (and were confirmed) during the meeting with the investor, and if necessary, repeat any one of the steps that were carried out so far, including expanding the innovation team or substituting its' members.

Art Thinking

Taking into account the topic that had emerged during the process of solving the problem, the innovation catalyst can invite an artist into the team or personally prepare a selection of artworks that address the chosen theme. Regardless of whether the innovators include an artist or whether the innovation catalyst himself has come up with a selection of art projects, it is the task of the innovation catalyst to appropriately explain, translate the artistic principles, methods, effects and the poetics of the artworks to the other members of the team. The works of art are often impossible to verbalize as their narrative is coded in the direct experience of the viewer/participant, thus the role of the innovation catalyst also includes guided visits of artistic events or locations, viewing works of art (exhibitions, installations) and similar, with which he tries to sensitize the innovators to the unspoken, which can only be felt in the works of art. The reactions to these feelings become the starting points for the practical hermeneutics and situational epistemology. In this sense

art thinking does not focus on the creation of works of art, but is an attempt to understand imaginary dimensions, which emerge through artistic creation. To perceive these dimensions appropriately and sensitively, the task of the innovation catalyst is to explain the idiolect of the author (a single artistic explanation of the method, way of perception, compositional principles, the semantics of materiality, etc.) to the innovators in the group, and with this draw attention to the experience and intelligence that is used to perceive a work of art.

In some cases, it is possible to, through a selected work of art, recognize the space (or multiple spaces) from which the new meaning emerges, while in other cases the principles that can be discovered through the artistic idiolect help the innovators capture and define a completely new topic by mirroring these principles into their creative process. The only rule in this phase of the innovation process is that there are no rules. This means that we are, in this phase of innovation, left to intuition, a selection of no's that we have amassed during our analysis and an open structure of elements that offer themselves in an endless selection.

At this point the innovation catalyst is of key importance, for he takes care of the presentation of the various artistic narratives with which he offers speculative support. He also persists for the innovators not to reach quick solutions, generalizations or two-dimensional solutions, as his task is to lead the innovation group to a certain ultimate point at which the ultimate question will arise, which will in turn, lead to the ultimate answer.

Design Thinking

There is no precise distinction in the way artists and designers work, as the creation of works of art are to a great extent governed by existing technologies, materials, procedures as well as the contemplation in regards to the consumer of the work of art. An important difference can be found in the design and goals that the two practices follow. As previously mentioned in the section on *art thinking*, this deals predominantly with the denotation of something new, a field that did not exist before and from which an imaginary reality of a work of art emerges, a field that needs to be given a meaning. The meaning is given through sensory-perception processes, which address us through physical, mental and emotional levels. In *design thinking* the available elements and resources that the designers creatively iterate from the very beginning of the innovation processes are contemplated in a structured way. The various methods of *design thinking* use a number of steps to develop the process from the understanding of the problem, through empathy (pain storming) and the first ascertainment, to research work (in which the ideas emerge in the form of prototypes through a hands-on approach) and materialization, in which the best prototypes are tested, implemented and evaluated in regards to their success in addressing the problem. To avoid solutionism, productivism and economism, which we recognize as negative sides of *design thinking* (as undesired by-products of hasty decision making), we should persist from reaching conclusions too quickly, as these emerge as a result of unambitious expectations.

The role of the innovation catalyst, who has been sensitized to contemporary research and artistic practice, is to encourage truly radical innovations by introducing *art thinking*, which uses in-depth addressing of the starting points to positively subvert the various existing quick-delivery methods. At this stage, he needs to introduce the interventions of

speculative design, which is in fact some sort of vector derivation of solution-oriented designer thinking that has been attached to the imaginary starting points that have emerged through *art thinking*. The understanding of imaginary constructs is taken as the basis within these speculations. These constructs which have emerged through artistic ideation, are prototyped and modeled with various materials, protocols and actors and the possible scenarios that the innovation could offer are included into the contemplation.

Product-oriented *design thinking* is not excluded with the introduction of speculative design that is oriented towards the possible future. The first is determined by the criteria of optimality, while the other assumes the life of the product or service in ideal (idealized) circumstances. Speculative design thus offers an ideal possibility that can serve as a provider of good information in regards to the ideal (so far non-existing) circumstances for the product or service. Such an insight into the possible scenarios provides the client with a basis for an informed and thus optimized decision in regards to the product or service, for which a decision needs to be reached.

Connecting the Dots

The usual understanding of the innovation process is that the process ends once the initial problem has been solved with a proposal for a product or service. However, as it is radically new and ahead of its time, a truly radical innovation is merely the beginning of a successful implementation of the solution at the end of the *design thinking* process which shows the various empty spaces. From the viewpoint of applicability, these voids can be seen either as dangerous or as new opportunities. For a better understanding of the newly emerged situation, one needs to perform an iteration of the mapping process in the same way it was performed in the pre-innovation phase. One needs to use similar tools in order to determine the actual or eventual connectivity of the new innovation. The connectivity of the existing possibilities and the emergence of the new opportunities might create emergent pictures within the empty spaces that could not have been imagined before the creative and innovative process began.

At this point, we can, in agreement with the client, bring the innovative process to an end or use the newly emerged situation for a new cycle of the innovation process in which the innovation catalyst could change the members of the innovation team and repeat the meeting with the investor as well as change the *art thinking* and *design thinking* process.

If the client considers that the new opportunities are of key importance for successful innovations, the expansion of his operation, diversification or an opportunity to develop his influence, the innovation catalyst can diversify the innovation process and continue the work with various groups that seek symbiotic connections with the initial innovation and use this to create an ecosystem solution.

Innovation Resilience

Even if the innovation process ends in a concrete product or service, its' future can be uncertain. For the innovation to successfully see the light of day, the innovation catalyst needs

to carry out a series of verifications in which he ascertains the robustness of the innovation. This process can be carried out with the initial group of innovators or a new group can be established, as there is a great chance of emotional attachment to one's work which can easily obstruct the view of the more or less obvious dangers, weaknesses and mistakes of the innovation. The innovation catalyst needs to provide the new group with all and any information that has emerged during the development of the product or service, and at the same time remain objective. Testing the innovation in regards to its' resistance to failure (failure as a service - FaaS[20]) can also be an independent activity with which the innovation process can be started, as the weaknesses of the tested product or service can indicate whether these should be set differently. FaaS is a protocol that tests the system that has been established within the innovation process. It helps us ascertain whether the innovation that we propose and know rather well, is robust and resistant to sudden, unpredictable events (Chaos Engineering)[21]. Testing the resistance of the innovation through external penetrations[22] is a completely different process, in which not even the innovation catalyst knows where and in what way it will hit. Even though the innovation catalyst ordered and enabled these tests, he is in the same boat as his innovation team, which will have to face a totally unknown way of thinking, a disorder, a change and new information.

Resistance to mistakes can also be tried in other ways, and in the end this will lead to the realization of the robustness of the innovation. In the event that the innovation cannot be changed, the innovation catalyst has to estimate what is the chance that the client's new product or service will fail. It is definitely worth making a good risk assessment[23], as this provides good criteria for measuring the success of the innovation in the later estimates of its' direct and indirect effects.

Impact

Nobody is perfect. Thus, the success of the innovation catalyst is determined by his monitoring of the life of innovations in the real world and periodically evaluating their success. As the conditions and circumstances behind the emergence of the innovation change constantly, today's innovation can be outdated and inappropriate by tomorrow. Temporal distance is a relentless judge, and if the innovation was measured far into the future it is likely to have greater longevity.

Preserving contacts with clients, who can report on the inner problems (those reported by users) provides key information for the understanding of the scope of interactions that were not taken into account during the innovation process. With a better understanding of the effects that the innovations have produced, the innovation catalyst increases his knowledge base, which he can put to good use in the future planning of innovation processes.

Apart from the effects that the innovation brings or fails to bring to the client, it is very

20 https://www.apriorit.com/dev-blog/567-failure-as-a-service (Last seen: 19-01-2021)
21 Chaos Engineering is a discipline of experimenting on a system in order to build confidence in the system's capability to withstand turbulent conditions in production. https://principlesofchaos.org/?lang=ENcontent (Last seen: 19-01-2021)
22 https://www.apriorit.com/dev-blog/567-failure-as-a-service. (Last seen: 19-01-2021)
23 Risk mitigation: avoid, acceptance, reduction of control, transference, https://accendoreliability.com/4-effective-risk-mitigation-strategies/ (Last seen: 19-01-2021)

important that the innovation catalyst also monitors the effects that the innovation has on users (individuals), society as a whole and the environment (animate and inanimate nature).

Innovation Catalyst as a Non-Profession

During the innovation process, one can stumble across numerous obstacles and problems that can prevent a new product or service solution from seeing the light of day. This is why the innovation process needs to be designed in a way demanded by the issue from which the challenge emerged and not be tailored to the expectations of the clients, users or the innovators themselves. The independence and neutrality of the innovation catalyst play an extremely important role, as he is the leader on the journey into the unknown and as such needs the freedom to select the team, time and space, as well as the tools that will enable the team to truly focus on their work. He should not be governed by career rules and professional deontology, as his mission should be governed by his skills and reputation.

With ad hoc innovation design tasks this maneuver space focuses on micro-processes with which the work of the innovators can be facilitated in spaces that are temporarily intended for innovation. Thus, one can expect that the innovation catalyst will focus predominantly on the client, his problem and the possible solutions and scenarios.

Innovation processes that take place through research and production platforms (HUBs, laboratories, etc.…) and in which the innovation catalyst can work with multiple innovation teams, make it possible for the innovation catalyst to focus on establishing an innovation culture in which innovators are submerged into the imaginary realities that they have constructed through endless project or semi-projects, which, in turn, makes it easier for them to address the various challenges. The example of laboratories such as Parc, MIT Medialab, Nokia Bell, or Ars Electronica Futurelab reveals that groups that emerge in an exceptional innovation culture and are exceptionally successful in their inventions and innovations regardless of whether they are searching for solutions to external challenges or whether they are offering homegrown innovations to the real sector.

In the latter, the innovation catalyst is a person, who, within an innovation platform that is composed of several laboratories, encourages research, experimentation and creativity and through this establishes some sort of an imaginary space governed by marginal conditions of space-time. In a metaphor of simultaneous discovery and creation of new territories, this imaginary 'terraforming' functions as a prototype for a future society in which the possible scenarios for a better, i.e. safer, more sustainable and more ethical life are tested.

Jurij Krpan
Kersnikova Institute Art Director
Ljubljana, April 2020

4. Guidelines (ECTS)

MAST proposes implementating of the following set of courses, offering building on each partner institution is existing expertise and exploiting the synergies among art, sociology, computer science, critical design, and science and technology studies, thus offering complimentary training in the existing programs. In this structure, there is a balance between theoretical and practical training recommended for 2nd cycle study programs and for aspects of technological training, consistent with the Bologna Process. This balance is not based on a simple curriculum succession of university-directed units, but the integration of content in a teaching and learning flow that results from successively more complex actions, always interrelated. This means that each unit needs to be designed according to other related courses, resulting in complementary efforts that materialize in the systematic pursuit shared of projective methods. However, the theoretical training will not be neglected, and will occur whenever possible associated with the practical proceedings.

The MAST module proposes to achieve those minimal experiences and competences based on the proposed course structure. It may be implemented within larger curricular entities such as a thesis or an entire Master Study Program.

>> Online introductory course (1-2 ECTS)[4] as a generic preparatory course to give (future) MAST students and faculty an introduction to the field of AST, also clarifying the ethical implications within the innovation process/paradigm. The ECTS value of 1 or 2 ECTS points may be later added to a course quota or any other summative curricular structure in a program.

>> MAST Challenge Lab (8 or more ECTS) is a full-semester course that starts with the articulated MAST challenge related to a topic and ends with a solution in terms of a response to the challenge and relates to all of the learning outcomes of the MAST module. SEV should be properly reflected along the course process, along all the key stages. This is a common semester-long course, based on a real-life challenge, evaluated/feedbacked by an external committee in the end, repeatable annually.

>> AST Workshop (4 or more ECTS) It is an intensive course (usually 2-4 week) focused on a topic within the intersection of Art, Science and Technology, and related to the MAST challenge. Ideally, these are guided by mentors from different disciplines in which students get familiarized with selected methods and tools specific to the topic and its social, physical, political, scientific, economic, and local context.

4 https://mastmodule.eu/online-course/

In the MAST project, this is a local intensive workshop course, prepared collaboratively by the consortium partners, topic-related to the challenge, and that implies mobility and co-mentoring in the domain of AST.

>> Smaller "courselets" (Optional - Maximum 12 ECTS) Are individual-student specific arrangement of 2-4 ECTS short courses that provide the student with sets of skills and knowledge either generally relevant for the crossfield of AST, or specific for their local (institutional), or even individual project work. These courses often imply shorter mentorship sections and may interface with real-life work environments, as well as with the MAST challenge. This is an occasional workshop course focusing on a coherent set of skills, amounting to the MAST module.

>> internship/work-placement (8 or more ECTS) This learning activity integrates student work with the non-academic sector such as projects or other works within CCI organization (for example NGO, company, among others). The student is mentored from the academic side and co-mentored from within the cooperating organization. Both the progress of learning and the work as such are monitored and reflected from a social Europe's point of view of within the crossfield of AST.

5. MAST Implementation

The MAST consortium developed a concise curriculum and experimented during two academic years (2018-2020) through courses or workshops as Intensive Learning Events (ILEs). Out of working with a particular conceptual framework first: The *Future of Work,* and second: *Solidarity*, it was decided to construct the Challenge Lab as a fundamental structure to implement the challenge and to continue creating a variety of courses that would exemplify the MMI.

Unicult-MAST
Pilot Program
Rijeka, Osor, HR
Face-to-face

2 - 16
July 2018

PROGRESSIVE PRODUCT PROTOTYPES
The first MAST workshop
Funchal, PT
Face-to-face

9 - 23
Nov 2018

FUTURE.HUMAN@WORK
Rethinking Art, Science and Technology
Nova Gorica, SI
Face-to-face

11 - 15
March 2019

ALGORITHMIC SPACE STUDIES
Workshop
Graz, AT
Face-to-face

8 - 12
April 2019

Unicult-MAST HYBRID INTERFACING ACADEMY
Rijeka, HR
Face-to-face

1 - 6
July 2019

Fig.9 Intensive Learning Events of the MAST project

22 - 23 Sep 2020

MAST
Hybrid Interfacing Academy
Ljubljana, SI
hybrid

31 July - 31 Aug 2020

Infiltration _ einlsickerung
Workshop | Exhibition
Graz, AT
hybrid

2 - 6 June 2020

STORIES OF THE NEIGHBORHOOD
Workshop
Graz, AT
online

2 - 7 Feb 2020

SOLIDARITY 2020
Workshop
Funchal, PT
Face-to-face

20 - 22 Nov 2019

MAPPING
Art, Science and Technology
Workshop
Nova Gorica, SI
Face-to-face

18 - 19 Nov 2019

MAST Symposium
Rethinking Art, Science and Technology
Workshop
Nova Gorica, SI
Face-to-face

5.1. Challenge Lab

The first year of MMI worked on the challenge *The Future of Work* (topic 2018/19), which served as scaffolding for the entire development of workshops and readings. In the period 2019-20, the consortium consequently activated a reflection that contributed to a better understanding of the MAST Challenge. For the second year of pilot implementation, the MAST Challenge revolved around the idea of *Solidarity*, so the Challenge Lab was called *The Solidarity Lab*. Taking place at M-ITI (Portugal) in February 2020, this first attempt for implementing the challenge lab was a smaller version of the now designed MAST Challenge Lab. The MAST Challenge Lab is defined and constructed through the working matrix of methods mentioned Fig.3. It was gradually developed through the ILE program in 2018/19, and consolidated in the different ILEs along the years 2019 and 2020. Following the schedule of ILEs is possible to see the evolution of the MAST Challenges.

5.2 Intensive Learning Events (ILEs)

To develop the curriculum, the MAST consortium created different ILEs, a series of workshops where the community came together to exchange and experiment within AST.

During the MAST Project, ILEs were organized by the MAST consortium in different locations in Europe. Being most of the events organized face-to-face (7) and some online due to the COVID-19 pandemic (2). Fig.9 indicates the topics, locations, dates, and formats of the ILEs.

These events had an average duration of 1 week and participated in each with an average of 10 students and 3 mentors (Fig.10). In most cases, mentors were from different institutions and in all the cases, had a mixture of different backgrounds. All of them had the involvement of at least one academic partner, and 62% - 5/8 of NGOs and 50% - 4/8 of Industry. The format of the ILEs varied, being a mixture of hands-on and conceptual work (75% - 6/8), with 50% - 4/8 of them combining it with regular lectures, and leading to the materialization of some type of prototype (62% - 5/8), either individually (62% - 5/8) or in group (50% - 4/8).

For example during the implementation in Spring 2019 the ILE # 4 in Graz coordinated by TU Graz, was an add-on to the curriculum master elective *Space Material Detail*, a subject of the master of architecture at the university. The experimental ILE consisted of a collaboration between the media art gallery esc medien kunst labor, the University of Performing Arts Graz (KUG) within the Institute of Electronic

Music and Acoustics (IEM[5]), and the specific project Algorithms that matter (ALMAT[6]) with the help of invited artists. With this elective, students had the possibility of approaching technology through ALMAT, and at the same time, experimenting with the focus point of the Institute of Spatial Design, by developing concrete models for spatial interventions on the spot, so to say, a practical approach to AST. Since TU Graz focuses on practical knowledge that warrants the MAST student experience in the real world. Facing the problematics of COVID-19 for the second summer of implementation (2020) around the solidarity challenge, the TU Graz core group decided to opt for hybrid solution with two ILE options: ILE 8a (online) called *Stories of the Neighborhood*, and ILE 8b (presential), on the practical set up of the exhibition *In|filtration*[7].

In|filtration was the subsequent collaboration of the constellation of institutions of ILE # 4 of the previous year. The initial design installation models created during the workshop *Algorithmic Space Studies*[8] by students of the universities of Nova Gorica (SI), Madeira (PT) and TU Graz (AT) were considered. Out of six projects, the design *filtered* by Xhylferije Kryeziu, Carolina Silveira, Feni Susic, and Gaja Znidarsic was selected to be realised in a further treatment and at scale 1:1. The visual installation was implemented in connection with a new algorithmic sound installation by Hanns Holger Rutz and David Pirrò (ALMAT), who were invited-faculty during the first implementation. The spatial display was created with the support of Nayarí Castillo and Franziska Hederer as experts on spatiality and installation art. The sensor design was created by Richard Dank. This interdisciplinary project was an experiment taking place within the debate on interactions between art, science, and technology. The exhibition was part of the Graz Cultural Year 2020 parcours *Algorithmic Segments*[9].

A second book called Spatial Experiments in Art, Science and Technology complements this Manual and serves as a showcase of the MAST implementations.

5.2.1 ILEs Data Analysis

The following cluster analysis focused on investigating clear processes and methodological structures implemented during the ILEs. The set analysis started by resorting to MAST website[10] and TU Graz's Research Catalogue pages. These sources were used to gather information about each ILE (Fig.10). For this analysis, it was decided to concentrate on the methodology used at each ILE and establish a relationship with the 10 steps of the MAST Innovation Cycle (MIC) model proposed by the MAST

5 https://iem.kug.ac.at/en/institute-of-electronic-music-and-acoustics.html
6 https://almat.iem.at/
7 https://www.researchcatalogue.net/view/711664/711665
8 https://www.researchcatalogue.net/view/595459/595460
9 https://www.researchcatalogue.net/view/656665/656666
10 https://mastmodule.eu

Fig.10 Format of and participation in the Intensive Learning Events

		Industry	Academia	NGO	Lectures	Hands On	Conceptual	Prototype	Group	Individual	Duration/days	Students	Mentors
1	Unicult-MAST Rijeka, Osor, HR	X	X			X		X		X	15	10	3
2	PROGRESSIVE PRODUCT PROTOTYPES Funchal, PT		X	X	X	X	X	X	X	X	15	9	4
3	FUTURE HUMAN@WORK Nova Gorica, SI		X	X		X	X			X	5	9	3
4	ALGORITHMIC SPACE STUDIES Graz, AT	X	X				X	X	X	X	5	22	2
5	World without human Ljubljana, SI; Bratislava, SK	-	-	-	-	-	-	-	-	-	-	-	-
6	MAPPING Art, Science and Technology Nova Gorica, SI	X	X	X	X	X	X	X		X	3	9	2
7	SOLIDARITY 2020 Funchal, PT		X	X	X	X	X	X	X		5	10	5
8a	STORIES OF THE NEIGHBOURHOOD Graz, AT		X			X	X		X		5	11	2
8b	in|filtration_ ein|sickerung Graz, AT	X	X	X	X	X	X		X	X	30	10	2
9	MAST Hybrid Interfacing Academy Ljubljana, SI	X	X	X	X					X	2	12	-
	Total	5	9	6	5	7	7	5	5	5	7 (average)	10	3

project. The MIC model proposes the following ten steps: 1-CHALLENGE, 2-TEAM, 3-RULES, 4-MAPPING, 5-BENEFICIARIES, 6-ART THINKING, 7-DESIGN THINKING, 8-MODELLING, 9-APPLICABILITY, 10-IMPACT (Fig.3).

Excerpts of data available from each ILE corresponding to each of the MIC 10 steps were placed in the corresponding intersections between each ILE and MIC. These excerpts were later encapsulated into hashtags.

From the 199 hashtags created, it became apparent that some steps had more data available. For instance, each MIC's step had an average of 20 hashtags, but the TEAM step had a total of 28 hashtags.

The hashtags were then ordered into relevant groups „*by mapping the similarities or dissimilarities on various dimensions*" according to Henry et al[11]., using Miro[12], an online collaborative whiteboard visual platform. The goal was to determine patterns in the qualitative data to further our comprehension of the specificities and the contexts they are enclosed. First, the generated hashtags were placed on Miro's digital platform on individual color-coordinated post-its. A color was assigned to each ILE. These posts-its were organized in columns on the designated 10 steps of MIC. Later these elements were grouped according to its meanings, resulting in 17 groups.

The resulting analysis can be found in Fig.11 and Fig.12. Cluster 1 (DEVELOP MODULE) contains a single hashtag within with the same name. It is followed by cluster 2 (PARTICIPATORY DEVELOPMENT), with four examples reinforcing the stakeholders' needs throughout the ILEs process. The third cluster (STAKEHOLDERS), with four hashtags containing *#University*, *#Academia* and *Creative&CultureSector*. The subsequent clusters, (STUDENTS) and (MENTORS), with 2 and 4 post-its respectively illustrate the involvement of MAST's alumni and mentors, who are united by the fifth cluster (INTERNATIONAL GROUP), named after the one post-it encompassed by this group. Cluster 7 (TOGETHERNESS), with four hashtags, emphasizes the proximity of which the stakeholders need to be in this process and establish a close mentor/mentee relationship. Cluster 8 (AST) encloses 23 coded data that relate to Art, Science, and Technology by referring *#ASTPoject, #AST* or *#ASTPractices*. Cluster 9 (CONNECTION), links AST and cluster 10 (CALL FOR INNOVATION) with 31 hashtags. It is possible to observe „#CatalystOfInnovation" appearing five times and associated with a call for *#InnovativeSolutions*. Cluster (METHODOLOGIES), with two hashtags, strengthens the need for a *#MethodologicalDevelopmen*t that should be established through cluster 12 (FLUID FORMAT). This announces a flexible setting where the stakeholders share their knowledge and assess the way they would like to investigate their explorations, either through *#GroupWork* or by *#IndividualWork* as indicated by cluster 13 (FORMAT). Cluster 14 (MAKE) with 43 hashtags, accentuates the

11 Henry, D.B., Tolan, P.H. and Gorman-Smith, D., 2005. Cluster analysis in family psychology research. Journal of Family Psychology, 19(1), p.121.
12 www.miro.com

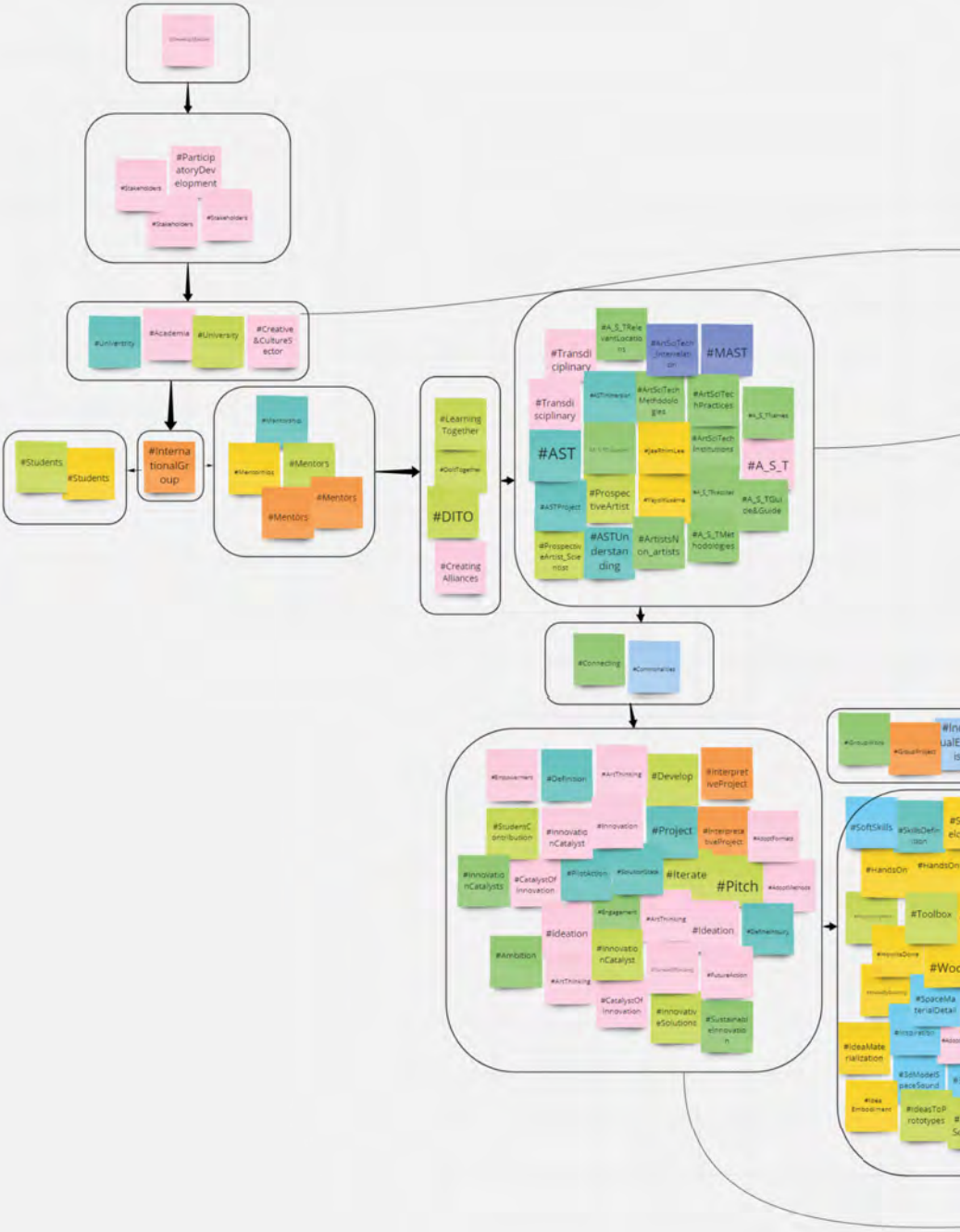
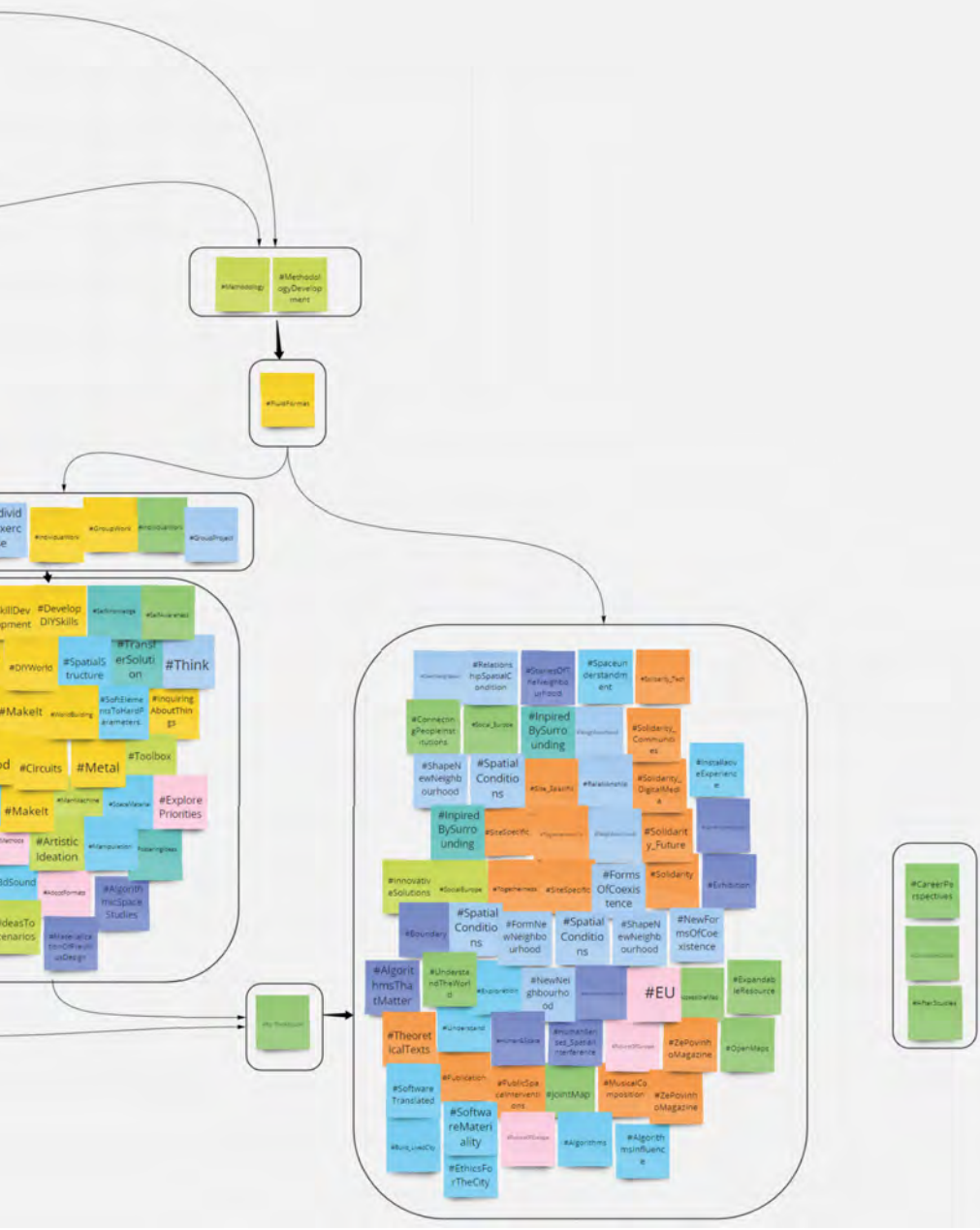

#ParticipatoryDevelopment
#University
#Academia
#University
#Creative&CultureSector
#Students
#Students
#InternationalGroup
#Mentors
#Mentors
#Mentors
#LearningTogether
#DITO
#CreatingAlliances
#Transdisciplinary
#Transdisciplinary
#AST
#ProspectiveArtist
#ASTUnderstanding
#ArtistsNon_artists
#A_S_TRelevantLocations
#ArtSciTechInterrelation
#MAST
#ArtSciTechMethodologies
#ArtSciTechPractices
#ArtSciTechInstitutions
#A_S_T
#A_S_TGuide&Guide
#A_S_TMethodologies
#Connecting
#Empowerment
#Definition
#ArtThinking
#Develop
#InterpretiveProject
#StudentContribution
#innovationCatalyst
#Innovation
#Project
#InterpretiveProject
#innovationCatalysts
#CatalystOfInnovation
#Iterate
#Pitch
#Ideation
#Ambition
#Engagement
#ArtThinking
#Ideation
#innovationCatalyst
#CatalystOfInnovation
#InnovativeSolutions
#SustainableInnovation
#SoftSkills
#SkillsDefinition
#HandsOn
#Toolbox
#SpaceMaterialDetail
#IdeaMaterialization
#SoftModelSpaceSound
#IdeasToPrototypes

Fig.9 Intensive Learning Events of the MAST project



mentors and mentees examination from exploring possibilities to *#IdeaMaterialization* relative to their situatedness. In a *#DIYWorld*, the students must explore their soft and hard skills and their *#ArtisticIdeation* should be achieved by a myriad of conceptual and material possibilities. Cluster 15 (FUTURE THINKING), as indicated by the only hashtag, permeates and connects the previous cluster and the sixteenth one (SITUATEDNESS) by acknowledging the need for a *#SpaceUnderstandment* and by being *#InspiredBySurrounding* which ultimately may lead to new *#FormsOFCoexistence*. Cluster 17 (CAREER), with three hashtags like *#CareerPerspectives*, infer that new models of apprenticeship must be investigated with the full commitment of all stakeholders in order to achieve new forms of understanding and coexistence.

A second methodology using text analysis tools was also used to analyze the content and methodology implemented in the different ILEs, KH Coder[13], a free software for quantitative content analysis or text mining utilized for computational linguistics. We computed the co-occurrence of words (verbs and nouns) from the syllabi of all the ILEs[14]. This analysis rendered a co-occurrence word network diagram. A co-occurrence network diagram[15] shows words with similar appearance patterns, by connecting them by lines (edges) according to their frequency of appearance. Only co-occurrences with a correlation value higher than 0.2 are considered for this analysis.

The co-occurrence network diagram shows that the main concepts of the ILEs, according to their frequency of appearance, were STUDENT, DEVELOP, WORKSHOP and NEW, followed by CREATE and NEIGHBOURHOOD, then by SOLUTION, INNOVATION, FUTURE, SPATIAL and METHODOLOGY.

From the analysis, some clearly separated clusters can be identified, being the triangle of FUTURE + INNOVATION + CATALYST and TRANSLATE + POSSIBLE + ARTISTIC the most relevant ones. These reflect some of the underlying hypotheses of the MAST project, such as using artistic practices as an enabler to innovation, as well as the focus on innovation and its impact on the future of our societies.

The remainder of the diagram shows a highly interconnected network around the most frequent words. This diagram places the STUDENT next to *DEVELOP* cluster, which mediates with the translation of solutions to specific settings (ISLAND + RURAL + SETTING). The STUDENT cluster and DEVELOP cluster are also connected through the METHODOLOGY, highlighting the role of RELEVANCE, PRACTICE, AND INSTITUTIONS in the methodological choice. The clusters STUDENT and DEVELOP are also connected to WORKSHOP through a web describing the processes. These processes involve PROJECT, SITE-SPECIFIC, EXPERTS – MENTORS – PUBLIC, and ac-

13 https://khcoder.net/en/
14 available at https://mastmodule.eu/events/
15 Higuchi, K. (2016). KH Coder 3 reference manual. Kioto (Japan): Ritsumeikan University

tions such as CONVERSATION-CRITIQUE-ENGAGE-INTERPRETIVE that confluence in GROUP to perform TASKS in the WORKSHOP. These processes are also connected to the CREATE cluster through values (SOLIDARITY and FUTURE). The STUDENT cluster is also connected to CREATE through the WORK node and UNDERSTAND-MODEL-ELEMENT. The *CREATE* and the *NEW* clusters are mediated through the ART – COMMUNITY – FIELD triangle, indicating the mediating role to arts in the creation of innovation. Connected between the METHODOLOGY and NEW clusters we find a variety of concepts related to situatedness (CITY – NEIGHBOUR – SPATIAL – RELATIONSHIP – SHAPE – PLACE) as well as actions (LIVE – DEAL – OWN – FORM – MEAN – BUILD – STUDY – BRING – THINK).

From this analysis we can conclude that the MAST methodology to social innovation places the student at the core, who engages stakeholders with a complex dialog and a critical thinking porcess for creating innovation with social values through art, and relying on a methodology that primes the understanding and situatedness of solutions. Other events change dramatically the implementation cadence as response towards the situation of pandemics.

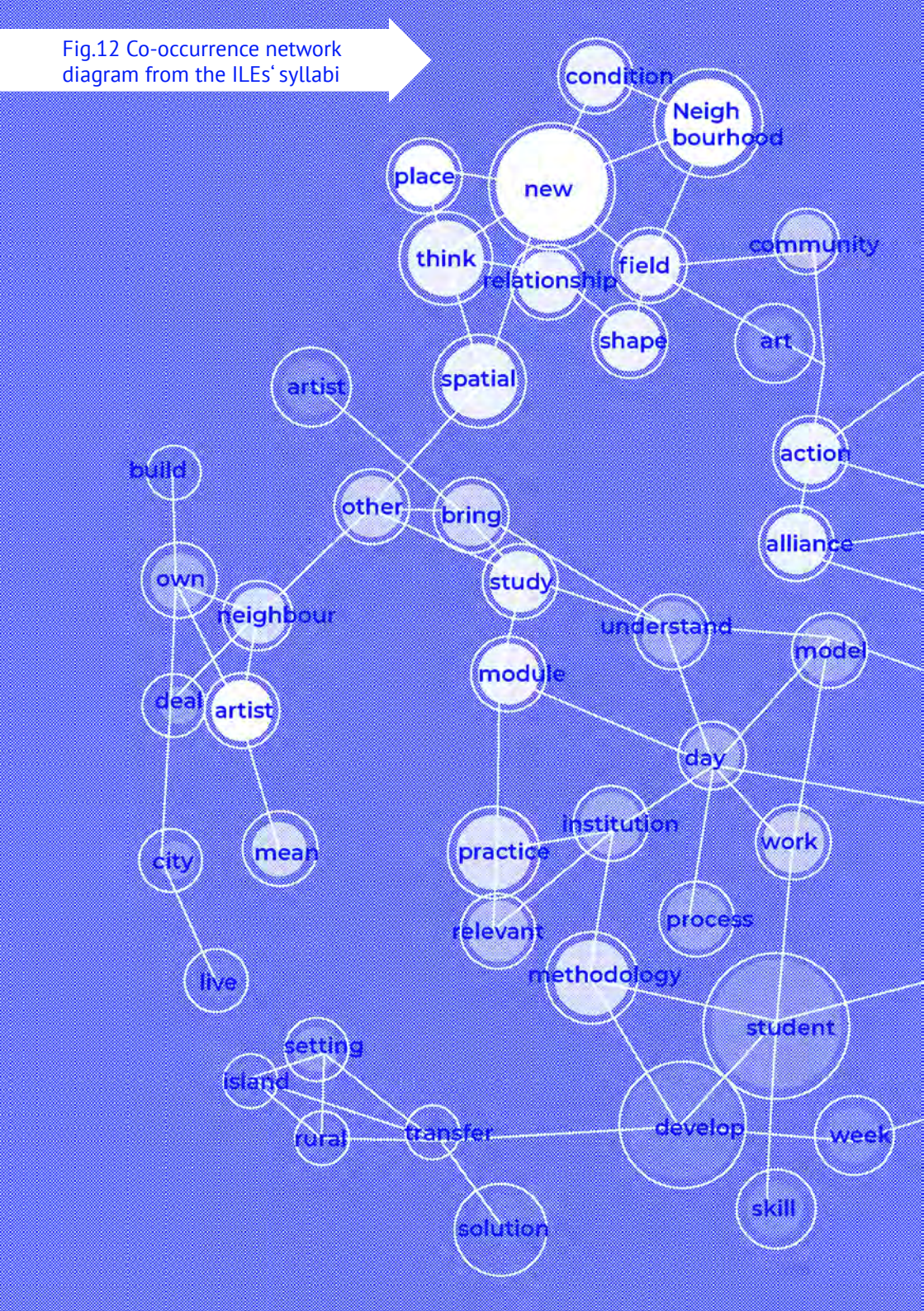
5.3. MAST Hybrid Interfacing Academy (HIA)

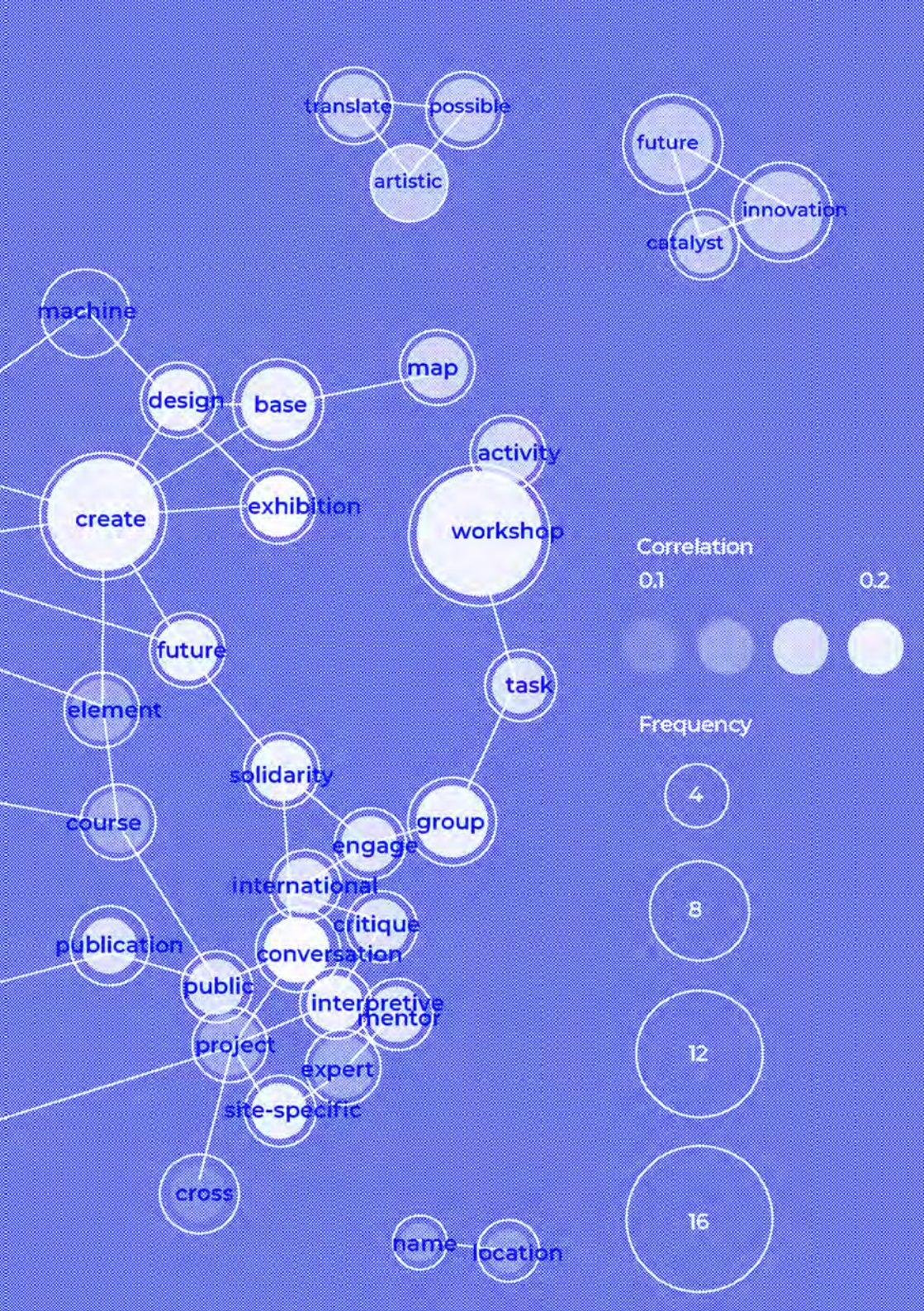
This hybrid, on and offline event, took place from 22nd to 24th September 2020, exploring *In what way can the imagination of artists and their creative tools bring about true novums at the crossings of technology and science, tackling the most complex challenges of the future, both for society at large, and the industries in particular?*

At this concluding event of the MAST project, participants from various of disciplines have jointly explored and identified the vectors of possible policy impacts and priorities for the future of Europe and created alliances for forward-thinking future actions. The event itself presented the pinnacle of the MAST project, supported by Creative Europe, dedicated to developing an applied study module at the intersections of AST, combining methodologies and practices that intertwine the academic sphere with the Culture and Creative Sectors (CCS) closely.

The range of events included a symposium with four key speakers. The HIA also featured a speculative situation to stimulate new pivotal points of innovation processes with a radical approach. Different stakeholders were brought together to ideate primarily within the artistic realm by adopting the methods and formats of the Challenge Lab, which is also the core of the recently accredited master study module of MAST. In addition, an overview of best practices and experiments on how art thinking could empower future Innovation Catalysts was shown in an exhibition, and presented live at the event by MAST students and mentors. Moreover, two policy-making workshops have been organised with strategically architectured lists of participants: one pivoting around burning matters of education, the other in the realm of industry.

Fig.12 Co-occurrence network diagram from the ILEs' syllabi




translate
possible
artistic
future
innovation
catalyst
machine
map
design
base
activity
create
exhibition
workshop
Correlation
0.1
0.2
future
task
element
Frequency
solidarity
4
course
group
engage
international
8
critique
publication
conversation
public
interpretive
mentor
project
12
expert
site-specific
cross
16
name
location

5.3.1 MAST HIA Showcase

An exhibition of students' works was presented in the real space of a gallery. The video showcase[16] takes you on a tour through the minimalist HIA exhibition at Kersnikova Institute, Ljubljana, Slovenia (September 22-23, 2020), touching upon some key events and ideas of the MASTModule-EU project, presented by Peter Purg (UNG-MAST project leader); and Simon Gmajner, Kersnikova Institute, including narratives of MAST alumni and students caught on video along several ILES as pilot workshops[17] for the MAST module.

5.3.2 MAST Symposium 2020

The goal of this cutting edge panel discussion[18] with individual keynotes was to bring together policymakers, artists and academics, in a debate about the interdisciplinary challenges of open innovation in the interface AST. Artists and designers shape an important relationship between science, technology, and human beings, and this dialogue stimulates innovation centered on transversal competencies and unconventional thinking. The combination of artistic research and participatory design strategies is key finding divergent approaches to sustainable development of science and technology, and transforming their socio-economic impact. It is necessary to create a context of possibility for the skills' development, knowledge and tools from experimental and collaborative environments, research methods in art, social sciences, sciences and technology, and cultural studies. Participants:

>> Viviane Hoffmann – Deputy Director-General for Education, Youth, Sport and Culture, European Commission

>> Barbara Stacher – European Commission, DG EAC, Cultural Policy Unit

>> Michela Magaš – Innovation Catalyst who bridges the worlds of science and art, design and technology

>> Marko Peljhan – Media artist, professor and entrepreneur; new media arts and technology

>> Peter Purg – Assoc. Prof. PhD. UNG-MAST project leader

>> Tere Badia – Culture Action Europe (workshop moderator)

16 https://vimeo.com/showcase/5565582/video/460459486
17 https://mastmodule.eu/the-mast-module/
18 https://www.youtube.com/watch?v=yH4_FZdDK3U&feature=youtu.be

5.3.2 MAST Education and Policy Workshop

The key aim of the workshop[19] was to discuss the AST's potentials blend in higher education for pedagogy, research, and especially radical innovation. The workshop identified assets among the participants, and applied them to discerned needs and opportunities, in order to prototype both formal and non-formal implementation formats for a common European future in AST education. The workshop included primarily academics and policy-makers, but also reflected the student's view, not least it sought to represent the employers' view from a broad range of CCIs including the NGO sector and the tech industry. The policy makers on EU and national scale were invited to explore the viability of policy support and potential changes, with a final aim to instigate a positive integration of the AS-T innovation methodology into the education systems at large. Participants:

>> Peter Friess – Future Media, Social Network Innovation, Science-Technology-Arts / Media Policy, European Commission, DG Connect, Brussels, Belgium

>> Sanja M. Bojanič – University of Rijeka, Academy of Applied Arts, professor and vice-dean, executive director of CAS SEE, Croatia

>> Christophe De Jaeger – Director GLUON, BOZAR Programme Manager BOZAR Art & Research, Brussels, Belgium

>> Jana Javornik – Director at the Higher Education Directorate, Ministry of Education, Science and Sport, Slovenia

>> Robert Manchin – Culture Action Europe president, Belgium

>> Milena Dragićević Šešić – Head of the UNESCO Chair in Cultural Policy and Management, professor of Cultural Policy & Cultural Management, Cultural Studies and Media Studies, University of Arts, Belgrade, Serbia

>> Sašo Sedlaček – Vice-dean for R&D at Academy of Fine Arts, University of Ljubljana, Slovenia

>> Peter Purg– MAST project lead, UNG, Slovenia (workshop moderator)

5.3.3 Industry Collaboration Workshop

The workshop's[20] aim was to clarify policy directions that encourage a synergetic approach between the art sphere and the industry. Such collaboration seeks a more sustainable and ethical economy, alongside social innovation solutions reached through the collaboration between the art sphere and the communities. The workshop addressed primarily artists with a broad understanding of the arts' role in contemporary society. Followed by art researchers involved in the investigation of

19 https://vimeo.com/showcase/5565582/video/461317484
20 https://www.youtube.com/watch?v=yH4_FZdDK3U&feature=youtu.be

contemporary technological and societal phenomena. And finally, art producers who are facilitating art laboratories, and art laboratories where artists, scientists and engineers collaborate on joint projects. The workshop's participants were thus the artists with whom the partners in MAST consortium collaborated so far, Slovenian artists from the field of contemporary investigative arts (konS project - a platform for investigative arts), experts in different art supporting activities, producers of artworks, as well as scientists and engineers who are collaborating with artists in art laboratories.

>> Facilitated by Jurij Krpan, Kersnikova Institute

>> With various participants of the different universities and general public.

3.5.4 Challenge Lab Discussion

The Challenge Lab discussion[21] presented a setting similar to the Situation Room – within which an interdisciplinary group interested in taking part in an innovation process is put in front of a challenge, to provide technological innovation, an application of technological innovation in society, or social innovation. The four participants represented each, an aspect of the MAST mix: art production and facilitation, pedagogy, innovation management, science, and technology). Such a process is to be facilitated by an Innovation Catalyst, a professional profile that is being built through AST study modules, such as MAST, herein presented as the facilitator (J. Krpan). The discussion gives a deeper insight of the terms such as: Challenge Lab, Innovation Catalyst, and art thinking, and presents the entire Challenge Lab with the 10-step innovation cycle as the core of the MAST module syllabus. Participants:

>> Simon Mokorel – Project Designer and Design Engineer, Innovation Manager

>> Jurij Krpan – Art Director at Kersnikova Institute, as Facilitator

>> Sergi Bermudez i Badia – Professor at Madeira Interactive Technologies Institute

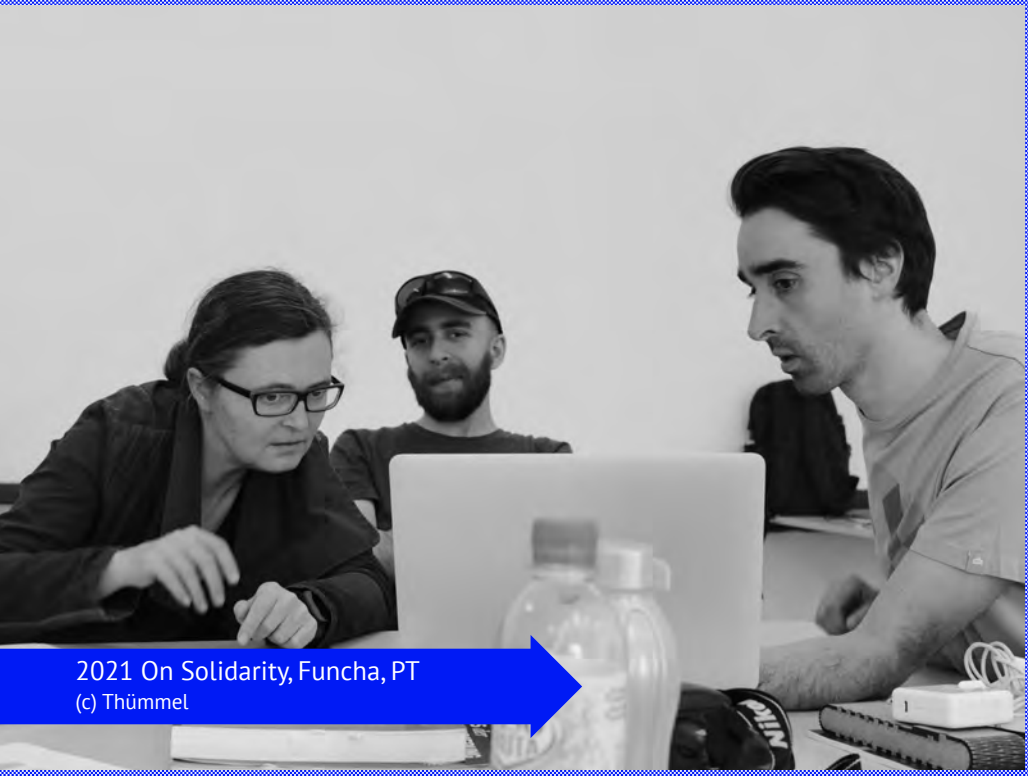
>> Peter Purg – Assoc. Prof. PhD. University of Nova Gorica School of Arts

3.5.5 UNICULT @ MAST

The UNICULT @ MAST[22] took place at the Museum of Modern and Contemporary Art Rijeka. The topic of the 6th Edition of Unicult2020 was: *Culture in Transition – heading towards a more innovative and equal society.* The subtopic focussed on Professional and Personal Development in AST where the MAST CDG was discussed, and is to be presented eventually along with the shared experiences and perspectives from

21 https://vimeo.com/showcase/5565582/video/461317283
22 https://www.facebook.com/MASTermodule

2018 Unicult-MAST, Rijeka, Osor, HR
(c) MAST



2021 On Solidarity, Funcha, PT
(c) Thümmel

artists, scientists and curators, focusing also on the emerging MAST alumni profiles. The online speakers and pre-recorded lectures addressed students, policy makers and leadership structures in arts and culture, alongside with the general public. Participants:

>> Milena Dragićević Šešić – Head of the UNESCO Chair in Cultural Policy and Management, professor of Cultural Policy & Cultural Management, Cultural Studies and Media Studies, Serbia

>> Lev Manovich – a world- renowned innovator in digital humanities and theorist of digital culture and media art

>> Michela Magaš – Innovation Catalyst who bridges the worlds of science and art, design and technology

>> Jan Fabre – Multidisciplinary artist, playwright, stage director, choreographer and designer, Belgium

>> Luk Van den Dries – Dramaturg and full Professor of Theatre Studies at the University of Antwerp, Belgium

>> Ivana Jozic – Dancer and actress at Troubleyn, Belgium

>> Phil Griffin – Artist, photographer and director

>> Daniela Urem – producer and founding president of the Doors Art Foundation, New York (USA), and the Croatian Cultural Alliance – CCA Croatian Cultural Alliance

3.5.6 Reflection Roundtable — ILEs Results

The roundtable discussion[23] addressed the methodologies, good practices and outputs of the different ILEs as pilot workshops[24] for the MAST module. In an in-depth conversation with facilitators and students involved in the activities, the event presented the best experiences. IT provided vivid examples of future educational approaches within art, science, and technology studies, that may model or even directly build their programes:

>> Keynote speech by Lev Manovich, introduced by Daniela Urem and Nayarí Castillo-Rutz.

>> Open discussion with Lev Manovich – with Hanns Holger Rutz, Nayarí Castillo-Rutz, and Franziska Hederer (TU Graz, MAST mentors)

>> Duarte Luis de Sousa, Carolina Silveira, Helene Thümmel – MAST Students from University of Madeira, University of Nova Gorica School of Arts, Graz University of Technology.

23 https://www.youtube.com/watch?v=UM7V0xEThCg&feature=youtu.be
24 https://mastmodule.eu/the-mast-module/

>> Facilitated by: Nayarí Castillo-Rutz, and Franziska Hederer, Assoc. Prof., Institute for Spatial Design, Graz University of Technology

5.4 Other Events: Pop-up Synergies

MAST had a significant symbiotic outreach in several events throughout the project duration in addition to the events of the project itself. Within the different project ILEs Pop-Ups and other dissemination strategies, synergies were always sought, establishing contact with other projects and initiatives.

5.4.1 PIF Camp

PIFCamp is a 7-day hacker-base set in Slovenian nature, where art, technology and knowledge meet. MAST@PIFCamp in the second project (4.-11.08.2019, Soča, Slovenia) year was designed as a pop-up event where the students of MAST would join a one week prototyping session and get in touch with the projects and individuals (or collectives) that have been successful in upgrading their DIY / DITO methodologies and prototypes into business solutions. Two of the MAST students were able to join and a mentor from Kersnikova Institute as the facilitator of the pop-up event.

5.4.2 Mast Symposium, Pixxelpoint

The first highlight of spreading the project's core values and ideas came with the MAST Symposium (18.-19.11.2019, Nova Gorica, Slovenia) and the Pixxelpoint Festival, which were planned as sister events. Both explored an open variety of topics among AST, discussing them through different prisms of the festival topic: Checked Reality. The Work at the Interface Continues.

5.4.3 Bozar

In January 2020, Culture Action Europe collaborated with BOZAR LAB and Joint Research Centre (JRC), the partners facilitated a multifaceted evening *Occupying the middle. On Transdisciplinary Research* to debate on the status quo of transdisciplinary research and the challenges of creating a common field which generates new sectoral and cross-sectoral dynamics and the specific contribution of artistic research in setting this new paradigm. The three-part session brought forward the MAST project, showcasing the real-life results of MAST students using problem finding methods and introducing the concept of mastering art thinking as a key competence in creating more profound, plausible and sustainable solutions. Great emphasis was put on the importance of forming the next generation of catalysts of innovation to generate socially meaningful and ethically reflected innovation in today's big and small organizations.

5.4.4 Algorithmic Segment - xCoAx - Graz Kulturjahr 2020

In July and August 2020, building up a previous collaboration for the first ILE in Graz in 2019, TU Graz worked along with ALMAT[25] producing the transdisciplinary exhibition In|filtration in the esc medien kunst labor project space. In|filtration was part of the umbrella project Algorithmic Segments[26] in the framework of the Cultural Year 2020 impulsed by the city of Graz and Conference on Computation, Communication, Aesthetics & X (xCoAx 2020)[27] Exploring the potential of algorithms as material to evoque the conjunction of art, science and technology. The synergy produced a coherent amalgam of institutions and people that will keep sustaining relations in the region. Students were invited to develop, work and live a real CCI experience from conception to implementation, constructing a multi-sensorial space.

5.4.5 MAST HIA Sessions

The HIA represented an important moment of crystallization in the relation with the CCS. The event gathered several experts, practitioners and students in an amalgam of discussion and reflection that change radically the thought of many of the present.

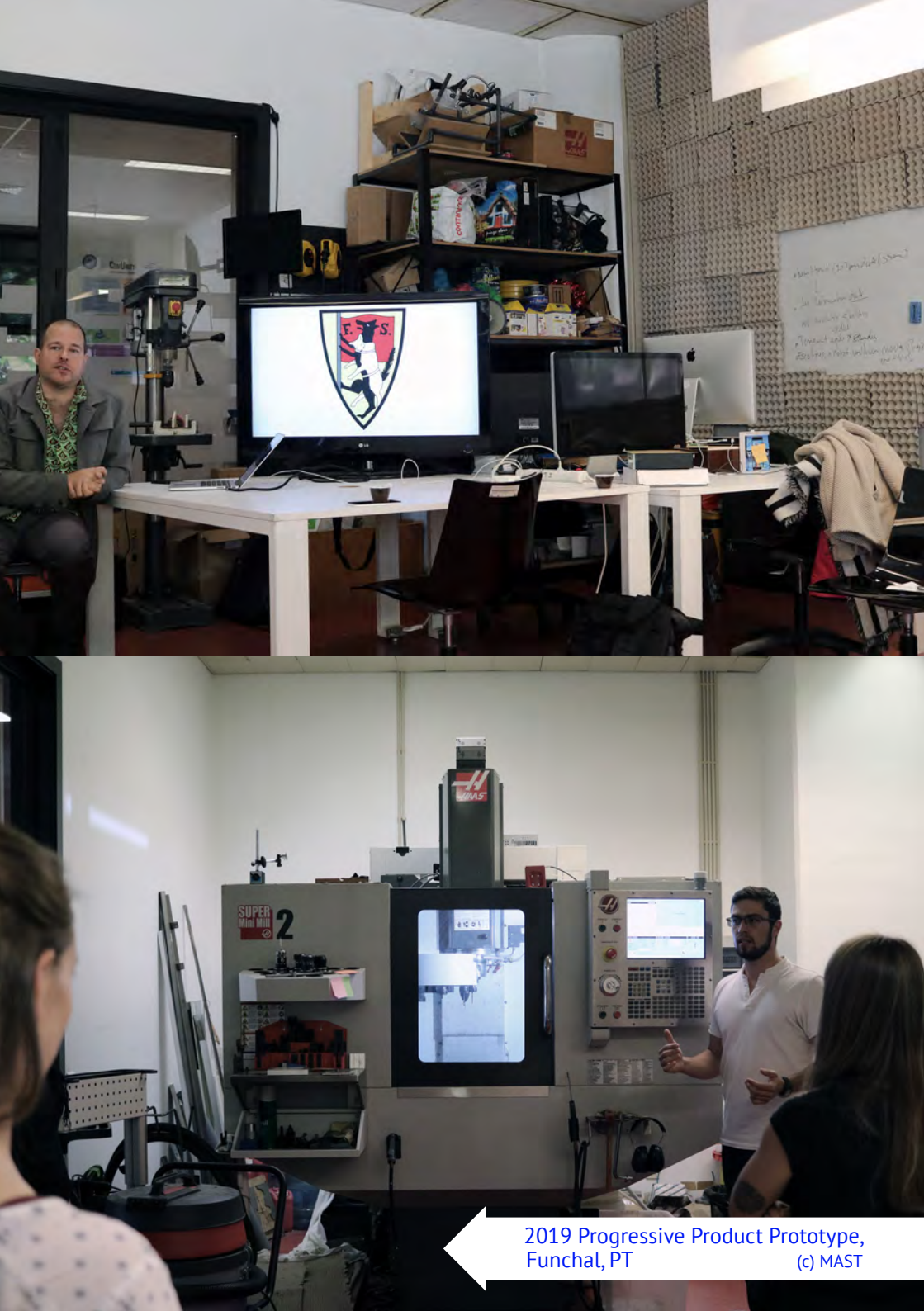
As seen in previous sections, the MAST Module was implemented differently across the various institutions and consortium partners. Here some examples of how they interpreted the implementation.

25 https://almat.iem.at/
26 algorithmische-segmente.mur.at
27 https://xcoax.org/

2018 Unicult-MAST Pilot, Osor, HR
(c) MAST

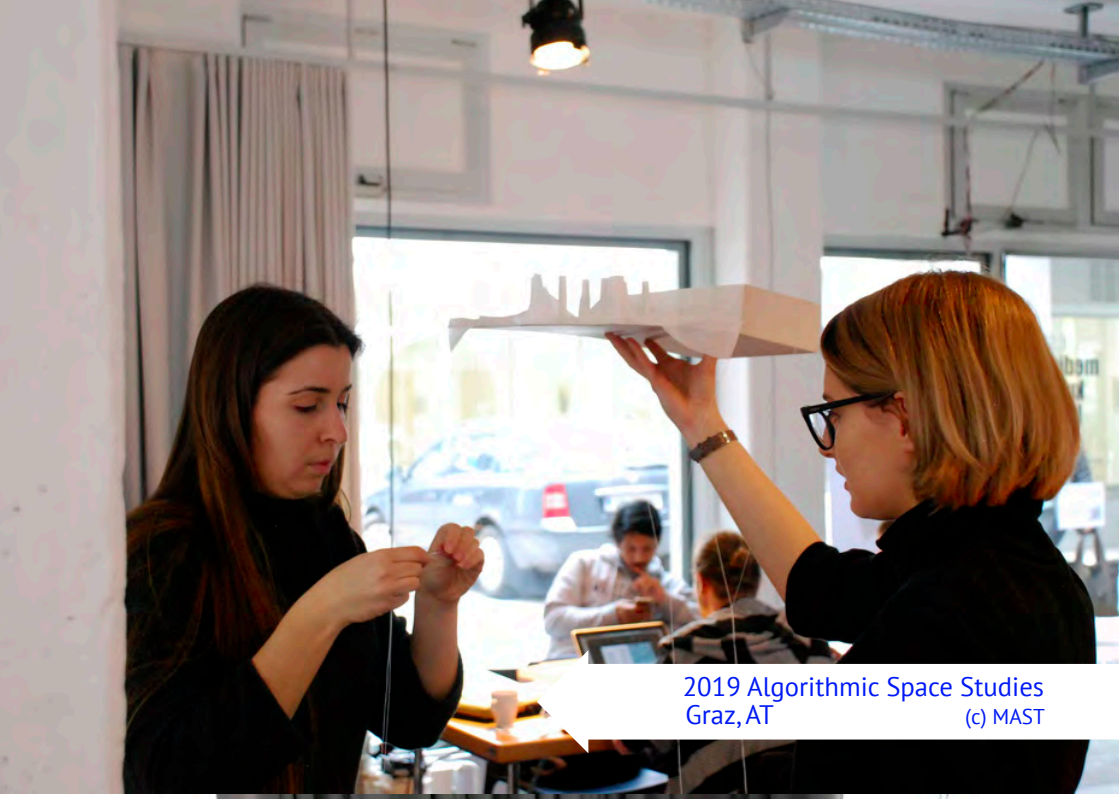
2018 Unicult-MAST Pilot, Rijeka, HR
(c) MAST

2019 Progressive Product Prototype,
Funchal, PT (c) Gobec



2019 Progressive Product Prototype, Funchal, PT (c) MAST

2019 FUTURE.HUMAN@WORK
Nova Gorica, SI (c) MAST



2019 Algorithmic Space Studies
Graz, AT (c) MAST

2019 Unicult-MAST Interfacing Academy, Rijeka, HR (c) MAST

2019 Unicult-MAST Interfacing Academy, Rijeka, HR (c) MAST

2019 Pixxelpoint Symposium
(c) Vidmar

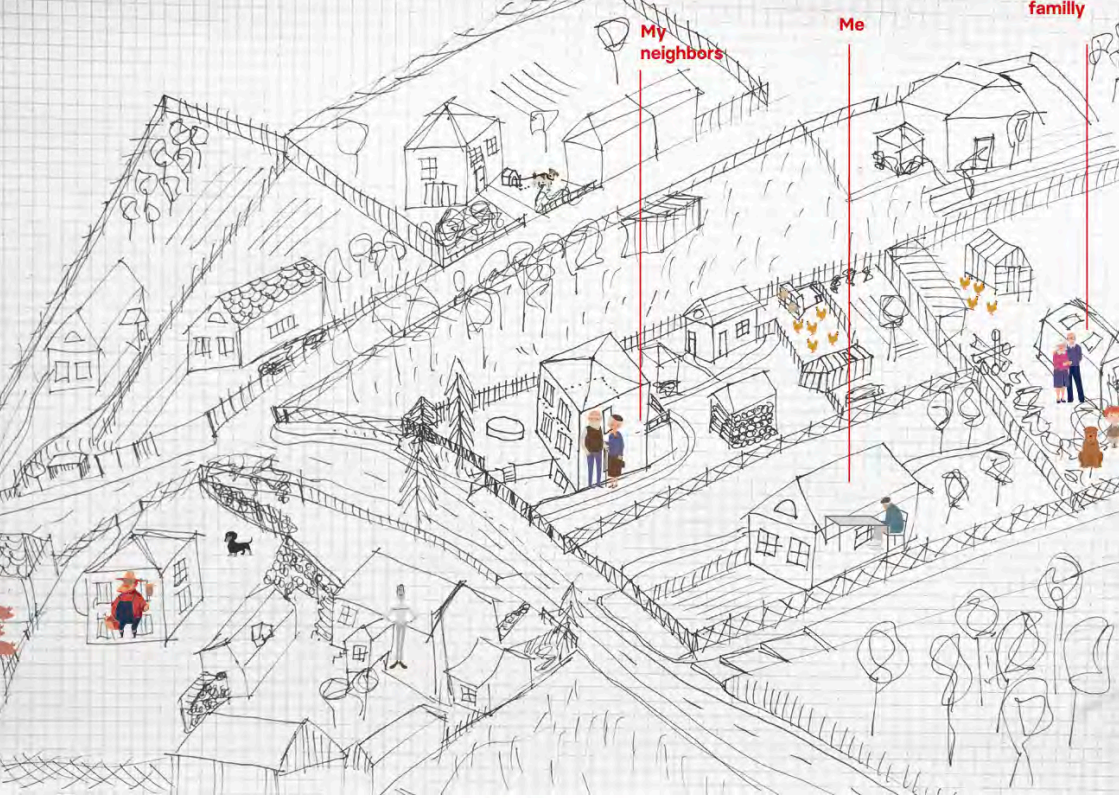
2019 Pixxelpoint Symposium
(c) Purg

2019 MAPPING Art, Science and Technology, Nova Gorica, SI (c) Bonelli

2019 MAPPING Art, Science and Technology, Nova Gorica, SI (c) Vidmar

2020 On Solidarity, Funchal, PT
(c) Thümmel

2020 On Solidarity, Funchal, PT
(c) Thümmel

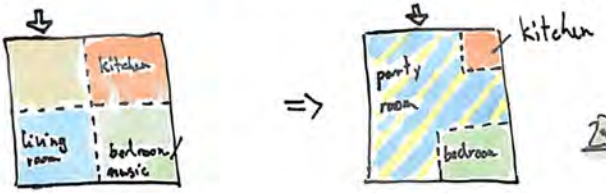


2020 Stories of the Neighbourhood

- plays drums
- weekend parties
- vacumes appartment before family visits
- currently his appartment is under construction + emits a lot of noise

HABITS:

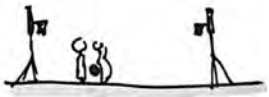
PLAN:



SECTION:

COEXISTANCE NEEDS:

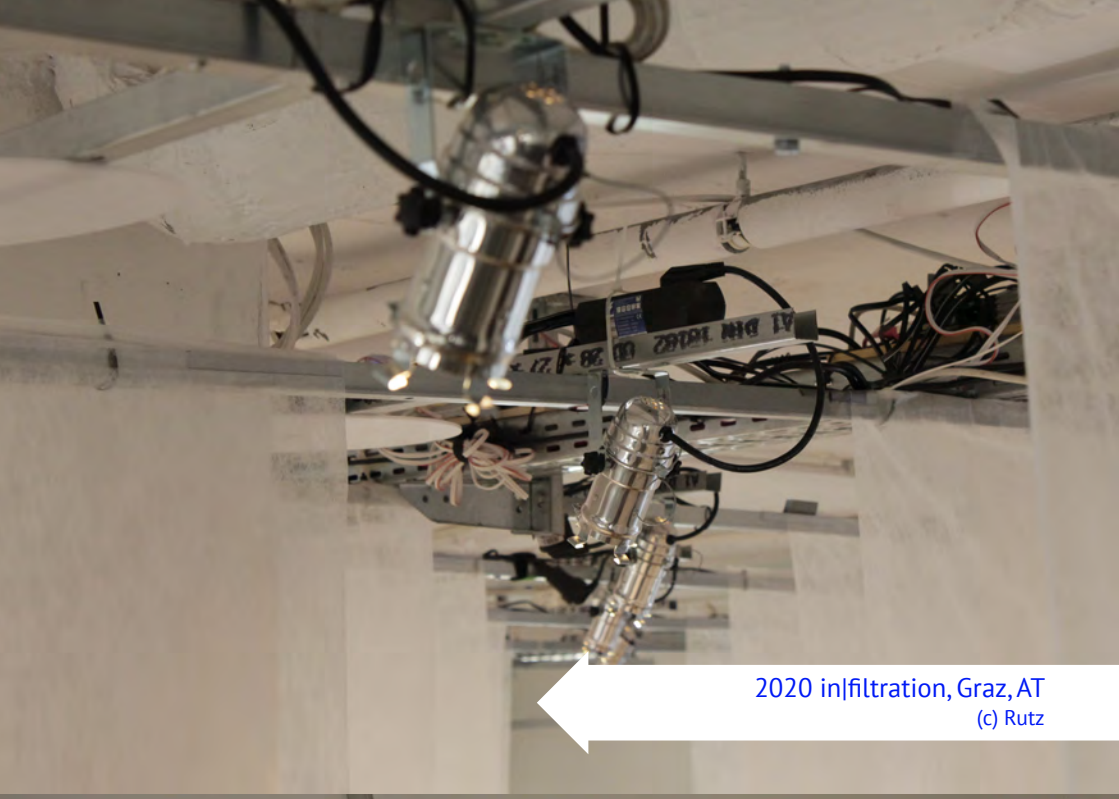
- garage band in the basement



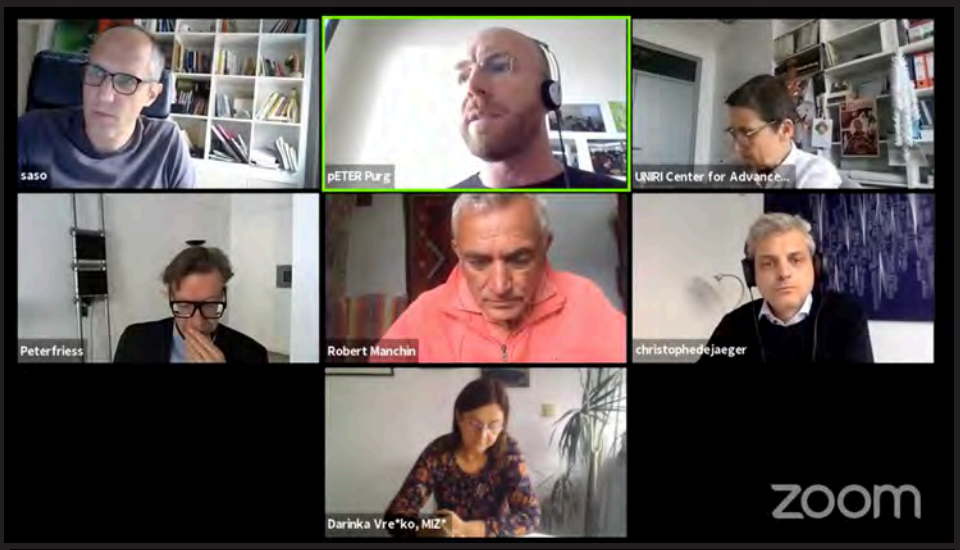
- sports, recreational activities with friends

- a bar nearby
- a place to meet new people

2020 in|filtration, Graz, AT
(c) Rutz



2020 in|filtration, Graz, AT
(c) Rutz



2020 MAST Hybrid Interfacing Academy
Multiple locastions

2020 MAST Hybrid Interfacing Academy
Ljubljana, SI (c) Godec

6 Current interpretations

6.1 UMa (University of Madeira)

At UMa, the MAST-program was implemented by using the elective courses and project components of the Master of Interactive Media Design (MDMI) program. MDMI students have chose 3 electives (7.5 ECTS each) during their program and realized a project work (45 ECTS). Among the offered electives Advanced Topics in Informatics consists of 3x 2-week intensive mini-courses. These intensive mini-courses each are different every year and are used to tackle areas that no other courses address, and generally through invited or guest lecturers. Hence, this is a perfect umbrella for implementing the AST workshop component of the MAST curriculum. Besides, other electives can be created to address the courselets on a need basis, depending on each year's MAST challenge.

Finally, the internship/work-placement and the MAST Challenge curricular components would be both combined in the MDMI project for MAST graduates. This project that amounts to 45 ECTS would require co-mentorship and internship/work-placement in the non-academic sector and implement the MAST Challenge in a specific real-work scenario. To that end, a physical MAST Challenge Lab has been designed and implemented at the University of Madeira. This is a laboratory that has been designed to support our teaching activities and MDMI with a portfolio of technologies and setups that enable quick experimentation and prototyping at the intersections of AST, combining methodologies and practices that intertwine the academic sphere closely with the CCS. Hence, given the flexibility of the MAST curriculum, this can be embedded into the MDMI program through its current accredited curricular structure, preserving its normal functioning for non-MAST graduates, but at the same time offering the possibility of AST training through the MAST module an elective and project. Also, given the current Erasmus+ agreements between our HEI, the implementation of AST workshops co-mentored by UNG or TUG is guaranteed even after the end of the MAST project through faculty mobility agreements.

6.2 TUGraz (Graz University of Technology)

At TU Graz the MAST-program has been implemented in a couple of electives inside the master studies of architecture at the faculty of Architecture / Institute of Spatial Design. These courses are: Space Material Detail (Seminary) with 6 ECTS, Space Experiments (Exercise) with 3 ECTS and Spatial Perception (Lecture) with 1,5 ECTS. The main topic of these three courses is the significance of space in the interference of AST. In further developments or iterations of the MAST Module, the faculty of the IRG will serve as a connection point, allowing students from the other partner institutions to be part of the subjects that incorporate MAST ideas and methodologies. There is an open possibility to keep the MAST related relations with added programs as an Erasmus+ warranting the MAST Module Implementation in the future. At TU Graz the module is an add-on structure, and it is implemented mostly within its conceptual framework.

6.3 UNG (University of Nova Gorica)

UNG has accredited the complete module (teaching+thesis, 30+30 ECTS, cca) and keep it within the already accredited (international and interdisciplinary profiled) Media Arts and Practices (MAP) program. Since a joint programme accreditation was deemed too demanding of a process that falls under the massive transnational accreditation procedure at the national accreditation agency SQAA[28]. Thus much more probable and viable is a robust MAST module that is a real joint endeavour with an obligatory student experience obtained at TUG and in MITI, but with a vertebrae of the Progress Track and the Studio modules including courselets within modules of TIP (techniques in Practice) & DIP (Discourses in Practice).

Within the current program but under a separate and new accreditation as a module, the MAST provision is mapped against the MAP program´s existing courses as follows:

>> 2 ECTS - the online introductory course – The ECTS points may be later added to the course quota of SIP (Selections in Practice), or any other summative curricular structure in a program

>> 3 x 8 (24) ECTS – The MAST Challenge Lab as a full-semester course within MAP program becomes one of the Carrier Modules (8 ECTS of different complexity or level, per semester, in the first three semesters of the MAP master program).

>> 3 x 4 (12) ECTS – AST Workshop as a Studio course of MAP; is a local intensive workshop course, prepared collaboratively by the consortium partners. Topic-related to the challenge, which implies mobility and co-mentoring in the AST‘s domain (4

28 https://www.nakvis.si/?lang=en

ECTS of different complexity or level, per semester, in the first three semesters of the MAP master program).

>> 12 ECTS of smaller courselets – within the TIP and the DIP courses of MAP, these are 2-4 ECTS short courses that provide the student with sets of skills and knowledge either generally relevant for the crossfield of AST.

>> 8 ECTS of internship/work-placement – relates to the Selections in Practice (SIP) course that brings students outside the school environment to gather real-world relevant skills, network etc.

>> 30 ECTS – in total may be obtained for AST-embedded for thesis development, including also off-campus fieldwork, or other (non-internship, non-work) projects. Within MAP this is the big Master Thesis course of 24 ECTS and its prerequisite of Master Thesis Preparation (6 ECTS).

In total this amounts to 88 ECTS (almost three quarters from the 120 ECTS total of the master program) of AST-specific academic provision within a fully AST-profiled implementation of the MAP program.

6.4 Long-term Sustainability

The MAST sustainability plan describes the ways each project partner individually, and the project consortium as a whole, intend to turn their involvement in the MAST project and the project outcomes into future possibilities, to support the development of their current activities, and to possibly lead the launch of new activities.

All partners highlighted the importance and network of excellence that the MAST project has brought about, starting to form a community of practice. The three universities participating in the project specifically mention that they will continue to strive for teacher and student exchanges between them using the developed MAST curriculum and methodologies, such as the Challenge Lab within their existing and planned programs. In this respect, the rich material developed and the free online course will be useful in the study material.

The major project's outputs that will have the most value for sustainability are:

>> MAST curriculum development: an accredited master-level module within a partner network of supporting services and curricular collaborations

>> Establishment of a physical Challenge Lab, for the implementation of the MAST methodologies, in the interactive media domain.

>> Methodologies and policies: MAST Challenge Lab methodology, AST domain, Art thinking

>> MAST online courses and study modules

>> Online digital resources: MAST symposium video talks, Video lectures and Podcasts= PodMASTs

>> Digital documentation of: workshops, pop-up events, policy discussions, MAST challenges and Interfacing Academies

>> Guidelines: Career Development Guide, best practices book all assembled in the MAST Manual

>> Scientific articles and other professional communications

>> Business plan on how to widen and deepen the impacts of MAST

>> Repository website featuring primary materials, resources, online course, and events as well as social media community

>> Creation of a community of practice and MAST alumni informal network that ensures the sustainability of results beyond the project's lifetime.

>> Reports: Report on need analysis of the target groups, project methodologies and practices, dissemination, evaluation report, sustainability plan listing the main outcomes and possible sustainability roadmaps

The project has an important relevance on a policy level as well. It has enabled international collaboration on the intersection of the disciplinary and sectoral boundaries between AST. Disciplinary science cannot cope with the complexity of contemporary issues, such as environmental problems or the impacts of technological and social change, because these problems do not fit into the system of separated knowledge domains and need non-disciplinary and problem-focused approaches. Therefore, interdisciplinary work is in the best position to solve boundary problems between disciplines, to interrogate their assumptions and methods and to create a place beyond expertise territories getting into the gaps between the so-called disciplinary silos. The project's members, and the European Institutions, have a role to play to break those silos on European, national and local level to find answers to the complex challenges Europe and the world are facing today.

During the project's implementation, several formats were created and documented as extended parts and outputs of the MAST project.

7 Accompanying Formats

7.1 MAST Career Development Guide

It has been estimated that by 2025, we will lose over five million jobs due to automatization. According to the Future of Jobs Report from the World Economic Forum, even just five years from now, more than one-third of the skills we believe are essential for today's workforce will change. However, new future jobs will also be available to university graduates- mostly related to education, creation and innovation. While advancements in technology may combine to provide students with the tools to explore, experiment and find innovative solutions to complex problems, it will also open up a world of new career opportunities. In fact, the essential for future employment involve using human skills such as creativity, emotional intelligence, analytical and critical thinking, active learning with a growth mindset, judgment and decision making, interpersonal communication skills, leadership skills and cultural competence. Jobs in AST will take many forms, and therefore will require a range of abilities and training. The MAST CDG gives you an overview of career opportunities in art, science and technology, along with ways to get started and additional resources. Directing the career-management upon mechanisms like work placement, internship/ scholarship schemes, residency, incubation and mobility schemes/models will bring about an innovation ecosystem as an approach to corporate innovation. In doing so, universities will be a source of people and ideas, and a conduit to new start-ups to establish of innovative strategic programs for university-industry relations.

Developed as part of the AST program, the guide documents the needs of emerging practitioners undertaking the new module, guiding them around the knowledge and skills needed throughout the process as students. It compiles a wide range of resources for artists focusing in the development of the future skills, personal and professional as:

>> Defining their goals

>> Identifying business opportunities

>> Designing and testing future prospects

>> Planning business logistics

>> Balancing between being an artist and a business person

7.2 MAST Learning Velocity Experience[29]

MAST Learning Velocity Experience (LVE) was conceived as an experiential, career development, project-based space and an extended workbench where students work, individually and/or in teams, guided by mentors and industry leaders, outside of the classroom. Together they apply concepts of innovative thinking and hypothesis-driven startups towards the development of their careers and proactive partnerships to reinforce the university-corporate-government- NGO axis of interaction within the European innovation context and career development. Under MLVE faculty, students were able to develop and experience skills throughout the entire innovation process, including start-up formation, foundation skills, divergent-thinking, intermedia creativity, problem-solving and cross-cultural empathy, and social inclusion geared towards the improvement of quality of life.

MLVE was developed during the Unicult2020's programs in 2018, 2019, and 2020 and additionally held as part of the MAST HIA at the Museum of Modern and Contemporary Art Rijeka. MAST students were provided with an opportunity to be mentored by world-renowned artists and authorities on innovation, cultural management and policy and technology including Ulay, Jan Fabre, Michela Magaš, Milena Dragićević Šešić, Lev Manovich, and many others and will continue to do so through the Unicult platform.

7.3 MAST Online Course

The free of charge online course was developed as a knowledge transfer tool that would help the students identify challenges within the digital, entrepreneurial and design/art fields and help them acquire interdisciplinary skills and experiences with emerging technologies. The course will be used in the entry stages of the MAST module.

The course guides students through methods that promote innovation. It was created jointly by inputs from consortium members, students, innovation and business professionals, and led by Kersnikova Institute. Jointly, we designed a course in which students get to know intermedia art, which thematises contemporary information technologies, cybernetics, biotechnologies, and a variety of tactical media and their impact on society.

By developing an understanding of creative principles and contemporary artistic practices, the students gain deep insight into the epistemology of artistic projects, which leads them to a different, creativity-oriented understanding of the world we live in. They learn to draw the inspiration needed to create ideas about different,

29 First called Learning Velocity Lab, but changed during the implementation while in creation of the Challenge Lab.

bolder values more imbued with solidarity and ethics, values that should become a guiding principle in addressing the challenges on the path towards achieving a future that is friendlier to humans and nature. A better understanding of intermedia art leads to a better understanding of the times we live in, and hence a better understanding of what kind of world we wish to live in – and help shape – in the future.

7.4 The Business Plan

The plan was primarily intended to be developed by Kitchen Budapest, a partner exiting the MAST project consortium. Following Kitchen Budapest's exit, the partners redistributed the tasks with the Business Plan development being taken over by Kersnikova Institute. The task was to develop a proper business plan of how to both deepen and widen the relevant impacts of MAST, meet the project's objectives, and expand their efficiency in the long run, to keep their effect also after the project's funding is finished. The main focus was on ensuring a sustainable continuation and/or legacy of the project activities. The task was then co-led by UNIJA Accounting and Consulting Services company and Kersnikova Institute.

The aim of the MAST project in the future is to succeed in the education of future innovation catalysts that will be able to lead innovation processes for more sustainable, safe, ethical products, and services. The Innovation Catalyst would be a main driving force for the future of work where people will be engaged in a creative, collaborative and solidarity-inspired economy. The economic analysis showed that the MAST project is justified and represents added value for all users, and Unija Consulting confirmed the financial feasibility of carrying out the MAST project. They also considered the set business model of the MAST project to be sustainable in the long run, as the project from 2022 onwards shows self-sustainability. They estimated that the project is low-risk, as it is an innovative idea and a clear business model with a professional team that we believe, can face all the challenges and risks during the project.

7.5 Evaluation Strategy

Amid the project's implementation, different evaluation and reflection methods warranted the smooth development of it. Constant SWOTs analysis produced exciting insights into the project in its various stages. For most events, stakeholders were confronted with different questionnaires, vital for restructuring the project within the implementation years, while an external independent evaluator observed the process. The MAST project overpassed all obstacles during its implementation, producing an interesting conglomerate of experiences and lessons learned and cementing the path for future projects in AST. The module is a successful example of experimental methods that change educational parameters.

2019 Future.Human@Work,
Nova Gorica, SI (c) Smrekar

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mastmodule.eu

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Graz University of Technology

Faculty Nayarí Castillo-Rutz, Franziska Hederer, Carlotta Bonura
Visiting faculty Hanns Holger Rutz, David Pirrò, Richard Dank, Reni Hofmüller **Guests** Daniele Pozzi, Jamilla Balint, Markus Metz, Georg Seeßlen
Collaborations ALMAT – FWF PEEK AR 403-GBL | almat.iem.at, esc medien kunst labor, Kulturjahr 2020 (City of Graz), Institute of Electronic Music and Acoustics (IEM) | Graz University of Performing Arts (KUG)

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Croatian Cultural Alliance

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SCHOOL OF ARTS

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