Annual Report – Year 1

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Executive Summary

The 1st Annual Report of BIG focuses on the activities carried out in the first 12 months of the project. This annual report addresses the efforts carried out by the ERA Chair team towards expanding the research and innovation potential of Técnico-Lisbon. In the first report, we present the activities and the approaches taken to complete the goals specified in the project proposal.

1. Introduction

The overall goal of BIG is to expand the research and innovation potential of Técnico-Lisbon, contributing to foster a digital ecosystem taking advantage of Blockchain technologies and design Innovation for social Good through the hiring of an ERA Chair and the associated team. BIG aims to develop a critical mass of interdisciplinary research in deploying and testing Blockchain technologies in strategic application domains aligned with Portugal and Lisbon's smart specialisation strategy (S^3). The BIG ERA Chair activity aims to unlock the full potential of interdisciplinary research while strengthening innovation and knowledge transfer activities in close collaboration with local and global industrial partners. The BIG ERA Chair will therefore contribute to the smart specialisation strategy of the Lisbon Region by stimulating the upcoming ecosystem of digital startups and their economic impact.

BIG is particularly well suited to assist Lisbon to leapfrog and become a European high-tech hub for the data economy. The BIG ERA Chair on Blockchain technologies and design Innovation for social Good is pursuing the following strategic objectives:

- **Upgrade the existing research and technological development capabilities** by expanding the human potential and fostering a critical mass of researchers with interdisciplinary expertise in Blockchain and related technologies (distributed computing, security and applied cryptography, AI, machine learning, big data, and cloud computing) as well as design thinking. BIG is looking at new ways to boost the potential of these emerging technologies in application areas such as health, energy, digital citizenship, transport, and creative industries and their economic impacts. BIG will provide resources to design and other creativity-enhancing practices to explore innovative solutions for Blockchain and distributed ledger technologies via design studios. By developing unanticipated uses of technology, testing unusual application domain solutions, and working on social innovation/acceptance, BIG will investigate and support novel methods of examining and communicating the potential of blockchain technologies and guide and evaluate their impacts on critical societal challenges.

- **Improve the innovation potential and impact** of Lisbon and Portugal as an ideal platform in the Euro-Atlantic region of the EU through design-driven innovation for the data economy. By unravelling the implications of open innovation in Blockchain technologies on advanced training and knowledge transfer and expanding the human capital and the creative research

capabilities of individuals and organisations with the ultimate goal of materialising opportunities offered by Blockchain and distributed ledger technologies. Examples include investing in creating testbeds for decentralised, trusted, transparent, user-centric digital services and stimulating new and improved business models that promote decentralised social innovations. These testbeds will enable the industry stakeholders to test and market solutions in strategic application areas aligned with the smart specialisation strategy, for instance, tourism, transportation, mobility and logistics, creative industries, and the blue economy.

- **Raise international awareness** about the research institutes (LARSyS and INESC-ID) and connect Técnico – Lisbon and its industry affiliates to the global knowledge networks: work with mentoring institutes based at prestigious universities in Europe (CNRS, EPFL, Polimi, and Soton), which have agreed to serve as advisors to the project by sharing their knowledge and promoting the exchange of key personnel; BIG will continue to deepen the strong partnerships established with Carnegie Mellon University (CMU) and Massachusetts Institute of Technology (MIT), which include joint research and advanced training programs and help position BIG and Lisbon as a brokering platform in the Euro- Atlantic region for the data economy. The BIG ERA Chair project will generate long-term opportunities for economic development by enabling the Lisbon digital ecosystem to undertake a vital role within the Euro-Atlantic region and strengthen its competitive position.

BIG aims to deploy a campus-wide initiative in blockchain, distributed ledger technologies and design innovation to better integrate Técnico – Lisbon with the European Research Area (ERA) through the following objectives revised from the original GA:

- **O1.** To reinforce the position of Técnico - Lisbon as an active player in the ERA by building an experienced partnering network of EU centers**.** These will assist Técnico's research capacity in blockchain and distributed ledger technologies and design innovation through synergies, know-how exchanges, infrastructure setup, EU funding access and talent retention, fostering excellent research and internationalisation.

- **O2.** To focus the research strategy of Técnico's main ICT research labs (LARSyS and INESC-ID) on core distributed ledger technologies with strong ties to application areas corresponding to the needs of industry affiliated from the Lisbon ecosystem and internationally.

- **O3.** To assist Técnico - Lisbon to reach distinctive and critical human capital in blockchain and distributed ledger technologies and design thinking, by overcoming the fragmentation of competences, which is currently straining the existing human resources of LARSyS and INESC-ID.

- **O4.** To overcome the brain-drain and increase the competitiveness of Técnico - Lisbon by recruiting high quality experienced researchers and established scientists capable of driving

- **O5.** To improve the innovation performance by creating a unique research infrastructure (Blockchain Design Studio) that acts as a platform for collaborative impact, based on an open innovation model. This platform will leverage Lisbon as an international living lab for testing
- innovative applications and services based on blockchain and DLTs, and impact EU societal challenges and S^3.
- **O6.** To enhance the generation of advanced knowledge and, in a complementary way, the use of that knowledge through an effective strategy for managing intellectual property.
- **O7.** To boost the potential of Técnico - Lisbon to generate innovative ideas that can be turned into new marketable and usable data intensive systems and services through the increased collaboration with industry and the generation of startups and spin-offs in the upcoming Lisbon digital ecosystem.
- **O8.** To substantially improve the RTD indicators of Técnico – Lisbon, resulting in an expected two-fold gain in the number of funded projects in these topics.
- We have called this initiative "DCentral". By doing so, BIG will lead to better integration of Instituto Superior Técnico in the European Research Area (ERA) and improve the associated ICT research Labs, LARSyS, and INESC-ID engagement Horizon Europe and ESIF programs.

2. Objectives of the period

The BIG project team had set clear objectives for the first 12 months of the project, mainly the hiring of the ERA Chair Holder, the start of the recruitment process of the ERA Chair team, establishing the quality procedures of the project and developing the communication plan.

We had a successful kick-off of the project in September 2020, which allowed us to establish the management structure of BIG, namely the ERA Chair Board, the Research Management Unit, and the Search Committee. The Search Committee was a quintessential part of the scouting and hiring process of the ERA Chair holder. The ERA Chair Holder, Catherine Mulligan, was hired on month 8 (May 2021) of the project. Once Catherine Mulligan was hired, there was immediate action to start the scouting process for the ERA Chair team. The recruitment actions for the ERA Chair Team were completed by July 2021, and it is expected that the team starts working together by October 2021.

The quality procedures of the project were determined with the establishment of the Quality Plan, the Data Management Plan and the Communication Plan.

Regarding the development of research capacities, some team members have attended Horizon 2020 training courses to help raise the competitiveness when applying for Horizon2020 projects.

We built the project's website and created social media accounts for BIG concerning the communication and dissemination activities. The website and social media were mainly used to promote hiring the ERA Chair holder and its team.

3. Tasks for the period

The table below determines all the tasks from each work package set to be accomplished in the project's first year and the tasks whose planning and work should start during this period.

Task	Execution Period
Task 1.1. Activity Planning and Reporting to the Commission.	M1- M60
Task 1.2. ERA Chair Board and Institutional Coordination.	M1- M60
Task 2.1. Recruitment of the ERA Chair	M1 – M12
Task 2.2. Recruitment of ERA Chair research team	M7- M27
Task 2.3. Recruitment of ERA Chair Support Team	M6 – M27
Task 3.1. Acquiring Horizon 2020 funding development expertise	M6-M24
Task 3.2. Exchange of Know-how with Potential EU Partner	M6 – M36
Task 3.3: Secondments of doctoral students and junior researchers	M1 – M36
Task 4.1: Building the BIGLab	M10 – M21
Task 4.4: Industrial Affiliates Program	M10 – M60
Task 4.5: Knowledge transfer planning	M10 – M60
Task 5.1 Project Communication and Dissemination Plan	M4 – M60
Task 5.2: Newsletters, Website and social media	M4 – M60

4. Work progress during the period

5.1- WP1 – Project Management

Objectives

The objective of this work package is to perform the global project coordination and support tasks, the project management in general, the monitoring of project development and budget spending, the coordination of the interactions among partners, and the communication with the European Commission. The activities performed in this Work Package will provide the basis for administrative, technical and financial project management and ensure the technical and economic features of the project are correctly conducted.

Task 1.1. Activity Planning and Reporting to the Commission

In its first year, the staff, the research management unit, and the working groups did the overall management of the project. The main activities performed in the scope of this work package were the following:

- Budget control;

- Procurement processes – purchase of goods and services;
- RH procedures – opening of research vacancies for the ERA Chair and its team;
- Supporting the ERA Chair team in project applications and submission;
- The organisation of events;
- To write and submit deliverables to the European Commission.

The Quality Plan was established on month 3 of the project and determined the quality procedures and standards for the activities done in the project's scope.

The Data Management Plan was delivered on month six and determined how the data produced/ collected will be exploited and made accessible.

Task 1.2. ERA Chair Board and Institutional Coordination

The ERA Chair Board was appointed to the project kick-off meeting on September 29, 2020. It is composed of the following members:

- Prof. Nuno Nunes – Project Coordinator / ITI/LARSyS
- Prof. Rodrigo Rodrigues – co-PI / INESC-ID
- Prof. José Santos-Victor – Coordinator of LARSyS
- Prof. Inês Lynce – President of INESC-ID
- Prof. Luís Silva - President of the Scientific Council of IST

From 1st May, the ERA Chair Board was joined by Prof. Cathy Mulligan

5.2- WP2 – Recruitment of ERA Chair, Research and Support Team\

Objectives

This WP aims to recruit the ERA Chair holder, the research team, and the support team, including three researchers, one research manager, and one TTDO. The staff should support the work of the Chair holder, providing the blend of complementary expertise and skills needed to promote the excellence of research and the activities of fundraising, advanced training, knowledge transfer, and public dissemination.

Task 2.1. Recruitment of the ERA Chair

The main goal of BIG was to hire an experienced researcher able to build critical mass and widen the fields of expertise of Técnico-Lisbon, LARSyS and INESC-ID. The recruitment campaign started in October 2020 with the establishment of the Search Committee formed by the following group of Professors and Researchers:

- Prof. Rodrigo Rodrigues- Full professor at Técnico-Lisbon and Head of the Scientific Council

- Prof. Nuno Nunes- Full Professor at Técnico and Head of the Department of Computer Science and Engineering
- Dr. Sonia Ben Mokhtar- Senior researcher at the Laboratoire d'Informatique en Image et Systèmes d'information (LRIS)
- Prof. Rachid Guerraoui- Full Professor at École Polytechnique Fédérale de Lausanne
- Prof. Srini Devadas- Professor of Electrical Engineering and Computer Science at MIT
- Prof. Donatella Sciuto- Full professor at Politecnico di Milano
- Prof. Elena Simperl- Fellow of the British Computer Society and a former Turing Fellow
- Prof. Chris Speed- Chair of Design Informatics at the University of Edinburgh
- Dr Neha Narula- Director of the Digital Currency Initiative, a part of the MIT Media Lab
- Dr Miguel Castro- Principal Researcher at Microsoft Research
- Prof. Jodi Forlizi- Geschke Director and Professor of Human-Computer Interaction at Carnegie Mellon University.

The Search Committee's purpose was to identify the best potential applicants for the position and select the ERA Chair holder.

The hiring limitation of research-track faculty for IST is a consequence of a national Decree Law Nr. 124/99 commonly known as ECIC). Article 45 of ECIC states a maximum of 10% of invited research track staff to be hired as 10% of the total permanent research staff. This value was already surpassed by IST and hence a position of "invited researcher" could not be offered by IST to the ERAChair holder or her team. These bureaucratic limitations, including the hiring restrictions, were discussed with the PO during the preparation of the GA and after the ERAChair holder was identified with a formal request to change the grant to one of the not-for-profit institutions of IST, which didn't have these limitations. This change was refused "*that changing the host institution post-evaluation is not possible*" (Annex W2.5).

Given that salary levels and the general research coordination roles are equivalent for both "Professor Catedratico" and "Investigador Coordenador", while these are different careers, it is generally acceptable to say the rights and duties of a "Professor Catedratico" (i) coordinate courses and programs, ii) coordinate research work, iii) coordinate other professors) include all of those listed for "Investigador Coordenador": (i) coordinate and conceive research programs; ii) Develop training activities). The main difference lies on the pedagogical responsabilities which are atributed to a "Professor" status, which include a minimum number of teaching hours and responsibilities which in the case of the ERAChair holder (and her team) has been reduced to the minimum. In fact, during the first year of her contact the ERAChair holder was not requested to teach any courses and/or supervise students.

Considering that benefits, responsibilities and salary levels of both positions are precisely the same the Coordinator and the co-coordinator with approval from the Management Council of IST and through

an exception that reduces teaching load of the ERAChair holder decided to move forward with the hiring. It is important to state that the the type of contract offered offered to the ERAChair holder is in full compliance with the GA (pg. 37): i) as a full professor the ERAChair holder is autonomous in defining the strategic research direction of BIG; ii) the ERAChair holder was ultimately responsible for requesting changes and selecting and hiring her research team signing the statements for hiring approved by IST; iii) the ERAChair holder participates in the ERAChair Board (led by the Coordinator) which includes board members form INESC-ID and LARSyS hence providing close and streamlined coordination with the two labs included in BIG; iv) the ERAChair holder leads the RMU which is responsible for the daily operation of the project; v) the ERAChair holder can freely submit competitive proposals to national, industry and European funding agents hence achieving the status of principal investigator and she (and her team) was included in several Horizon Europe proposals submitted by co-PIs; vi) the ERAChair holder "*will have the opportunity to remain at Técnico - Lisbon beyond the end of the project, through opening a permanent position at the full professor level in his/her area at Técnico – Lisbon and as a consequence have a seat in the senior council of the department which takes all the strategic decisions.*"

Three applicants applied for the call, and only one member was shortlisted by the search committee and asked to give a talk on Demystifying Blockchain.

During January 2021, the Search Committee met to review applications; as a result of this meeting, Dr Mulligan was asked by the search team to prepare a proposal for the delivery of the BIG project and to outline an initial plan for the BIG Lab across Técnico. Dr Mulligan prepared and submitted this proposal on the 28th January, 2021. The search committee decided to appoint Catherine Mulligan as the ERA Chair holder, starting in May 2021. From May 2021 onwards, Catherine Mulligan, as ERA Chair holder, has been involved in developing the job descriptions, selecting and interviewing the ERA Chair research team, initiation of initial research with Masters students, development of project proposals to attract funding to the ERA Chair activity DCentral, connecting with industry and started to create DCentral-a digital living lab infrastructure to support the further development of the research capacity of LARSyS and INESC-ID and for Técnico more broadly.

Due to Covid-19, Cathy Mulligan has commenced working for Técnico remotely from May 1st and during this time has outlined an initial plan for the activity and commenced several aspects of delivery that are required for BIG. Below (Figure 1) is a high-level overview of the strategy outlined - illustrating the aim of longevity for the BIG activity through the creation of DCentral:
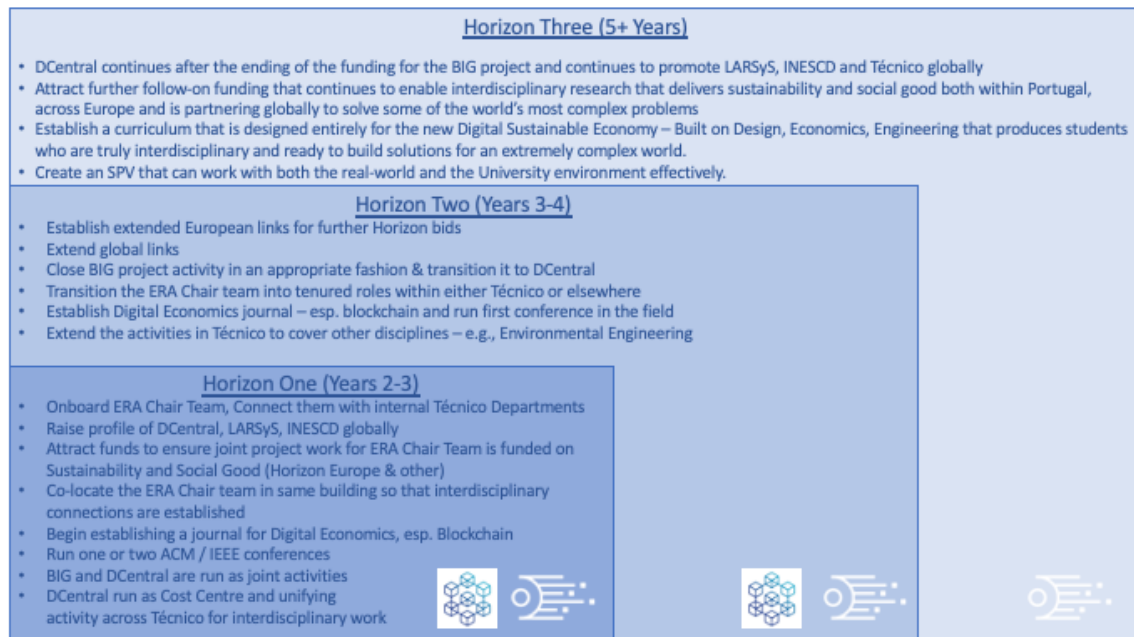
Figure 1 - Overview of the strategy outlined for BIG's longevity

Task 2.2. Recruitment of ERA Chair research team

The scouting process for selecting the ERA Chair team began in May 2021, after the appointment of the ERA Chair holder. The following profiles were identified as complements of the expertise of the ERA Chair holder:

- Expert in Blockchain Technologies – research profile for working on a broad set of real-world practical problems of massive scale that will have a direct and significant business impact. Capable of developing and analysing highly scalable algorithms and applying these algorithms to the solution of real-world systems problems.

- Expert in Design Innovation – research profile for applying people-centred design methods and techniques following design research and HCI approach. Capable of conducting workshops with end-users and industry affiliates to generate novel solutions for blockchain technologies. Skills in design methods and people-centred design techniques, applying state-of-the-art design techniques to complex distributed systems and getting research results in high impact scientific venues in design, HCI and applications.

- Expert in Innovation and Policy – research profile for working in public policy and economics in particular methods for assessing the impact of these technologies in complex social-economic settings where efficiency, transparency, and trust can have equal contributions. Competences in economic models and public policy.

The vacancies were advertised in two scientific magazines – ACM and IEEE. We also announced them on EursoSys, the Internet Technical Committee (ITC), and the project's website.

The following research areas were identified by the ERAChair holder:

DCentral is looking for exceptional researchers eager to: embrace rather than dissimulate the political, social, economic and geopolitical potential of blockchain technologies; draw from design, social science and the real-world as much as computer science for inspiration in order to directly contribute to our primary research outputs. Successful applicants will have an ambition to build one of the best research centers in the world. We are open to candidates from a wide range of complementary academic disciplines, with demonstrated research interests in areas that may include:

- *Blockchain and associated coding disciplines, with a willingness to learn new ones*
- *AI / ML / Cybersecurity / Applied Cryptography*
- *Traditional HCI with design thinking and design practice innovation interests*
- *Decentralised Economics, Decentralised Finance (DeFi and similar), Incentives and/or behavioural economics*
- *Appropriate technology development including ethical and social implications of technology*
- *Big data with a focus on environment, social justice, or international political economy*
- *The study of global flows and systems in the emerging decentralised economy*
- *Artistic and humanistic approaches to blockchain technology*

The application requirements were determined according to the GA as follows:

General Requirements:

- *PhD in an appropriate discipline*
- *A strong demonstrated record of accomplishment in research, whether in the sciences, engineering, design, or humanities*
- *Teaching experience*
- *A portfolio of prior research work*

Research Fields:

- *Technology – Information Technology*
- *Architecture -> Design*
- *Communication Sciences -> Media Studies; Arts -> Visual Arts*
- *Engineering -> Design Engineering; Telecommunications*
- *Environmental Science -> Global Change*
- *Computer Science -> Distributed Computing, Edge Computing, Security and Applied Cryptography, AI, Machine Learning, Big Data and Cloud Computing*

Career Stage

- *Early-stage researcher (0-4 years) or Experienced Researcher (4-10 years)*

The scouting process received 24 applications. The applicants were asked to send their CV, a letter of interest, a brief research summary and three references. The deadline for applications was June 30. The hiring process of the ERAChair research team was conducted by the ERAChair holder, which distributed the calls, organised interviews and discussed her proposal for the ERAChair team with the RMU after conducting the interviews.

Dr. Catherine Mulligan, Prof. Nuno Nunes, and Prof. Rodrigo Rodrigues analyzed each application and shortlisted 7 candidates, who were invited for interviews. After the interviews, offers were made to 5 researchers whom we believe are the perfect fit for the team. Their work contracts are expected to begin in October 2021 for three of the researchers, January 2022 for the fourth and June 2022 for the fifth. The spread of researchers gives us a good ability to not just deliver the BIG activity, but to ensure its longevity for both Portugal and Técnico.

The final list of five ERAChair research team members (4 early stage and one experienced) is summarized below and complete packages with CV, research statement and reference letters are available in Annex 5.

A summary of profiles is provided here from excerpts of the statements signed by the ERAChair holder:

- **Alfio Puglisi** - "*Alfio brings to the ERAChair team a solid background in two key areas – economics and innovation policy - in particular econometric methods and a strong interest and background in FinTech. His vision for blockchain and associated technologies builds on his existing experience and work in FinTech and innovation covers Regulatory Regimes of FinTech and Blockchain-enabled economics, Digital Humanities, and the politics of lobbying. Alfio will play a critical role in WPs 3,4 and 5 and will assist us in creating awareness within and outside of IST through output of high-quality research aimed at Research Policy, Econometrics, and Innovation outlets. In addition, Alfio's experience in working at the European Banking Authority is illustrative of his ability to have high level impact because of his research, here therefore holds the potential to directly impact the Innovation agenda of Portugal and Europe more broadly.*" - **Signed by Catherine Mulligan and Rui Baptista (area coordinator of Management of the DGE)**

- **David Matos** - "*David Matos has a good background across several relevant areas to both DCentral and Técnico more broadly – including consensus design and implementation for mobile ad hoc networks, intrusion recovery, blockchain design and software vulnerability detection. David received his PhD in Computer Sciences and Engineering (2019), Instituto Superior Técnico - Universidade de Lisboa, MSc in Computer Sciences and Engineering. Specialization in Architecture, Systems and Computer Networks Faculdade de Ciências - Universidade de Lisboa and his BSc in Computer Sciences and Engineering. Faculdade de Ciências - Universidade de Lisboa. He has a robust set of publications for an early career*

researcher covering Byzantine fault-tolerant protocols, intrusion recovery, blockchain and secure software. He has also done some work in applying digital technologies around social good – in the healthcare sector. During his interview, David illustrated an open mind and experience outside of pure computer science – his experience in industry will in particular serve him well with DCentral. David will therefore play a critical role in WPs 3 and 4 through high quality research in computer security. He will also help in WP 5 and will assist us in creating awareness within and outside of IST through output of high-quality research." - **signed by Catherine Mulligan and Luis Rodrigues (area coordinator of Distributed Systems of CSE Dep.)**

- **Kevin Gallagher** - "*Kevin Gallagher is a rare find in a computer science department – one who has not just actively pursued multidisciplinary research but one that has also excelled at it. Kevin brings to the ERAChair team privacy, anonymity and security research capabilities that are core to DCentral being able to deliver innovative new solutions around the underlying protocols and technologies of Blockchain. One example of his vision around blockchain is the relatively unexplored area of Horizontal Security through the development of a collective based access control system. Such research could help manage the issues of small groups of developers controlling blockchain source code – a key area that remains relatively centralized despite claims around Blockchain's decentralization. Kevin 's vision is one of driving forward a multidisciplinary research agenda that enables users to successfully engage with and around the areas of security, privacy, anonymity – an under researched area in blockchain, cryptocurrencies and security more broadly. Kevin will play a critical role in WPs 3,4 and 5 and will assist us in creating awareness within and outside of IST through output of high-quality research aimed at ACM Conferences and Usenix as some examples of outlets he has already published in.*" - **signed by Catherine Mulligan and Luis Rodrigues (area coordinator of Distributed Systems of CSE Dep.)**

- **Mariana Pestana** - "*Mariana brings to the ERAChair team design and curatorial skills that are central to push an agenda embracing fiction and speculation as a working method. Her vision looks at blockchain technology as a key innovation in pushing new models of decentralizing in politics, ecology and other fields of study, that is a home for academic research but also welcomes activists, thinkers and speculators. She will contribute critically to the WP5 - Communication, Dissemination and Exploitation where many activities are described to create awareness within and outside of IST and the Lisbon ecosystem about blockchain technologies for social good.*" - **signed by Catherine Mulligan and Ana Tostões (area coordinator of Architecture of Civil Eng. Dep.)**

- **Teresa Almeida** - "*Teresa Almeida has an extremely strong background and track record in critical-humanistic approaches to design and research. Her research has resulted in award-winning research in the top tier international conference ACM CHI 2016 (Best Paper Award*

and Honorable Mention Award), and a Design Award at Augmented Human 2015 International Conference. Furthermore, her work has been nominated for the O2 NextGen Digital Challenge Awards 2016 (UK) and received a Silver Award, App Idea Awards 2017 (NYC, USA). Her vision is to continue to build and design interactions and systems to embrace and explore notions of decentralisation, expanding her career in research with a focus on improving quality of life and social equity through technology and design. Teresa has an extremely broad background and engagement across several applying design practice research approaches, e.g., to novel concepts, design interactions and experiences with workshops and education in the real world; ultimately, contribute to a plan of action that helps mitigate societal issues through collaboration and innovation in support of socio-cultural change. Teresa will therefore play a critical role in WPs 3,4 and 5 and will assist us in creating awareness within and outside of IST through output of high-quality research and engaging with local communities through her design practice. Teresa has also started her own platform – Bitness – which will further assist DCentral with dissemination and communication." - ***signed by Catherine Mulligan and Joaquim Jorge (area coordinator of Interaction and Graphics of the CSE Dep.)***

Appointments

The same legal restrictions that prevent the hiring of the ERAChair holder in the research track (Article 45 of ECIC) are also applicable to the ERAChair research team members. The Scientific Council of IST approved the exception of reduced teaching to the ERAChair research team which were offered a 3-year contract as invited professors with starting dates and appointments as follows:

- Kevin Gallagher (1st Oct. 2021), 100% CSE Dep.
- Mariana Pestana (15 Oct. 2021), 50% CSE Dep., 50% Civil Eng. Dep.
- Teresa Almeida (1st Feb. 2022), 100% CSE Dep.
- Alfio Puglisi (1st Feb. 2022), 50% CSE Dep., 50% Eng. Management Dep.
- David Matos (1 July 2022), 100% CSE Dep.

Task 2.3. Recruitment of ERA Chair Support Team

To assist the ERA Chair holder and her research team, Task 2.3 of the workplan included the recruitment of the support team (M6-27). The support team is composed of a professional research manager and a TTDO. They should oversee the knowledge transfer actions to promote and manage innovation activities with the public administration and private business corporations. They also play an important role in the establishment of the Industry Affiliates Program (WP 4). In addition, one lab technician will be required to run the ERAChair Research Infrastructure. This technician will work in close collaboration with technical staff already working at the facilities of LARSyS and INESC-ID, but he/she

will focus on the implementation of the specialised techniques required to the deployment of blockchain infrastructures. We have identified the following profiles as a starting point for discussion with the ERA Chair holder.

The recruitment process of the Research Manager will start after hiring the ERA Chair holder (M8), and is expected to be completed within three to six months (M11 to 14). The recruitment process of the lab technician will start in Month 13, after the recruitment of the Research Manager who will oversee the process. The recruitment process of the support team is expected to be finished simultaneously to that of the ERA Chair researchers, so that all the team can start working in Month 24.

5.3- WP3 - Development of Research Capacities to Participate in the ERA

Objectives

To strengthen the research capacity of Técnico – Lisbon, LARSyS and INESC-ID and to promote its long-term sustainability by providing support to foster the project management, networking and fundraising capabilities of its researchers. Specifically, the WP aims to: (i) provide LARYS and INESC-ID researchers with training on the technical and practical skills needed for preparing successful applications to H2020 and to gain project management skills; (ii) build relationships with key international organisations and networks in the environmental area; (iii) consolidate and expand the network of partners through regular, bi-directional exchange of researchers and students; (iv) foster the establishment of long-term partnerships with leading research institutions; and (v) promote the preparation of applications to H2020 calls.

Both BIG and DCentral are aimed directly at ensuring the associated activities enable Técnico to participate in the ERA. The aims of the refreshed ERA are to:

- Strengthen mobility of researchers and the flow of knowledge
- Incentivise investing in research and innovation
- Promote gender equality and diversity in science
- Enhance cooperation among universities, business and other research and innovation actors and it has four strategic aims:

    1. Prioritise investments and reforms in research and innovation, to support the digital and green transition and Europe's recovery
    2. Improve access to excellent research and innovation for researchers across the EU
    3. Translate results into the economy to ensure market uptake of research output and Europe's competitive leadership in technology
    4. Make progress on the free circulation of knowledge, researchers and technology Wthrough stronger cooperation with EU countries

In order to ensure that BIG and DCentral are fully aligned to the ERA strategic aims, we have developed an initial plan along the following lines that ensure the Tasks in this work package provide a unified effort to deliver towards the ERA and enable our full participation.

Firstly, we ensure an interdisciplinary approach in order to enable us to align to strategic objective 1) through ensuring we take an environmental, economic and social perspective into account for any engineering solution we propose (Figure 2) - this will ensure that we are able to contribute research and ideas that directly link to the digital and green transition, in particular as it relates to Europe's recovery:
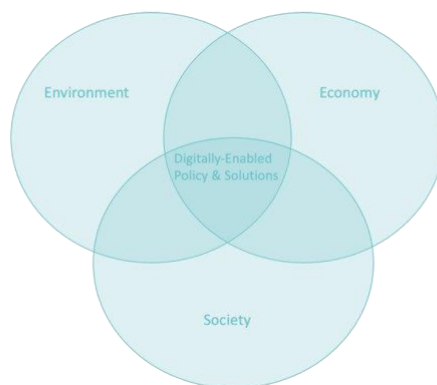
Figure 2 - Our approach to engineering solutions.

Our unifying research question is therefore:

> *"How can decentralised technologies help society build a sustainable future and deliver Social Good?"*

In order to deliver on the rest of the ERA strategic objectives, we apply an "innovation garage" approach (Figure 3) to 1) managing our research inputs and 2) developing our research outcomes. This is illustrated below:
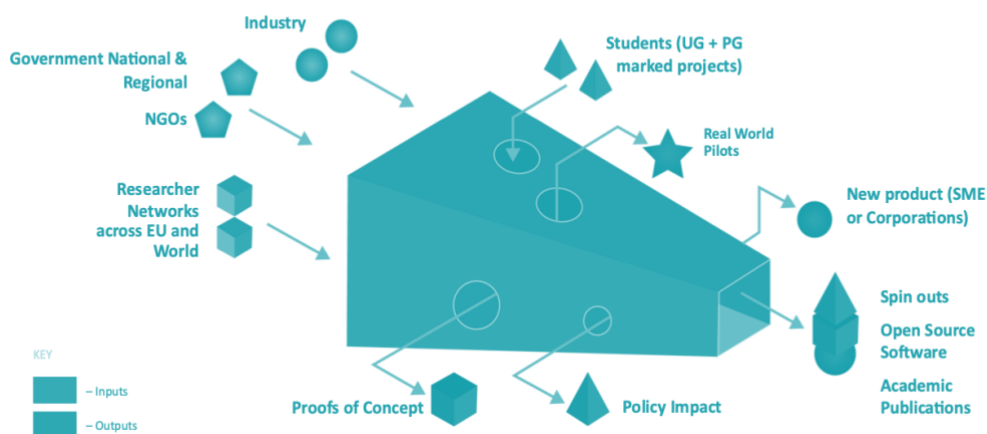
Figure 3 -"Innovation garage"approach

Firstly, our inputs to developing our appropriate research agenda come from various sources – including discussions with other researchers across the EU and globally, but also across different governments, both regional (EU) and national (Portugal), as well as industries and non-governmental agencies such as the United Nations, charities and others. Our Innovation Garage approach works to ensure that as we collate these inputs, we are generating *research activities* that are directly related to solving the issues identified. Through this we work towards strategic aim 3 by focusing research activity on problems identified across industry and broader society. We then focus our outputs on several items in order to fully deliver towards strategic aims 2 and 4:

- **Academic Publications**: As an academic activity, our main aim is to produce research excellence and this will be a core driver of our activities. This will be aimed at Computer Science, Design, Economics and Innovation Policy. In some instances, we will also push the boundaries of academia to create new journals for the new Digital Economy that is becoming a foundation of the EU.

- **Policy Impact**: We will ensure that the relevant Innovation, Economics and Policy insights are delivered into the correct policy forums locally and globally to better connect the academic outputs with the real-world.

- **Technical Outputs:** Another output of our work is a series of technical outputs and artefacts that can be:

    o **Proofs of Concept**: We will trigger uptake of our ideas through the development of PoCs that can form both the foundation of academic publications as well as useful ways to engage with industrial partners around initial topics

    o **New Products:** We will work directly with industrial partners to provide research input into their product developments to further embed the research activities in the industrial landscape of Portugal

    o **Spin Outs**: In particular, we will work with our students to develop their ideas and concepts into viable spin-outs – developing an innovative and flourishing start-up economy in Portugal. A key aspect of Dcentral will be to develop and cultivate not just the student projects, but also the connections to Venture Capital, Angel Investors and government agencies to ensure that good ideas for spin-outs are well-handled to give our students the best opportunities possible for success.

    o **OSS –** from a broader societal perspective, all of our software will be made available via Open-Source Software, allowing uptake of our research outputs and generating further research excellence across the EU through exchange of ideas and software components.

- **Cultural Impacts:** When dealing with a new form of money or value exchange such as cryptocurrencies that fundamentally challenge the social contract that has formed the basis of our society for over 150 years, it is important to conceptualise, research and provide insight into the cultural impacts of the technologies. Dcentral will also address these research concerns from a variety of angles.

We will also work with both undergraduate and postgraduate students to deliver the next generation of academic and industrial talent in this space.

Finally, DCentral will start as a collaboration between several departments, but over time will enable interdisciplinary activity across all of Técnico as illustrated below (Figure 4):
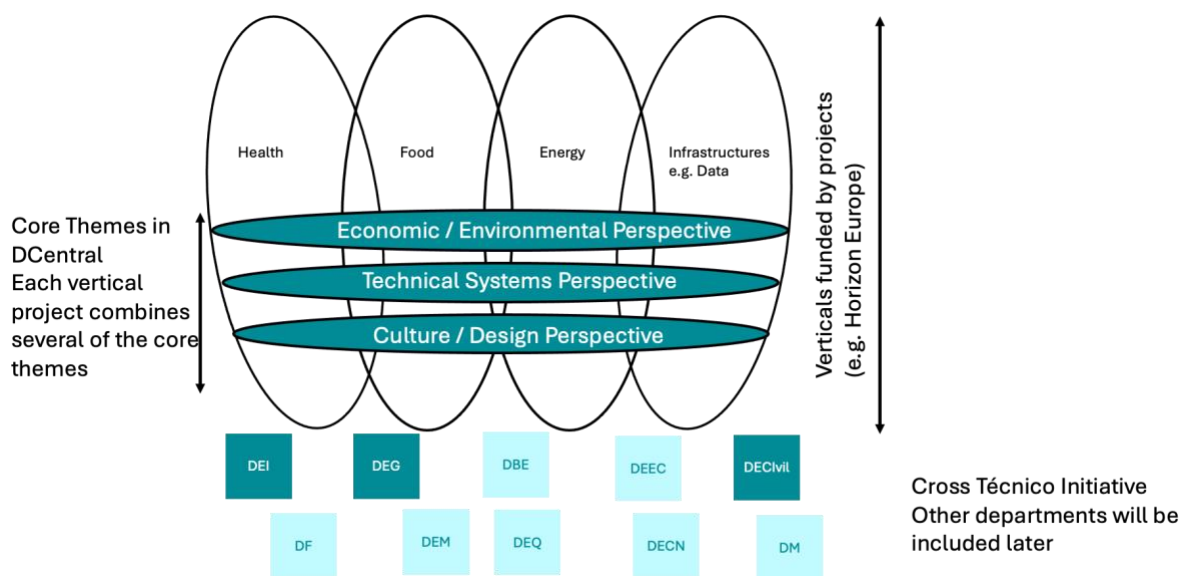
Figure 4 - Cross Técnico Initiative

Through these activities, BIG will initially build competence in Técnico and across Lisbon and Portugal. Through the longer-lasting DCentral activity, we will engage fully with the world and aim to interact both across the EU and at a global level: firstly, promoting the research excellence of both LARSyS and INESC-D, secondly developing new research excellence within blockchain and associated technologies and finally by creating a vehicle for long-term engagement both internally and externally to Técnico (DCentral).

Task 3.1. Acquiring Horizon 2020 funding development expertise

In this first year of the project, the staff and faculty acquired H2020 expertise through local training and online webinars lectured by the European Commission. One member of the team, Alexandra Mendes, attended the training course "Horizon Europa and the preparation of applications for European projects" organised by ARDITI and the University of Madeira, in the scope of the Horizon2020 project – FORWARD. The training course focused on the Pillars and topics of the Horizon Europa Program. The first session addressed the Participant Portal and all the information inherent and necessary to submit a

proposal. On the second day, the theme was Pillar I and the types of projects and proposals for the Marie Skłodowska-Curie Actions. In the third session, the focus was on Pillar II - Widening and filling out the sections of the forms. In the fourth and final training, Pillar III was addressed and its types of projects and the European Innovation Council (EIC).

LARSyS (Alexandra Mendes) project manager participated in a meeting organised by Instituto Superior Técnico on June 16, 2021, to discuss the financial, administrative and technical aspects of HE applications, specifically for the thematic Collaborative Pillar 2 projects and for the Pathfinder Challenges (closing dates September/October/November), so that we can advise and support researchers in preparing their applications.

BIG organised an info session on June 24, 2021, about the new Horizon Europe program for LARSyS researchers. This info session was given by Marta Candeias, IST Pre-award officer, and focused specifically on the upcoming project funding opportunities.

Catherine Mulligan and Alexandra Mendes participated in the European Research and Innovation Days event, organised by the European Commission on June 23 and 24, 2021. This event covered topics such as Horizon Europe, the European Research Area, the European Innovation Ecosystems.

Task 3.2. Exchange of Know-how with Potential EU Partners

A number of connections and discussions have been established for a number of different Horizon bids – including:

- Italy - Sant'Anna, Pisa & Instituto Italiano di Tecnologica;
- Germany - Weisensee school of art and design & Humboldt university;
- Spain - Centre Blockchain de Catalunya;
- UK - University College London, Imperial College, University of Exeter & MiFarm;
- Sweden - KTH

We are already preparing two submissions to Horizon Europe calls with EU partners, some of these proposals are not focused on blockchain technologies but gradually the teams are pursing the concept of BIG: to bridge the existing technical expertise at INESC-ID with the design innovation perspective focused on the deep understanding of human needs to produce strong case-studies in different domains for real-world testing which is the expertise of ITI/LARSyS. Examples include existing expertise at ITI/LARSyS in domains such as cultural heritage, mixed and augmented reality and application areas of energy, food and creative industries.

- HERITAGE-O4 - RIA, led by IIT in Italy (Nuno Nunes, Valentina Nisi and Cathy Mulligan);
- HORIZON-CL6-2021-FARM2FORK-01-07: Research & innovation roadmap for blockchain technologies in the agri-food sector together with Sant'Anna Pisa (Cathy Mulligan, Mariana Pestana).

We are also looking to non-Horizon funding sources and are actively developing funding from various foundations and national funds, including the forthcoming recovery and resilience plan.

Task 3.3: Secondments of doctoral students and junior researchers

Due to the Covid-19 pandemic, and for safety reasons, our doctoral students and junior researchers weren't invited or advised to spend time abroad on the partner institutions. We hope to be able to start this activity in 2022. We have, however, commenced working with Masters students at Técnico around the issues of Economic Growth, Service Design for Blockchain, and the Environmental impact of cryptocurrencies.

The project benefits from an existing pool of students (mostly supervised by co-PIs from INESC-ID) from the group from INESC-ID in Distributed, Parallel and Secure Systems which broadly addresses Systems, ranging from the underlying architectural support for high-performance systems, networks and applications, scalable and secure distributed platforms for cloud computing, big-data storage and processing, to autonomic computing and peer-to-peer systems of Internet scale. These students are working in technical topics using the high-performance data center which hosts several servers (many of them used by different EU and nationally funded research projects), including those initially purchased for the BIG ERAChair and additional equipment already requested.

Master students working on Blockchain-related topics

- Extended Self-Sovereign Identity Based Access Control, by Guilherme de Seiça Ribeiro do Quental de Menezes. Supervisor: Miguel Pupo Correia (2021)
- Recoverable Token - Recovering from Intrusions against Digital Assets in Ethereum, by Filipe Miguel Fernandes Martins. Supervisor: Miguel Pupo Correia (2021)
- Blockchain Address Transparency with DNS, by Mara Cristina Marques Caldeira. Supervisor: Miguel Pupo Correia (2021)
- Cryptojacking Detection with CPU Usage Metrics, Fábio Miguel de Jesus Gomes. Supervisor: Miguel Pupo Correia (2021)
- Universal Consent Management Platform, by André Santos Martins Nunes. Supervisor: Miguel Pupo Correia (2020)
- CryingJackpot: Network Flows and Performance Counters against Cryptojacking, by Gilberto Gomes. Supervisor: Miguel Pupo Correia (2021)
- P2CSTORE: P2P and Cloud File Storage for Blockchain Applications, by Marcelo Filipe Regra da Silva. Supervisor: Miguel Pupo Correia (2021)
- Segurança na Apreensão e Armazenamento de Criptomoedas, by João Maurício Barros Ascensão. Supervisor: Miguel Pupo Correia (2021)
- Data Recovery for Hardware Security Extensions, by Vasco Miguel António Guita. Supervisor: Miguel Pupo Correia (2021)

- A Tracking and Tracing System for a Supply Chain, by Miguel Ângelo Afonso Duarte Palma. Supervisor: Miguel Pupo Correia (2021)
- A Blockchain-based Platform for Sharing and Verifying Education Certificates, by Diogo Tavares Serranito. Supervisor: Miguel Pupo Correia (2020)

PhD students working on Blockchain-related topics

- Blockchain Interoperability, by Rafael Belchior. Supervisor: Miguel Pupo Correia (ongoing)
- Trusted Execution Environment Migration, by Daniel Andrade. Supervisor: Miguel Pupo Correia (ongoing)
- A fault model for data centers, by Daniel Porto. Supervisor: Rodrigo Rodrigues (ongoing)
- Scalable and Resilient Byzantine Fault Tolerant Consensus, by Ray Neiheiser. Supervisors: Miguel Matos and Carlos Montez (ongoing)
- Efficiency and security in permissionless blockchains, by João Martinho. Supervisor: Miguel Matos (ongoing)
- Blockchain sharding, by Francisco Rola. Supervisor: Miguel Matos (ongoing)
- Consistency and correctness guarantees in permissionless blockchains, by Paulo Silva. Supervisor: Miguel Matos (ongoing)

Funded projects

- **Qualichain**: Decentralised Qualifications' Verification and Management for Learner Empowerment, Education, Reengineering and Public Sector Transformation (EU H2020 grant agreement No 822404.), Total funding: 400K€. INESC-ID funding: 469K€. PI: Miguel Correia

  QualiChain targets the creation, piloting and evaluation of a decentralised platform for storing, sharing and verifying education and employment qualifications and focuses on the assessment of the potential of blockchain technology, algorithmic techniques and computational intelligence for disrupting the domain of public education, as well as its interfaces with private education, the labour market, public sector administrative procedures and the wider socio-economic developments. The project focuses more specifically on the assessment of the implications (technical, political, socio- economic, legal and cultural) as well as the impact - in terms of benefits and risks - of the prescribed solution's utilisation, whose disruptive potential lies both in the exploitation of the innovative features of the aforementioned individual technologies, as well as in their unique combination in a new territory for the provision of a set of baseline services (Awards'/ Qualifications' Archiving; Awards'/ Qualifications' Verification; Qualifications' Portfolio Management) and a number of value- adding services (Career Counselling and Intelligent Profiling and Competency Management including Recruitment; Competencies' Evaluation and Development; Consulting and Decision Support). The proposed solution will be piloted through four representative scenarios, including: (i) cross-

university degree equivalence verification; (ii) smart curriculum design; (iii) staffing the public sector; (iv) providing HR consultancy and competency management services.

5.4. WP4 – Deployment of BIGLab, Test Beds and Living Lab

Objectives

This work package focuses on offering the ERA Chair and the LARSyS and INESC-ID research team the opportunity to enhance the existing research labs with new equipment for world-class Blockchain and distributed ledger technologies and design innovation research. This equipment will be used to develop test beds that can be used by LARSyS and INESC-ID members and by European and local industry partners. These testbeds will play a key role in raising the visibility of the research teams and increasing their competitiveness in the Horizon 2020 programme. This work package will address the current lack of in-house and large-scale deployments and help further to aggregate and retain the critical mass. BIG's development of a Lisbon digital living lab infrastructure is a crucial action to further develop the research capacity of LARSyS and INESC-ID under the strategic direction of the ERA Chair holder in several key application areas. The acquisition of state-of-the-art equipment will make Técnico - Lisbon more competitive and a convenient partner due to the uniqueness of the BIGLab design studio. The foreseen focus for the BIGLab serves as a shared cross-domain platform (for the smart specialisation strategy application domains) that will foster interdisciplinary approaches and the exploitation of synergies among research members and collaborators. Hence, the living lab will unlock our research potential allowing for innovative and novel creative practices in the S3 application areas. Therefore, the equipment and the resulting cutting-edge research are crucial elements to position LARSyS and INESC-ID strategically to be competitive in ERA and beyond the project scope.

Task 4.1: Building the BIGLab

Several steps have been taken for the creation of the BIGLab, such as the purchase of a server cluster that will be used to assess the performance of blockchain systems and applications developed within the project. Blockchains typically have several nodes (computers) that are geographically distributed. In the servers, we execute virtual machines, each one emulating a node or a network element, allowing us to evaluate the performance of such systems without running them in a real setting, which is impractical and expensive. With the platform composed of the servers, the team can measure properties such as energy consumption, throughput and scalability.

Server Infrastructure

The GA (pg. 44) detailed the 5 x servers Intel Xeon Silver, 16GB and 4 x 1TB RAID 25000€ (5x5000€) – to be used by the ERA Chair holder, the ERA Chair Research Team and the Laboratory Technician.

The ERAChair holder was informed of the characteristics of the servers through the copy of the GA and subsequently in project meetings and by email shortly after the starting date by co-PIs of INESC-ID stating they were accessible for use by the ERAChair and her team.

The servers were acquired on 30 Nov. 2020 to maximise depreciation costs (which are 4 years using the decreasing quota method - "Método das Quotas Descrescentes" according to the Portuguese accounting rules) with equivalent or higher technical specifications (Supermicro A+ Server 1014S-WTRT 32Gb RAM, 10x240Gb SSD) for 20 760€+VAT and installed at the data center of INESC-ID because the central datacenter of IST didn't have the capacity for hosting the equipment.

The INESC-ID data center where the servers were installed was fully occupied, so it had no capacity for new equipment. Therefore, to install the servers, INESC-ID had to increase the data centre's capacity in terms of communications infrastructure (cabling), electrical infrastructure (power), and rack space. This expansion had costs, both in terms of major components (e.g., cables, racks) and small components (bornes, circuit breakers, labels,…). Moreover, it also involved staffing in performing the installation itself. This implied an additional cost that was not originally expected at proposal time. According to IST's central accounting, these costs are not equipment costs and cannot be depreciated.

Meeting and discussion between the ERAChair holder, the senior project manager and the Vice-President of IST for IT took place and precise instructions for purchasing new equipment were provided (annex 4.6): "It seems to us that the server specifications are compatible with our datacenters. To be in the safe side, I would suggest to include the following requirements on the procurement process: *"Form factor compatible with rack mount in 19" server cabinet, including sliding rails with a maximum length of 765mm and all accessories required for cabinet mount. Power supplies redundant and hot-plug (1+1), with energy certification 80-plus Platinum or higher. Remote management IPMI or equivalent, with required licenses for graphic console or virtual drive included. All management functions must be available in a dedicated network interface. It would also useful to know in a advance the estimated power consumption of the selected configuration. The specifications detail a redundant power supply of 1200W, but this seems the nominal/maximum power. It would be convenient to have an estimate of the real power consumption of the selected configuration, if possible."*

Despite the approval from the project coordinator, the procurement process for acquiring the additional servers was never initiated in the platform by the project manager.

Industry Affiliation Model

Several activities have been developed to start an industrial affiliates program, including discussions around providing research support for Portuguese recovery funds to Anchorage.

In addition, Prof Mulligan has developed research discussions with several cryptocurrency and blockchain companies that will form the basis of long-lasting partnerships providing a strong base for the longevity of DCentral.

Task 4.5: Knowledge transfer planning

A Knowledge transfer plan is being drafted and will focus on the following:

- identification of current and future areas of application of Blockchain and distributed ledger technologies and design innovation approaches;
- identification of organisations in public and private sectors that might benefit from these approaches;
- development of strategies for effective knowledge transfer;
- the exploitation of results and intellectual property rights.

The knowledge transfer plan will be explained in detail on deliverable D18.

5.5. WP5 - Communication, Dissemination and Exploitation

Objectives

This work package focuses on maximising the impact of the ERA Chair, and more generally that of BIG, at the regional, national and international levels, including activities for dissemination of knowledge, networking, and raising global awareness of the research and innovation potential and achievements in the scope of the project.

Task 5.1 Project Communication and Dissemination Plan

The Communication and Dissemination Plan has been developed for the past 12 months and determines how the activities and outcomes of BIG should be disseminated. The staff will communicate and disseminate the project in close collaboration with Técnico's communication team, ITI/LARSyS and INESC-ID.

The approval of the project was communicated in the national media: https://www.dnoticias.pt/pais/investigadores-do-tecnico-conquistam-25-milhoes-de-euros-para-projecto-que-combina-tecnologias-digitais-com-os-grandes-desafios-societais-ED6027134

Task 5.2: Newsletters, Website and social media

BIG's website was launched in October 2020. Since its creation and until August 2021, the website has received 2769 visits (Figure 5). BIG's website gives its visitors an overview of the project objectives, its team and organisation, and the workplan. There are also two sections that target the recruitment calls and media & Events.
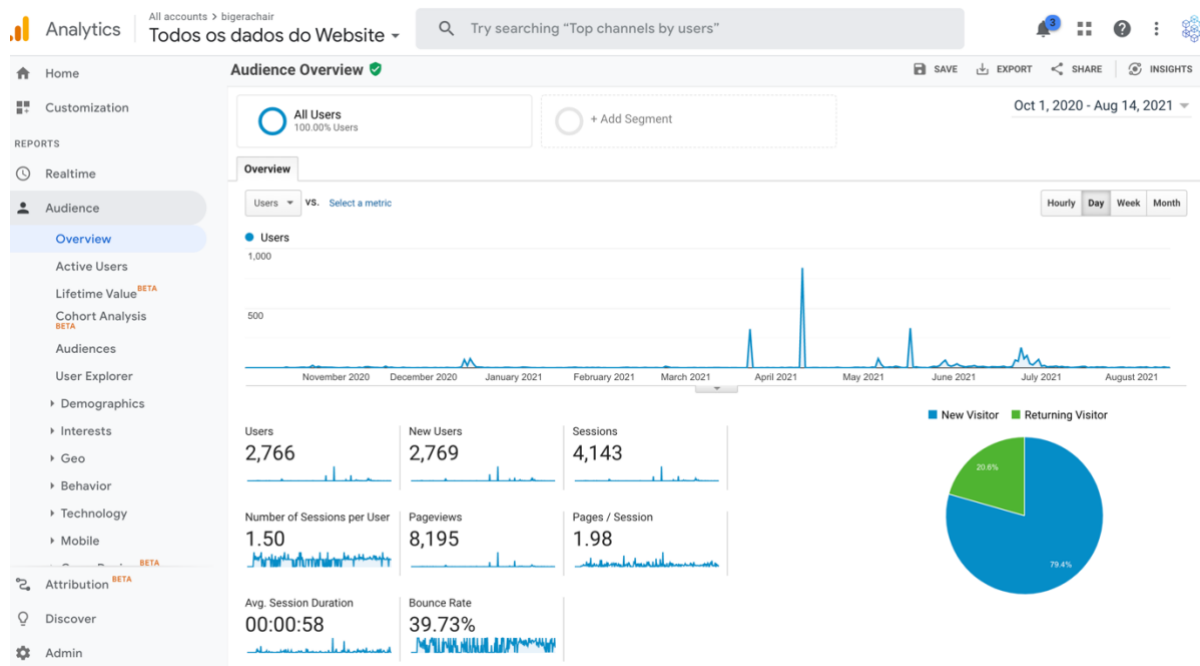
Figure 5. Statistics from https://bigerachair.tecnico.ulisboa.pt/

Regarding social media, we created an Instagram (*@big_tecnico)* and a Twitter (*@big_tecnico)* account for the project. We chose these two social media because Instagram is one of the most popular social networks and engages with a wider non-technical audience. On the other hand, the Twitter (*@big_tecnico)* public is middle aged and tends to have more literacy than in other social media which makes it an excellent resource to promote our research.

BIG's Instagram account was created in April 2021 and had 62 followers.

The more recent Twitter account was created in July 2021, and we already count with 21 followers.

Task 5.3 Participation in Workshops and Conferences

Prof. Catherine Mulligan:

- European Regions Summit for Smart Communities, 3rd-9th May 2021
- Data for Policy: https://dataforpolicy.org/ (UCL/Cambridge)
- IEEE ICTE, 2021
- Robert Bosch Stiftung Fellows - Workshops and Conferences 2021 (6)
- Institute of Directors "Sustainability Greenwashing Roundtable", 2021
- CreaTech Workshop, 2021
- IORMA Roundtable, 1st July 2021
- WEF Pathways to Digital Justice Workshops (4)
- D4A Pulse Blockchain Education Workshop
- IET / ONS - Measuring the Digital Economy Workshop 23rd June 2021
- IET Digital Panel Meetings - 22 June 2021

- Ascend 2021, 7th July 2021
- Extension of ICT Verticals and Horizontals for Blockchain Standardisation (3)
- MEMEX 2 Brainstorming workshop

6. List of Deliverables

Deliverables			
WP No.	Del. No	Title	Status
WP1	D1	Minutes of Kick-off meeting	Submitted
WP1	D2	Quality Plan	Submitted
WP1	D3	Data Management Plan	Submitted
WP1	D4	Annual Report 1	Pending
WP1	D5	Annual Report 2	Pending
WP1	D6	Annual Report 3	Pending
WP1	D7	Annual Report 4	Pending
WP1	D8	Publications in high impact journals in the relevant research fields before the start date of the project	Submitted
WP2	D9	Contract of ERA Chair holder	Submitted
WP2	D10	Contracts of ERA Chair Team	Pending
WP3	D11	Organisation of Horizon 2020 training events v1	Pending
WP3	D12	Organisation of Horizon 2020 training events v2	Pending
WP3	D13	Researcher Exchange Reports	Pending
WP3	D14	Strategic plan for long lasting collaborations	Pending
WP3	D15	Open Research Data Pilot	Pending
WP4	D16	Characterisation of Research Infrastructure	Pending
WP4	D17	Industry Affiliation Model	Pending
WP4	D18	Knowledge Transfer Plan	Pending
WP4	D19	Report on Knowledge Transfer and the Industry Affiliates 1	Pending
WP4	D20	Report on Knowledge Transfer and the Industry Affiliates 2	Pending
WP5	D21	Communication & Dissemination Plan – v1	Pending
WP5	D22	Communication & Dissemination Plan – v2	Pending
WP5	D23	Knowledge Management System	Pending
WP6	D24	Report of the Independent Evaluation Panel	Pending

7. List of Publications

Academic Publications

- Gilberto Gomes, Luis Dias and Miguel Correia. CryingJackpot: Network Flows and Performance Counters against Cryptojacking. In Proceedings of the 19th IEEE International Symposium on Network Computing and Applications (NCA), Nov. 2020
- Filipe Martins, David Matos, Miguel Pardal and Miguel Correia. Recoverable Token: Recovering from Intrusions against Digital Assets in the Ethereum Blockchain. In Proceedings

of the 19th IEEE International Symposium on Network Computing and Applications (NCA), Nov. 2020

- Fábio Gomes and Miguel Correia. Cryptojacking Detection with CPU Usage Metrics. In Proceedings of the 19th IEEE International Symposium on Network Computing and Applications (NCA), Nov. 2020

- Diogo Serranito, André Vasconcelos, Sérgio Guerreiro, Miguel Correia. Blockchain Ecosystem for Verifiable Qualifications. In Proceedings of the 2nd Conference on Blockchain Research & Applications for Innovative Networks and Services (BRAINS), Paris, France, September 2020

- Rafael Belchior, André Vasconcelos, Miguel Correia. Towards Secure, Decentralized, and Automatic Audits with Blockchain. In Proceedings of the European Conference on Information Systems (ECIS), June 2020

- Mulligan, C., Elaluf-Calderwood, S. 2021, AI ethics: A framework for measuring embodied carbon in AI systems. *AI Ethics* (2021). https://doi.org/10.1007/s43681-021-00071-2

- Mulligan, C., Kelly, F., 2021, Digital Entrepreneurship: Ensuring True Compliance with Sustainable Development Goals (SDGs) – 2021 IEEE ICTE (accepted, upcoming August 2021) - Winner of the Best Presentation at IEEE ICTE 2021

- Mulligan, C., 2021, Data for Common Purpose Initiative, Data for Policy 2021, accepted & upcoming September 2021

Non-Academic Publications

- Mulligan, Cathy, 2021, Data-driven Economies: Foundations for Our Common Future, World Economic Forum White Paper

8. List of Public Presentations and Activities

- Moderator @ World Economic Forum: Creating a Robust and Inclusive Global Ocean Data System" - https://www.youtube.com/watch?v=hAUBi6TQ0bk

- Member World Economic Forum Data Policy Council – 2020 / 2021

- Member World Economic Forum's Data for Common Purpose Initiative 2020 / 2021

- Ascend Presentation on Blockchain - May 7 2021

- Institute of Directors, "Sustainability Greenwashing" – July 28 2021

- Bauhaus of the Seas Co-Design Event, Lisbon, MAAT, 20 May 2021, https://bauhaus-seas.eu/conference/lisboa-maat-20-may-2021/. Main organizers: Nuno Jardim Nunes (Técnico – ITI/LARSyS), Mariana Pestana (U. Lusófona – Center for Other Worlds), Markus Reynman (TBA Academy), José Albergaria (Design)

- Worldbuilding a more-than-human future: Exploring and envisioning new narratives with the seas, Roundtable Discussion at the Bauhaus of the Seas, 20 May 2021, Chair: Nik Baerten

- Transformative Economies: Ecosocial Wellbeing and the Politics of Participation, Roundtable Discussion at the Bauhaus of the Seas, 20 May 2021, Chair: Ann Light

- Circular Economy for Coastal Regions: A sea of opportunities, 20 May 2021, Chair: Paulo Ferrão

- Tech in Sustainable Development: Digital & Other Technologies for social good, 20 May 2021, Chair: Catherine Mulligan

- Design Education: How to evolve design education for a NEB, 20 May 2021, Chair: James Auger

- Miguel Correia, IDC Security Roadshow 2021 - Academy Panel: The Future of Trust with Blockchain, April 21, 2021

- Miguel Correia, Euro Digital: O que vem aí?, Técnico+ / Católica Lisbon webminar, March 3, 2021

- Miguel Correia, Blockchain Cross-Borders: The European Blockchain Services Infrastructure, webminar, IEEE Engineering Day, Nov. 27, 2020

- Miguel Correia, Blockchain e Smart Contracts: Oportunidades e Desafios para as Empresas, Técnico+ / Católica Lisbon webminar, October 29, 2020

Upcoming:

- Mulligan, C, 2021, September 8th 2021, Data for Policy Conference, Standard Track 2.C: Data Technologies and Analytics for Policy and Governance

Prof. Mulligan has also become an Associate Editor for the first ACM journal for Blockchain (Distributed Ledger Technologies: Research and Practice), chief editors Raymond Choo and Mohammad Hammoudeh: https://dl.acm.org/journal/dlt/editorial-board