# NEWSLETTER

Resilience and antifragility

At the beginning of the current pandemic, probably none of us would expect it to last that long. Along these 1.5 years all of us had to learn new ways of working and master new tools at a fast speed, while also fighting the natural negative thoughts brought in by the situation.

At CTS level, it has been inspiring to see that many researchers have actively pursued the acquisition of new projects and exploited new collaboration opportunities leveraged by the online collaboration platforms. But in addition to these individual or group-level activities, three collective efforts deserve special mention:

1. The series of CTS seminars on Future Research Directions in Cognitive and Collaborative CPS. It was particularly pleasant to see the good number of colleagues that volunteered or gladly accepted the invitation to give a talk on their research topic. All presentations were of a very high level, carefully prepared, creating the opportunity for a wide exchange of knowledge, and identification of further internal collaboration potential. The number of attendants in each session has also been very good, with a particular mention to the good level of participation of young researchers. All these seminars motivated an extended period of discussion and questions & answers. Although organized as online events, these seminars played an important role in re-enforcing the internal cohesion among participants in these difficult times.

2. The annual doctoral conference (DoCEIS), which for the second time had to be organized online, was also a great success. Our PhD students had the opportunity to present and discuss their works in an international context and acquired extended skills on how to organize such events. All sessions during the 3 days of the conference were very well attended and our students did a great job as session chairs and technical support assistants. This was the culmination of a 10-months preparation period under the supervision of our colleagues João Goes, Luis Gomes, Pedro Pereira, and me.

3. Forum of young engineers, in its 5th edition, was again organized in conjunction with DoCEIS. This year's event attracted an increased number of contributions, and all sessions were also very professional and well attended. A special thanks to João Martins and Filipe Moutinho, who did most of the organizational work, as well as the other colleagues of CTS that chaired the various sessions.
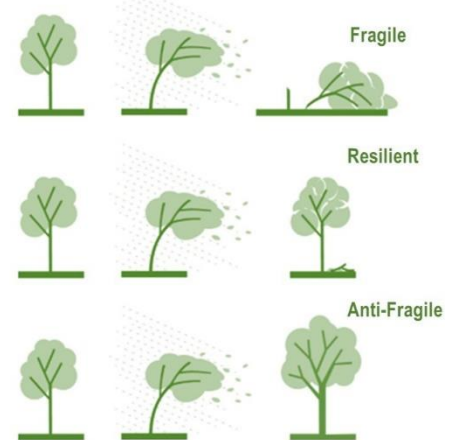
In all these activities, we can notice the very relevant role played by young researchers and students. This is particularly encouraging for the future of CTS. While various senior members tend to follow the normal trend of getting progressively more engaged in management and policy activities, it is very rewarding to see the emergence of many young researchers, eager to progress and pursue the path of excellence. But there are also various senior members that remain active researchers and focus on foundational research. Just like in a vigorous tree, we need the beauty of new shoots and leaves, but also the support of its strong roots and trunks.
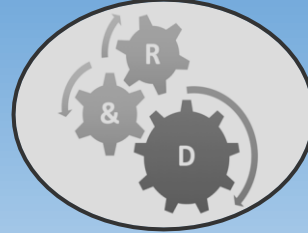
Thank you all.

Luis Camarinha-Matos (CTS-Director)

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CTS Seminars

CTS has been organizing a series of seminars devoted to discussing Future Research Directions in Cognitive and Collaborative CPS.

The seminars are organized online, via ZOOM, every two weeks, on Wednesdays from 17:00 to 18:30. This is an opportunity for all CTS researchers to get acquainted with recent research activities being conducted in different areas of the Center and to also discuss future directions and opportunities for collaboration.

Video recordings of the sessions are available at
https://cts.uninova.pt/events.html

CTS Seminars

The first series of seminars included:

- **17 Mar 2021: Distributed Artificial Intelligence in Industry**
  - Speaker: *Ricardo Peres*
  - Discussion moderator: *Luis Camarinha-Matos*
  - Attendants: 43
- **31 Mar 2021: Remote Sensing**
  - Speakers: *José M. Fonseca, João Pires, André Mora*
  - Discussion moderators: *Luis Oliveira, Pedro Pereira*
  - Attendants: 50
- **14 Apr 2021: CPS Contribution to Green and Comfortable Buildings**
  - Speaker: *Daniel Aelenei*
  - Discussion moderator: *Inês Oliveira*
  - Attendants: 40
- **28 Apr 2021: Emotions in Collaborative Networks**
  - Speaker: *Filipa Ferrada*
  - Discussion moderator: *Sanaz Nikghadam*
  - Attendants: 42
- **12 May 2021: Computational Creativity to Design CPS**
  - Speaker: *Sanaz Nikghadam*
  - Discussion moderator: *Paula Louro*
  - Attendants: 34
- **26 May 2021: Model-driven automatic generation of embedded controllers**
  - Speaker: *Luis Gomes*
  - Discussion moderator: *Isabel Brito*
  - Attendants: 39
- **09 Jun 2021: Distributed CPS in Smart Manufacturing**
  - Speaker: *André Rocha*
  - Discussion moderator: *Manuel Barata*
  - Attendants: 37
- **23 Jun 2021: Spectral Analysis and CPS**
  - Speaker: *Manuel Ortigueira*
  - Discussion moderator: *Luis Oliveira*
  - Attendants: 40
- **1 Jul 2021: Evolving the IoT towards a Multidisciplinary Cyber-Physical System**
  - Speaker: *João Pedro Oliveira*
  - Discussion moderator: *Rui Neves Silva*
  - Attendants: 33
- **13 Jul 2021: The Hidden Power of Graph Theory in Collaborative Networks**
  - Speaker: *Antonio Abreu*
  - Discussion moderator: *Anabela Pronto*
  - Attendants: 40
- **21 Jul 2021: Unlocking energy flexibility to support energy transition**
  - Speaker: *Rui Lopes*
  - Discussion moderator: *Bruno Guerreiro*
  - Attendants: 30

"I have been invited to participate at the seminars of CTS on "Future Research Directions in Cognitive and Collaborative CPS", both as a presenter and as attendee. I have learned that this cycle of presentations on different topics is very useful in terms of identifying future possible research directions and partners, in addition to meeting the research work developed by young and senior researchers from CTS. Therefore, I salute the organizers of this cycle of seminars for their initiative and efforts in putting everything together and I wish this kind of event to be continued."

Daniel Aelenei, Integrated member

" Connection with new experiences, knowledge, disciplines, and other researchers are the most valuable outcome of the seminars. I found the new "movement" very helpful and proper for the researchers and even Ph.D. students of the center. Since the first session, I always have been present during the presentations, and each time I have learned more and got new ideas from my colleague's projects and studies.
During this time, we became familiar with other research groups and their expertise. This seminar is a bridge for connecting the groups and researchers to collaborate for their future researchers and projects. "

Shabnam Pasandide, PhD student

"Excellent seminars, with high relevant topics. Presenters give us a different perspective of matters, encouraging us to make questions and create bridges between different areas of knowledge. A good time to learn, to be creative and innovative."

Ana Correia, PhD student

"CTS seminars is an innovative idea for sharing knowledge between members and bringing them the opportunity for more collaboration that leads to significant progress in the total performance of CTS. Indeed, this kind of online events have mutual benefits for both PhD. Students, to find out the new and up-to-date topics, and for senior researchers and professors who look for interested young researchers.
I hope these online seminars will continue."

Nazanin Vafaei, PhD student

"The presenters/speakers did a wonderful job, and I found the seminars to be highly informative. I would definitely recommend."

Isabel Sousa Brito, Collaborator member

"Today more than ever we need to be creative. However, the skills, knowledge, attitudes, motivations, and personality traits that lead to creative thinking and creative behaviour do not exist-and do not develop-in a vacuum. The CTS Seminars provided an environment that encourages Critical and Creative thinking, Communicating, and Collaborating. The 4Cs of Future!"

Sanaz Nikghadam, Collaborator member

"The seminars series at CTS-UNINOVA have been a very interesting forum of discussion, since the pandemic moved many of us into remote work, and the way we build relationships with our colleagues has drastically changed. These online sessions allowed me to fully understand and know better the current research of some of my colleagues, in the different groups of CTS, and paved the way for future collaborations and research projects."

Luis Oliveira, Integrated member

"The CTS seminars are important, not only for us to have a more general view of the centre but also for us to explore new possibilities for work and research. Since the seminars started, it has been possible to identify collaborations with colleagues that I previously didn't know."

André Rocha, Integrated member

"Through the fortnightly presentations of the CTS, in addition to getting to know the work of colleagues up close, they are also a great opportunity for updating in complementary or related areas.
From my part, I recognize the value of this initiative and recommend its continuation."

Manuel Barata, Collaborator member

Invited Talk

Prof. Luis Camarinha-Matos, director of CTS, gave an invited talk in the series of seminars "Incontri del giovedi", organized by the Italian CNR-IEIIT (Consiglio Nazionale delle Ricerche, Institute of Electronics, Information Engineering and Telecommunications), on 13 May 2021.
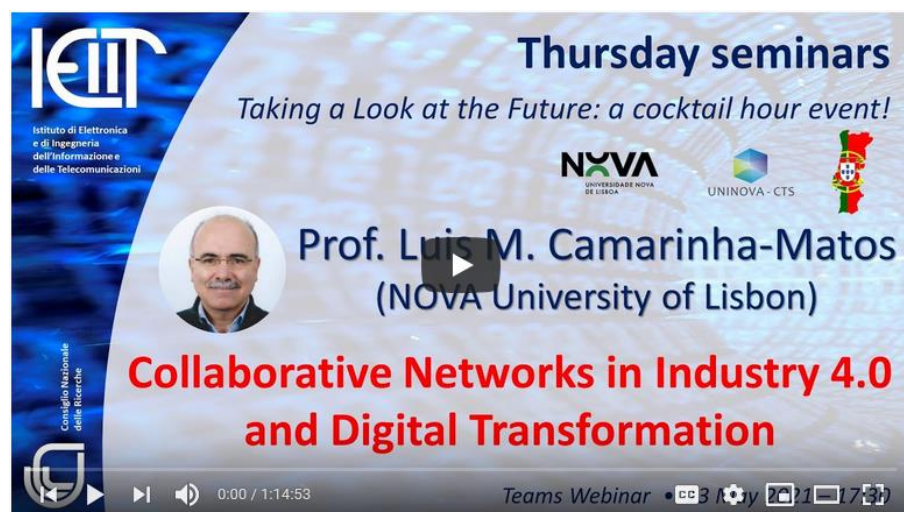

Collaborative Networks in Industry 4.0 and Digital Transformation

This talk addresses the contribution of collaborative networks as one of the core enablers to Industry 4.0 and the ongoing digital transformation. "Collaborative networks" is a research area that addresses networks of autonomous and heterogeneous entities that collaborate to achieve common or compatible goals. From an initial focus on collaboration among humans (e.g., virtual communities) or organizations (e.g., virtual enterprises, virtual organizations, business ecosystems), the scope has been expanding to include collaboration with and among smart machines and systems. Therefore, a brief overview of this evolving area and taxonomy of collaborative networks is first presented. An analysis of the collaborative aspects required in the various dimensions of the 4th industrial revolution is then introduced, complemented with a mapping between the identified needs and research results that can be adopted from the collaborative networks area. Furthermore, several new research challenges are identified and briefly characterized.

https://www.youtube.com/watch?v=GJ40nXsrkzE&list=PLlnluOvy2Pr-Pm_fQCWNnHnR6U-6MV2cH&index=17

DoCEIS 2021
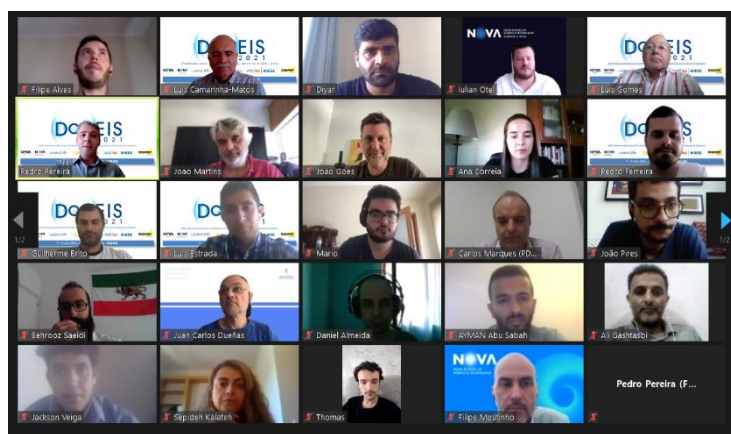
The 12th edition of the **Advanced Doctoral Conference on Computing, Electrical and Industrial Systems, DoCEIS 2021**, aims at bringing together PhD students, researchers, and engineers from all over the world, interested in innovative ideas and techniques around **Technological Innovation for Applied AI Systems**. AI is shaping and rebuilding society's basic constructs - such as economy, health, education, and lifestyle - and having a strong impact on people's lives, through the implementation of intelligent algorithms on everyday applications and promoting technological advancements that allow for a better and more sustainable quality of life. AI is expected to become an important vehicle for large-scale economic and technological growth, like previous revolutionary technologies, such as the steam engine, electricity, and the internet. AI techniques (e.g., machine learning and deep learning, automated reasoning, and planning, among others) can be applied to several knowledge areas, from electronics and energy to the biomedical field and industrial collaborative networks, providing technological developments that can impact and result in the enhancement of healthcare, the environment, manufacturing, transportation, and communication systems across the globe. AI is forecasted to have a

substantial influence across all sectors of industry and services and is therefore of paramount importance for both industrial and research innovation.

This edition of DoCEIS, which is sponsored by SOCOLNET, IFIP and IEEE Industrial Electronics Society, attracted a good number of paper submissions from PhD students (and their supervisors) from 16 countries despite the pandemic situation. The conference program includes 34 papers distributed by the following sessions:

- Collaborative Networks
- Intelligent Decision Making I
- Intelligent Decision Making II
- Cyber-physical Systems and Digital Twins
- Smart Healthcare Systems
- Communication and Electronics
- Classification Systems
- Smart Energy Management
- Smart Manufacturing
- Medical Devices I
- Medical Devices II

It also included 3 invited keynotes by:

- Iolanda Leite, KTH, Sweden
- George Theodorakopoulos, Cardiff University, Wales, UK
- Milos Manic, Virginia Commonwealth University, USA

And a **panel** on the topic of "My Research and Applied AI Systems" (Panelists: Ana Paiva – IST, Luis Paulo Reis – FEUP, Nuno Fachada – Lusófona, Miguel Cabrita – Enlightenment) and other associated activities.

As in previous editions, proceedings are published by **Springer**.
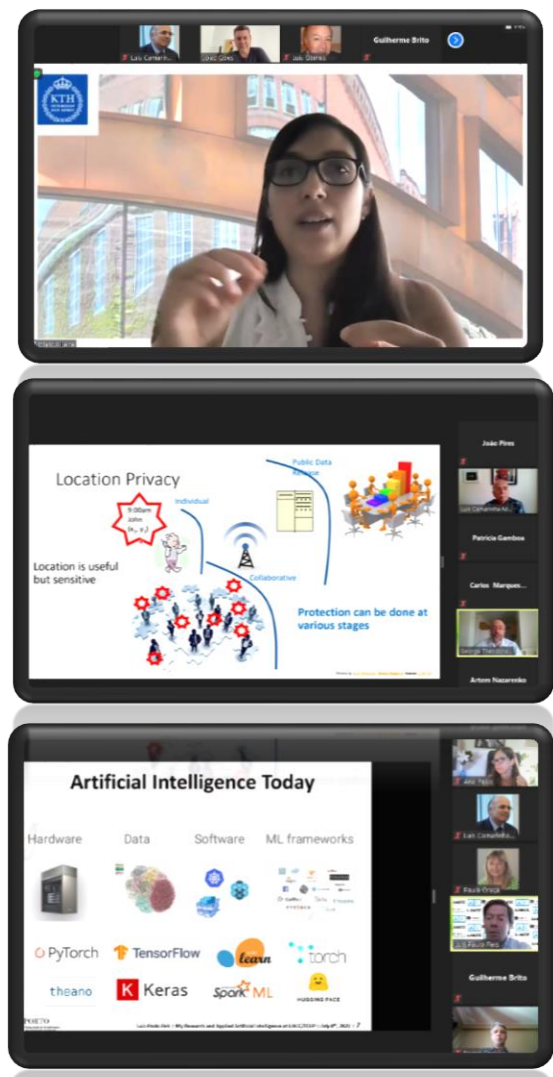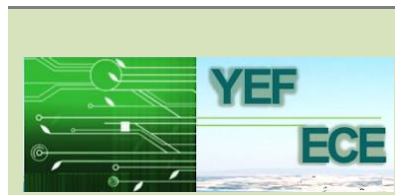
YEF-ECE 2021

5th International Young Engineers Forum on Electrical and Computer Engineering (YEF-ECE 2021)
Innovation in Electrical and Computer Engineering Solutions

The 5th Edition of YEF-ECE was organized on 9 Jul 2021 in association with DoCEIS 2021 and technically sponsored by IEEE Industrial Electronics Society. This event is a unique opportunity for young engineers to connect with each other enabling experience's sharing and to become internationally active.

For this Edition, 24 papers were accepted by the International Program Committee and presented in 6 sessions:

- Advanced Systems and Services
- Control Systems
- Electronics
- Modelling and Localization
- Power electronics
- Systems Modelling and Decision

As in previous editions, proceedings are published by **IEEE Xplore**.

Summer School

7th International Summer School on Industrial Agents

CTS hosted the 7th edition of the International Summer School on Industrial Agents. The focus of this years' edition was on Embedded Intelligence within the Edge and Fog Computing.

The summer school took place online, on 21-25th of June 2021 and provided advanced training for PhD students and practitioners on the advanced and smart automation technologies that are the basis for Industry 4.0, aimed to promote the discussion on how to use multi-agent systems to design, develop and implement the next generation of intelligent production system based on their cyber-physical formulation.

The summer school aimed to enhance the participants' knowledge in the field of multi-agent systems applied to industrial environments, particularly providing hands-on knowledge to develop industrial cyber-physical systems (e.g., production systems, smart grids, etc.). In particular, the main objectives of the course were:

- Introduce multiagent principles as a suitable paradigm to develop industrial distributed collaborative systems.
- Provide practical competencies in developing multiagent applications for industrial automation applications.
- Deployment of agent-based solutions for industrial environments.

The summer school provided a good opportunity to know people working in the field, to meet prominent researchers, share best practices and to establish contacts through interactions that may lead to research collaborations in the future. In fact, participants attended lectures and tutorials held by well-known experts in the field, coming from industry and academia, which provided their experience of developing/applying agent-based solutions for industry context.

The summer school was attended by twenty-three students from eight countries. They had the opportunity to attend twelve sessions, all of them lectured by different experts. Five of them coming from the industry, from companies such as ST Microelectronics, AFAG or SAP. The 1st edition of this same summer school was also hosted by CTS in 2015.

André Rocha
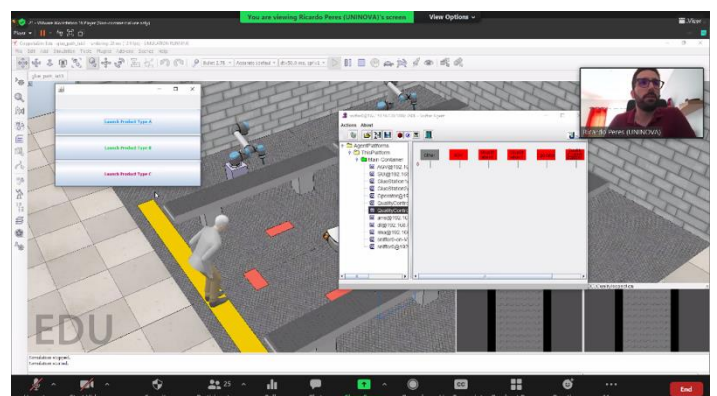
Best Papers Awards

The paper "Bi-Directional Communication Between Infra-Structure and Mobile Device Based on Visible Light Communication", **Paula Louro, Manuela Vieira, Manuel Augusto Vieira** (members of CTS), got the Best paper award at SENSORDEVICES 2020 - Eleventh International Conference on Sensor Device Technologies and Applications, Valencia, Spain, 21 - 25 Nov 2020.

Nazanin Vafaei, PhD student of CTS, was awarded the "EURO Working Group on Decision Support Systems 2020-Award" with the paper "Selecting Best Normalization Technique for MCDM Methods".

Majid Zamiri, PhD student of CTS, was awarded the Best paper award for the category "Intelligent Decision and Complex Systems" at DoCEIS 2021, with the paper "A Mixed Method for Assessing the Reliability of Shared Knowledge in Mass Collaborative Learning Community", Majid Zamiri, Luis M. Camarinha-Matos.

Engineering is for Tod@s! Engineering education and gender inclusion

The Portuguese Society for Engineering Education (SPEE) aligned with the 2030 Agenda for Sustainable Development (Goal 5) and the action plans of several national entities, such as INCoDe2030 and the Commission for Citizenship and Equality. SPEE's Research group "Gender and Diversity in Education in Engineering" is creating a Network of Good Practices for Attracting Female Engineering Students, an activity that aims to attract more women to technological/engineering careers.

The project "Engineering is for Tod@s!" is promoted by the partnership formed by the Polytechnic Institute of Beja and the Nova University Lisbon, in the context of the SPEE Research group's "Gender and Diversity in Education in Engineering" initiative. This partnership aims to promote to students in primary and secondary education that engineering and technology are not areas of a single gender, male in this case, but are available to all. In this context, we intend to carry out activities that aim at deconstructing stereotypes and prejudices, promoting knowledge that allows us to make informed and conscious decisions.

Anikó Costa
Isabel Sofia Brito

IMPACTOUR ReDiscover Europe Workshop

Under the auspices of the Portuguese Government, and with full collaboration from the Slovenian Government, H2020 IMPACTOUR Project organized the **ReDiscover Europe Workshop** on the Europe Day (May 9th, 2021). The ReDiscover Europe Workshop provided an unique opportunity to discuss the role of sustainable Cultural Tourism in today's Europe. Besides important keynote presentations the workshop held three key panel debates (with catalyst viewpoints from policy makers, scientific researchers, industry and cultural tourism practitioners):

1) post-COVID cultural tourism – what have we learned, what might we do differently, an opportunity for Big / SMART Data?
2) people – accessibility, inclusion/exclusion, market needs
3) technology – digital gateways, mobile interactive content / co-curation, dynamic modelling and tourism management
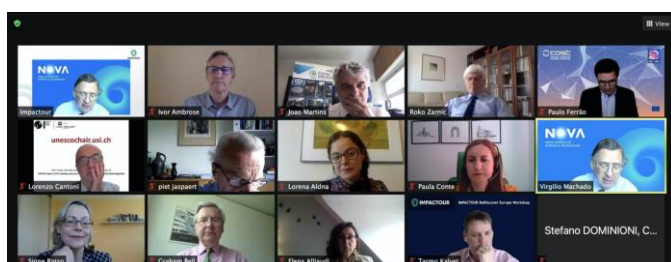
The **consensus declaration** and presentations can be downloaded at the IMPACTOUR website (https://www.impactour.eu/) and the workshop can be watched at (https://youtu.be/snD4gXQsjQQ)

ReDiscover Europe Workshop speakers and affiliations.
(Listed in programme order):
Virgílio Machado Head of Nova School of Science and Technology
Ricardo Gonçalves Head of UNINOVA
João Martins H2020 IMPACTOUR Coordinator
Graça Fonseca Minister of Culture, Portugal
Mechtild Rössler Director UNESCO World Heritage Centre
Stefano Dominioni Executive Secretary of the Enlarged Partial Agreement on Cultural Routes of the Council of Europe and Director of the European Institute of Cultural Routes
Signe Ratso European Commission, Deputy Director General in DG RTD
Paulo Ferrão President COST Association
Tarmo Kalvet IMPACTOUR partner IBS, Estonia
Tomeu Deyà Vice President ICTC-ICOMOS
Eduardo Santander Director European Travel Commission
Lorenzo Cantoni UNESCO Chair on ICT,
Monika Karu Visit Estonia
Paula Conte FSMLR, Spain
Joaquim Jorge Advisor to the Ministry of Culture, Portugal
Carolina Islas University of Turku, Finland
Tom Jenkins CEO European Tourism Association
Ivor Ambrose IMPACTOUR partner ENAT, Belgium
Lorena Aldana European Policy Coordinator Europa Nostra
Marinos Ioannides IMPACTOUR partner Cyprus University of Technology
Elena Alliaudi Coordinator Network of European Royal Residences
Roko Zarnic University of Ljubljana, Slovenia
Milada Šťastná H2020 SPOT Coordinator
Bart Neuts H2020 SMARTCULTUR Coordinator
Rob Davies Cyprus University of Technology
Reinhold Sahl Head of Austria Castle/Authority/European Heritage Label Network
Piet Jaspaert Vice President EUROPA NOSTRA
Graham Bell EUROPA NOSTRA Board
Vasko Simoniti Minister of Culture, Slovenia

Progress in research ethics and integrity
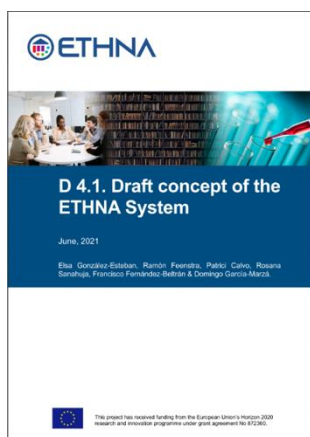
Establishing ethical governance in RRI is not done overnight. It takes work and commitment – and a guidebook detailing the steps of the implementation process. UJI researchers have now published the draft version of this guide for implementing ETHNA System within our pilot organisations. The guide will eventually be targeted at any organisation that performs research and innovation or funds it and that aspires to have a more effective ethical commitment. Complementing the guide is an in-depth toolbox that will support implementors in installing a system of their own.

The Guide is divided in six sections and includes seven annexes that form a toolbox to implement the ETHNA System. Section A, B and C explain the importance of having a system of ethical governance, its target audience and the benefits resulting from public commitment to manage the ethical basis for trust. Section D explains the structure of the system which consists of a set of building blocks that are flexible and adaptable to the needs, idiosyncrasies, and resources of each organisation to progress in RRI over time. Section E describes how to implement the ETHNA System through three phases and seven steps. And finally, Section F dives into the importance of internal and external communication in the ETHNA System to create a RRI culture.

The document is enriched with a Toolbox that will help with the implementation of ETHNA System.

"The ETHNA System wants to be useful for each institution to build its own system of ethical governance of RRI based on continuous improvement in a flexible and adaptable way to its circumstances", said Elsa Gonzáles-Esteban, ETHNA project coordinator. "In any case, the key to the successful implementation of the ETHNA System will reside in the shared construction, in the joint creation of the ethical governance structure."

Although far advanced, the current guide is still in draft stage and will be finalised by year's end.

The guide is available **here**.

> UNINOVA – CTS is a partner in this project, which is expected to provide substantial inputs towards developing a culture of Responsible Research and Innovation in our center.

IPSTERS

The IPSTERS Project - Sistema de reconhecimento terrestre do IPSentinel, coordinated by José Manuel Fonseca and with André Mora and Luís Oliveira as task leaders was selected for presentation at Forum Portugal Digital. This event marked the first year of "Plano de Ação para a Transição Digital" and the restructuring of the INCoDe.2030 program, focusing on themes related to the digital transition of People, Industry and Government. The IPSTERS Project was selected for the 6th May session dedicated to Artificial Intelligence Applications on Public Administration. The main goal of this project is the production of Land Cover Land Use maps using the European Space Agency satellite Sentinel-2 available to the public at the IPSentinel portal. These added values maps potentiate a more informed and optimized administration of the territory with improved water resource maps and forest maps, among others, that constitute fundamental support for decision-making. IPSTERS that has as partners the Direção Geral do Território (DGT) and the NOVA Information Management School, was considered as one of the six projects with the highest potential impact on Portuguese society by the Digital Portugal Forum evaluation panel. This event can be reviewed online at www.forumportugaldigital.pt and was broadcasted live on the SIC Notícias and Expresso online channels.

José Manuel Fonseca