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**ECOSISTEMAS DE INNOVACIÓN
EN LA UNIÓN EUROPEA
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UNIÓN EUROPEA**

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INNOVATION ECOSYSTEMS

IN THE EUROPEAN UNION

RENATA KUBUS

EUROPEAN UNION PHD PROGRAM

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'Nothing is more difficult than the art of maneuvering for advantageous positions.'

Sun Tzu (544 BC – 496 BC) Military general, strategist, and philosopher

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1. LIST OF SYMBOLS, ABBREVIATIONS AND ACCRONYMS

AEAC – Spanish Association for Science Advancement, after Spanish:
Asociación Española para el Avance de la Ciencia

AI – Artificial Intelligence

APIs – Application Programming Interfaces

BATCs - Best Available Techniques Conclusions

BGLN – Bank Governance Leadership Network

BIS – Bank for International Settlements

BREFs – Best available technique reference documents

CAP - Common agricultural policy

CAS – Complex Adaptive System

CEF - Connecting Europe Facility

CEO – Chief Executive Officer

CERN - the European Organization of Nuclear Research

COMPET – the EU Competitiveness Council

COST - the European Cooperation in Science and Technology

CRM – Customer Relationship Management

CSR – Corporate Social Responsibility

DEP - the Digital Europe Programme

EaPConnect - Eastern Partnership

EASME—Executive Agency for Small and Medium-sized Enterprises

EBA - European Banking Authority

ECB – European Central Bank

ECIA - European Creative Industry Alliance

EcoAP - Eco-innovation Action Plan

ECOFIN – European Economic and Financial Affairs Council

ECON – European Parliament Committee on Economic and Monetary Affairs

ECSA Spain – AUDESCO or Spanish Chapter of ECSA World – European Community Studies Association

ECSC - European Coal and Steel Community

ECU – European Currency Unit

EEA – European Economic Area

EFSD – European Fund for Strategic Investment

EFSD—European Found for Strategic Investments

EFTA - European Free Trade Association

EIB - European Investment Bank

EIC – European Innovation Council

EIOPA - European Insurance and Occupational Pensions Authority

EIT – European Institute for Innovation and Technology

EMCF - European Monetary Cooperation Fund

EMFS - European Mechanism for Financial Stability

EMS – European Monetary System

EMU – European Monetary Union

EOSC - European Open Science Cloud

ERAB – European Research Area Board

ERC – European Research Council

ERDF - European Regional Development Fund

EREK - European Resource Efficiency Knowledge Centre

ERM - Exchange Rate Mechanism – ERM

ESF – European Science Foundation

ESF+ - the European Social Fund

ESIF - European Structural and Investment Funds

ESMA - European Securities and Markets Authority

ESMH - European Science Media Hub

ESRB - European Systemic Risk Board

EU – European Union

EUR – Euro

EURATOM - European Atomic Energy Community

FAANG - Facebook, Amazon, Apple, Netflix, Google

FAIR - Findable, Accessible, Interoperable, and Re-usable

FED – Federal Reserve System of the US

FFM – Finance and Financial Markets

Fintech – Financial Technology start-up

FP – Framework Programme, in this document especially related to EU R&I Policy

FRB - Full Reserve Banking

FSB – Financial Stability Board

FSM - Financial Support Mechanism

GDP – Gross Domestic Product

GDPR – General Data Protection Rules

GEANT - Gigabit European Academic Network

GEOSS - Global Earth Observation System of Systems (GEOSS)

GNP – Gross National Product

Greenfield – new investment when building company from scratch

Govtech – Government Technology start-up

GVC – Global Value Chain

ICO – Initial Coins Offering

I+D+i – from Spanish: Investigación, Desarrollo e Innovación, corresponding in English to R&D+I - Research, Development and Innovation

IEBS – Innovation and Entrepreneurship Business School

IMF – International Monetary Found

IP – Internet Protocol

IPA III – EU Instrument for Pre-accession Assistance

IPCC - Intergovernmental Panel on Climate Change

IPO – Initial Public Offering

IRC – Innovation Related Centres Network of the EU

IT – Information Technology

ITRE—Committee for Industry, Research and Energy Centre of the European Parliament

JEDI – Joint Research Disruptive Initiative

JRC – EU Joint Research Centre

KETs - Key Enabling Technologies

KIC – EU (EIT) Knowledge and Innovation Community

KYC – Know-Your-Customer

Legtech – Legal Technology start-up

LGBT + - Lesbian, Gay, Bisexual, Transgender/Transsexual plus. The ‘plus’ is inclusive of other groups, such as asexual, intersex, queer, questioning, etc.

LGPD – from Spanish Ley General de Protección de Datos, in English GDPR – General Data Protection Rules.

LIFE - the Programme for Environment and Climate Action

LTRO - Long Term Refinancing Operations

MIFID – Markets in Financial Instruments Directive

MLP – Multilevel Perspective

MMT – Modern Monetary Theory

MMT – Modern Monetary Theory

MS – Member States of the EU

MSCA – EU Marie Skłodowska-Curie Actions

NBPs – National Promotional Banks

NDICI – EU Neighborhood, Development and International Cooperation Instrument

NIS – National Innovation System

ODS – from Spanish Objetivos de Desarrollo Sostenible, in English SDGs – Sustainable Development Goals

OSCOLA – Oxford University Standard for Citation of Legal Authorities (no Ibid)

OECD - Organisation for Economic Co-operation and Development

P2P – Peer to Peer

PSD2 – Payments Services Directive of the EU, part 2

PYMES – from Spanish Pequeñas y Medianas Empresas, in English SME – Small and Medium Enterprises

QE – Quantitative Easing

R&D – Research and Development

R&D+i - Research, Development and Innovation

R&I – Research and Innovation

RAMICS - Research Association on Monetary Innovation and Community and Complementary Currency Systems

REA – Research Executive Agency

Regtech – Regulatory Technology start-up

RIICO – International Network of Researcher in Competitiveness, from Spanish: Red Internacional de Investigadores en Competitividad.

RIS – Regional Innovation System

RMB – Chinese Renmibi

RTD – Research, Technology and Development

SAM – Sustainable Air Mobility Congress

Sandbox – test regulatory environments

SBTi - Science Based Target Initiative

SciDF – Scientists Dating Forum

SDG – Sustainable Development Goals of the UN

SDR – Special Drawing Rights

SEE - Sharing Experience Europe Platform

SFIC - Strategic Forum for International Science and Technology Cooperation

SME – Small and Medium Enterprises

SRSP – EU Structural Reform Support Program

SRSS – EU Structural Reform Support Service

SST – Social Shaping of Technology

ST – Sociotechnical

STEAM – Science, Technology, Engineering, Art, Mathematics

STEM – Science, Technology, Engineering, Mathematics

STOA - Panel for the Future of Technology and Science

STP – Science and Technology Park

TCFD - Task Force on Climate-related Financial Disclosure

TFEU – Treaty on the Functioning of the European Union

UdG – University of Guadalajara

UK – United Kingdom

US – United States

USD – US dollar

VC – Venture Capital

VCM – Value Chain Management

VUCA - Volatile, Uncertain, Complex and Ambiguous environments

WB – World Bank

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3. INTRODUCTION

The research paradigm, according to the scientist that coined the current use of this term is Kuhn, has two meanings: *‘On the one hand, it stands for the entire constellation of beliefs, values, techniques, and so on shared by the members of a given community. On the other, it denotes one sort of element in that constellation, the concrete puzzle-solutions which, employed as models or examples, can replace explicit rules as a basis for the solution of the remaining puzzles of normal science’*.¹ In the graph below, the paradigm applied for this study of innovation ecosystems is depicted, following basically the research process elements², ‘research onion’³ and epistemology diagnostic tool⁴. The ontological level is defined as relativism. Relativism maintains that points of view do not have, nor can they ever have, universal truth or validity, but only possess subjective validity within the framework of the different frames of reference.

Therefore, the reality needs to be interpreted to comprehend, it is understood as social construction, so that on the epistemological stance it is the interpretation of conceptual framework, understanding of the innovation ecosystem, its construction and processes. Thus, from theoretical perspective of the critical qualitative inquiry an adjusted model or conceptual framework is proposed as methodology, which afterwards is applied through the case study method. It is a qualitative and critical inquiry of the constructivist interpretative research⁵.

¹ Thomas Kuhn, *The Structure of Scientific Revolutions* (The University of Chicago Press 2017) 163.

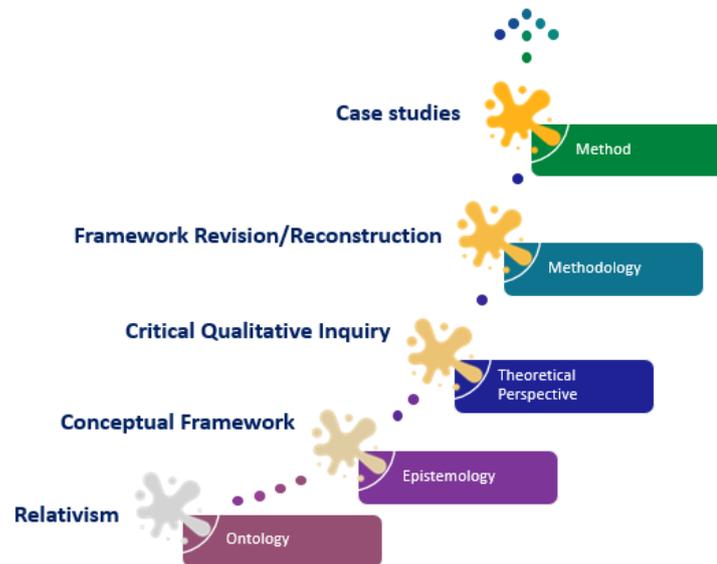
² Michael Crotty, *The Foundations of Social Research. Meaning and Perspective in the Research Process* (SAGE Publications 2012).

³ Mark Saunders, Philip Lewis and Adrian Thornhill, *Research Methods for Business Students* (2007) 160.

⁴ Gareth Morgan and Linda Smircich, ‘The Case for Qualitative Research’ (1980) 5 *The Academy of Management Review* 491.

⁵ See also: <http://salmapatel.co.uk/academia/the-research-paradigm-methodology-epistemology-and-ontology-explained-in-simple-language/> (Consulted on June 2nd 2020).

Figure 3-1. Constructivist Interpretative Research Base



Source: Own elaboration.

The subject of this PhD thesis is the determination and evaluation of the dynamics of structural advancement of innovation ecosystems in the European Union. Currently the innovation is seen as a way to respond to the challenges of our times. From the axiomatic stance, the question is what makes the valuable innovation flourish, and furthermore how to define the elements and dynamics of a successful innovation ecosystem, how to check what is going on in a sector or strategy, what is the level of their collective intelligence orchestration. Schumpeter and still many see the private entrepreneur figure as the key, but this is not the answer that emerges from the study. The key hypothesis of this work is that apart from the triple helix standard actors⁶ based on the Sabato knowledge triangle⁷, with industry (and private entrepreneurship), government and university, it is required to

⁶ Henry Etzkowitz, 'The Triple Helix - -University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development' (1995) 14 EASST Review 14 <<http://www.leydesdorff.net/th1/index.htm>> accessed 5 October 2017.

⁷ Jorge Sabato and Natalio Botana, 'La Ciencia y La Tecnología En El Desarrollo Futuro de América Latina' (1968) 1 Revista de la Integración, INTAL 15.

take also the society and natural environment into the innovation focus, if the long term sustainability is to be attained.

Along the years of working in the efficiency increase of the banking systems, the real-life perspective constituted itself as a valid approach and laid the background for the methodological proposal of this study. The metamodern perspective⁸ and grid-group cultural theory⁹ are also introduced to back its validity and usefulness. The theoretical framework is based on the process and actors view of the innovation ecosystems. The process view is based on the Multilevel Perspective¹⁰, establishing innovation phases from the levels of niche, sociotechnical regime and landscape.

3.1. State of the art

The subject of innovation is nowadays on its highs. Its etymology is tracked to the XV century, meaning ‘restoration, renewal, novel change, experimental variation, new thing being introduced in an established arrangement’, coming from Late Latin *innovationem*¹¹ stem of *innovare*, from *in-* into + *novus-* new. Its originator in the economics field is considered Schumpeter, his notion of innovation¹², was basically centred in a product or a service as the outcome and on the individual entrepreneur as its engine. In the course of time, the innovation definition evolved toward a less tacit outcome and in principle, a more collective origination. An example can be the Spanish COTEC Foundation for Innovation, which brings forward the change in all its

⁸ Timotheus Vermeulen and Robin van den Akker, ‘Notes on Metamodernism’ (2010) 2 Journal of Aesthetics & Culture 5677.

⁹ Mary Douglas, ‘A History of Grid and Group Cultural Theory’ 7 <<http://projects.chass.utoronto.ca/semiotics/cyber/douglas1.pdf>>.

¹⁰ Frank W Geels, ‘Processes and Patterns in Transitions and System Innovations: Refining the Co-Evolutionary Multi-Level Perspective’ (2005) 72 Technological Forecasting and Social Change 681.

¹¹ <https://www.etymonline.com/word/innovation> (Consulted on February 10th, 2020).

¹² Joseph Schumpeter, *Theorie Der Wirtschaftlichen Entwicklung* (Duncker & Humblot 1911).

applications, but based on thoroughly understood knowledge and centred on bringing value, the last one, globally understood also.

The question of value is an important subject matter arranging and rearranging the ways of our socioecological systems. Already Adam Smith in his seminal book on *Wealth of the Nations*¹³ brought forward this subject, depicting the paradox between the ‘value in use’ and ‘value in exchange’, because the things with a high value in use are many times not having such value in exchange. Some¹⁴ even highlight a worrying tendency of the recently accelerated disconnection between the value and its monetary expression.

It is also important because of the consciousness of the Anthropocene¹⁵ era when the humanity is increasingly gaining insights about its pervasive influence on the planet Earth, with the backfires in forms of pollution or climate emergency.

This question is also related to the understanding of the innovation as a much more far reaching process than previously imagined. It does not only start with the supply chain and sales, but becomes much more extended, toward circular approach.

We live in a post-industrial society. Already mentioned, traditional viewpoints, like Sabato triangle of knowledge¹⁶ are centred on the Government, as the enabling physical and legal infrastructure towards the Business or Industry, with the Academia, allowing for the infrastructure and flow of knowledge among these elements. As already stated, in the present study the dimensions of Society and Natural Environment are added. Circular approach is unfortunately still under construction when it refers to reality of economy functioning. It implies not only marketing campaigns or greenish designs of final product and its aftersales but also the product waste and the possibility of its recycling. From the beginning it takes into account the raw materials and their impact as well as such factors as the transportation to be used in the process of its production and

¹³ Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*. (1776).

¹⁴ Douglas Rushkoff, *Life Inc: How Corporatism Conquered the World, and How We Can Take It Back* (2011).

¹⁵ <http://www.anthropocene.info>

¹⁶ Sábato and Botana (n 7).

distribution, which naturally has its not only monetised impact on the natural environment, e.g. in form of pollution.

As previously indicated, the innovation starts also to be taken into account, less as serendipitous struggle of an entrepreneur and much more as a collective endeavour, when consistently approached, taking into account the previously mentioned actors but also the innovation process and its levels. Triple Helix¹⁷, based on the Lowe¹⁸ ADN simile, is quite a well-known concept in the walks of innovation. Dynamic, spinning and evolving nature of the construct when adding the societal and environmental dimensions are important aspects, what is more providing for what can be called the innovation ADN of an ecosystem. It is especially relevant, to include inside the ecosystem the society and its natural environment, not as something external. In a sense, it would be a living ‘spaceship Earth’¹⁹. Its condition can provide for the quality and maturity of the innovation conception, birth and further life performance.

So that, it already implies a living system with its structure and functions and what is more, the evolving actors and processes. The actors’ interactions defined by Sabato²⁰ are vertical or intra-relational inside each of its vertices, inter-relational or among the actors and furtherly extra-relational in the sense of the relationship with other ecosystems. Especially, the last dimension is quite neglected in the area of studies, with their polarizing effects on the global scale, not so easy to conceive and after all, to grasp in the context of a more interconnected world with a lot of data, less information, and even less knowledge or furthermore wisdom. This could be an interesting area of studies; brain drain, and other processes could also relate to the innovation and start-ups attracting and extracting poles.

¹⁷ Henry Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (Routledge 2008) <<http://ssi.sagepub.com/cgi/doi/10.1177/05390184030423002>>.

¹⁸ CU Lowe, ‘The Triple Helix - NIH, Industry, and the Academic World’ (1982) 55 *Yale Journal of Biology and Medicine* 239.

¹⁹ Richard Buckminster Fuller, *Operating Manual for Spaceship Earth* (1969).

²⁰ Sábato and Botana (n 7).

What is more, these processes are much better seen from the multilevel perspective of the innovation process, implying the niche, sociotechnology regime and sociotechnological landscape. Niche perspective is very important from the diversity standpoint, but also in what regards the ‘blue sky’ research defence in an innovation world where everything seems to be in need of an immediate application to be considered valuable. Sociotechnical regimes and landscapes are critical in order to understand the suboptimal system lock-ups and related ‘valley of death’ overcoming when it comes to ‘window of opportunity’ openings. Metamodern vision of the society is an important structuring for the networked society of today’s world.

We live in the knowledge-based²¹ or information society²². In what refers to knowledge and innovation slowly becoming a much more collective endeavour, it implies the company leading role when the innovation is market-driven, but also the participation of other triple helix actors, and even more the society (just to mention the concepts of social construction of science and technology²³), including there also a commons outlook²⁴. In part it can be tracked to metamodern super-hybridity but also to similar so-called cross-pollination of knowledge²⁵, science and technology with the bees’ natural simile, when the richness can be built based on different fields cross-fertilization. The concepts of open science and open innovation can be seen as the responses to such requirements. There is however another structural part important to that, as the knowledge advancement process is not just a simple plain mix with some synergies, moreover this is

²¹ Peter Drucker, *The Age of Discontinuity. Guidelines to Our Changing Society*. (Butterworth-Heinemann 1969).

²² Fritz Machlup, *The Production and Distribution of Knowledge in the United States* (Princeton University Press 1962).

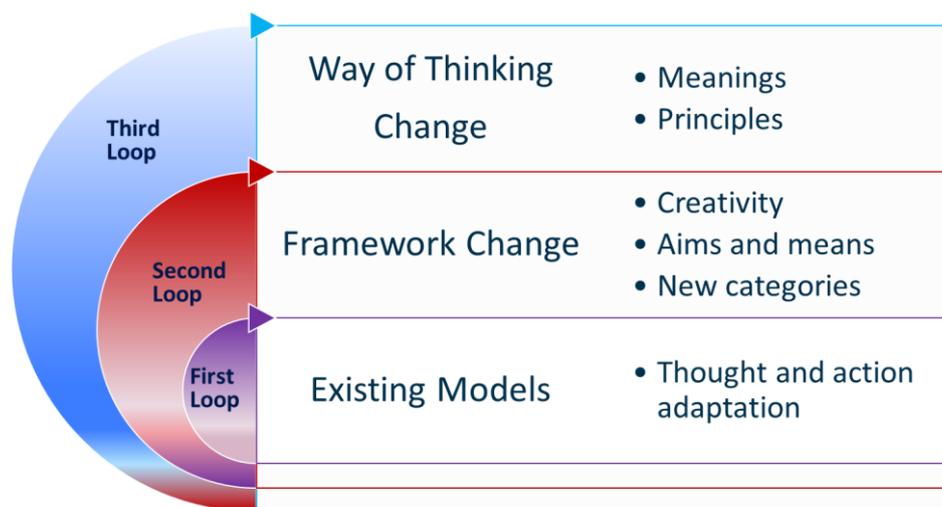
²³ Wiebe E Bijker, Thomas P Hughes and Trevor J Pinch (eds), *The Social Construction of Technological Systems. New Directions in the Sociology and History* (The MIT Press 1989).

²⁴ Charlotte Hess and Elinor Ostrom, *Understanding Knowledge as a Commons. From Theory to Practice* (Massachusetts Institute of Technology 2007).

²⁵ Yann Moulier Boutang, *Cognitive Capitalism* (Polity Press 2011).

the understanding of the intelligent learning loops²⁶²⁷ leveraging. First loop is based on the mental models and their outcomes checking against the reality. Second loop brings the reframing of these models, when there are too many unexpected and not matching processes and results. Third loop entails the change of the question, perhaps when new system of science arises. Citizen science can be a good example, when the science opens up to the society, and empowers its participation in the knowledge building and harvesting.

Figure 3-2. Intelligent learning loops



Source: Own elaboration based on Mulgan²⁸.

²⁶ Geoff Mulgan, *Big Mind. How Collective Intelligence Can Change Our World*. (Princeton University Press 2017).

²⁷ https://medium.com/@de_renata/aprendizaje-colectivo-inteligente-d22a8084729f?sk=759872159c93a21d6c34a040fd1928ac in Spanish (last consultation on June 2nd, 2020).

²⁸ Mulgan (n 26).

For such matter, subject of econometrics, computer systems fit rather the first loop, while the second and especially third loop are sort of bound to escape their conception. Artificial intelligence and machine learning could bring some better approaches, however. It goes along the saying attributed to Peter Drucker: ‘you can’t manage what you can’t measure’, sticking in this way to the first, or at its best the second learning loop. In a sense, it brings the response to the ‘innovation ecosystem’ term usage, due to it excessively complex nature, it seems better to ignore the question and stick to what can be done. In this way, some scholars take their preference for what is doable, for the sake of not being accused of a pseudoscientific approach. Furthermore, there are many cognitive traps or biases along the way.

State of the Art in the innovation ecosystems thinking

In recent years, there is an ongoing, heated discussion regarding the use of term of innovation ecosystems. The concept itself surges in the 2000s and becomes a thoroughly used ‘buzz world’ in business and afterwards in science. The term itself is a metaphor borrowed from the ecology. The world ‘ecosystem’ etymologically derives from the Greek *oikos*, meaning "home, household" and *systema*, or "system." Just to remind that it was first introduced by the ecologist Tansley²⁹ in 1935. Currently³⁰ its understanding in terms of ecology implies 5 factors: resources, agents or actors, processes, products and also trophic levels or distinct levels through which resources are carried out in time and space.

From the innovation perspective of the ecosystem orchestration in this study, especially the actors and processes are relevant, while the trophic levels can correspond to the learning loops in the environment where the ecosystem energy can be assumed as knowledge. Orchestration as it is used in the business environments probably refers to tuning the different instruments for a harmonised sound of a unique orchestra³¹, but the

²⁹ Arthur George Tansley, ‘The Use and Abuse of Vegetational Concepts and Terms’ (1935) 16 Ecology 284.

³⁰ <https://www.thecanadianencyclopedia.ca/en/article/ecosystem> (Consulted on February 10th, 2020).

³¹ However, in the musical terms, from where it is borrowed, it would imply rather ‘the study or practice of writing music for an orchestra or of adapting music composed for another medium for an orchestra’.

question is if it surely requires a central entity (e.g. company³² or Government) to perform the direction. Probably, it would be the collective orchestration when an improvisation is being performed, as still currently used in jazz music.

Within this definition probably choreography would fit better as a way of arranging the actors inside the group without any central figure requirements. It is an important question as the governance dimension in the innovation ecosystem studies is considered as playing a central role³³.

What is more the innovation ecosystem is seen as something engineered, that can be fully designed, even if evolving afterwards. In a sense, there is always some innovation or evolution in any socioecological ecosystem, ways of evolving the reality, even if not internal it can be external.

The ecosystem establishment and evolution are both very subtle processes, that are almost impossible to be exclusively achieved by any deliberate, direct policy measures or incentives, but rather the creation of a right ecological conditions is the key. 'The innovation ecology only partly depends on presence of elements (i.e. talent, firms, institutions, capital), but even more so on their identities, meaning, networking capabilities, culture of trust and pragmatic cooperation.'³⁴ Thus, the nature of innovation ecosystems can be depicted as an emerging, collaborative and innovation-conducive environments, in terms of their emergent nature, and how much can be assigned to a pre-designed system or the dynamically evolving network and structure of an ecosystem. How much its output, in this case innovation, can be defined or is originated by the interaction of its elements.

Here, the question is more on a proper orchestration or choreography to make this ecosystem more efficient in innovation concept, not in terms of inputs and outputs but on

³² Katri Valkokari and others, 'Orchestrating Innovation Ecosystems: A Qualitative Analysis of Ecosystem Positioning Strategies' (2017) 7 *Technology Innovation Management Review* 12.

³³ Susanne Durst and Petro Poutanen, 'Success Factors of Innovation Ecosystems - Initial Insights from a Literature Review *' [2013] *CO-CREATE 2013: The Boundary-Crossing Conference on Co- Design in Innovation* 27.

³⁴ Giedrius Jucevičius and Kristina Grumadaitė, 'Smart Development of Innovation Ecosystem' (2014) 156 *Procedia - Social and Behavioral Sciences* 125.

its quality, generated wealth and sustainability³⁵. In order to reach it, the first step would be to properly assess it, by taking into account all the actors involved and their standpoints, but also the way of stimulating their relations and interaction involving their self-organization, top-down but also bottom-up approaches³⁶.

There is a large history of the terms borrowing from one scientific field to other, the seminal contribution in this particular case of innovation ecosystem would be the evolutionary theory of economic change³⁷, implying innovation and its ecosystems even if not directly stated. It is centred on long-term economic development, policy orchestration and technological change as its main engine. It has however a strong business and market orientation.

Afterwards, there are similar intents of trying to draw the relations between the ecology of population organizations³⁸ and their environments. In principle and also in this study, the business article of James Moore from 1993³⁹ is quoted as the article where the term of innovation ecosystem was first used.

In opposition to its popularity, by some the term is assumed as a teleological fallacy⁴⁰, because of the supposed no aim of natural ecosystems and the innovation targeting by the innovation ecosystems (as the rule of distinguishing the innovation ecosystem from others). In a sense, both end up striving for a dynamic equilibrium maintenance or the long-term sustainability, i.e. the evolution and adaptation to change is both the mean and the purpose for them. Of course, it is difficult to make it distinguishable

³⁵ Kenneth Boulding, 'The Economics of the Coming Spaceship Earth (1966)' (*Future Forum on Environmental Quality in a Growing Economy*, 1996) <<https://www.panarchy.org/boulding/spaceship.1966.html>> accessed 9 November 2017.

³⁶ Jucevičius and Grumadaitė (n 34).

³⁷ Richard R Nelson and Sidney G Winter, *An Evolutionary Theory of Economic Change*, vol 93 (The Belknap Press of Harvard University Press 1982).

³⁸ Michael T Hannan and John Freeman, 'The Population Ecology of Organizations' (1977) 82 *American Journal of Sociology* 929.

³⁹ James F Moore, 'Predators and Prey: A New Ecology of Competition' (1993) 71 *Harvard Business Review* 75 <<http://blogs.law.harvard.edu/jim/files/2010/04/Predators-and-Prey.pdf>>.

⁴⁰ John Patrick Leary, *Keywords: The New Language of Capitalism* (Haymarket Books 2019).

if there is an assumption that the ultimate innovation goal is exclusively materialized through profit gains, i.e. implying market-driven business ecosystems.

The practically strictly business cases for the innovation or rather entrepreneurial ecosystems are presented starting from Moore⁴¹ and others⁴² broadly quoted in the field. It corresponds to the metamodern implication of ‘Ungleichzeitigkeit’⁴³ in terms of science. Even if already stated in the 60s the dimensions of the ‘knowledge triangle’, probably for the sake of a romantic vision of an entrepreneur or a company, if not econometric Occam’s razor and neoliberal conception of business centrality and ‘market invisible hand’ governance, the notion of Government and Academia are eagerly omitted from the equation. Even if revindicated in triple helix, this concept is left for the what is considered as predecessors⁴⁴ or local expression of the innovation systems⁴⁵, in forms of clusters, Science and Technology Parks (STP), science cities, technopolis and even National or Regional Innovation Systems (NIS or RIS).

‘Measuring the “progress” of a co-evolving ecology – where the ecosystem metaphor can be fully embraced – would be beyond current scientific capability.’⁴⁶ The question would be if leaving it apart due to what is considered scientific rigour is a correct option. ‘Even granted the impossibility of a perfect research design, we believe it is worthwhile to engage in various forms of academic inquiry over the important real-life

⁴¹ Ellen HM Moors, Arie Rip and JSC Wiskerke, ‘The Dynamics of Innovation: A Multi-Level Co-Evolutionary Perspective’ [2004] *Seeds of transition: essays on novelty production, niches and regimes in agriculture* 31 <<http://doc.utwente.nl/51062/>>.

⁴² Ron Adner, ‘Match Your Innovation Strategy to Your Innovation Ecosystem’ (2006) 84 *Harvard business review* 98.

⁴³ This term was introduced first by Ernst Bloch in 1930s referring to the different levels of development of thought can cohabit the same space time of civilization.

⁴⁴ Nataliya Smorodinskaya and others, ‘Innovation Ecosystems vs. Innovation Systems in Terms of Collaboration and Co-Creation of Value’ [2017] *Proceedings of the 50th Hawaii International Conference on System Sciences* (2017).

⁴⁵ Deog Seong Oh and others, ‘Innovation Ecosystems: A Critical Examination’ (2016) 54 *Technovation* 1.

⁴⁶ Oh and others (n 45).

phenomena.’⁴⁷ Especially, if we want to evocate the advanced levels of intelligent learning. ‘Value of qualitative process research for the study of dynamic phenomena like innovation ecosystems as it can provide rich understanding on the hows and whys of these processes’⁴⁸.

‘Eco’ prefix in many definitions of ecosystem relate exclusively to the interdependency among actors and the ‘co-evolution binding them together over time’⁴⁹. System would imply the specific set of components: actors, organizations, entities.

That is why in the latest discussions the usage of term ‘innovation ecosystem’, even if recognisably varied between business and economic field of studies, would be almost exclusively centred on the Industry dimension at most, in its business application including there: ‘business ecosystem, software ecosystem, industrial ecosystem, digital business ecosystem, entrepreneurship ecosystem, and knowledge ecosystem’⁵⁰⁵¹ or even innovative start-ups fostering environments⁵².

The difference with the system and ecosystem is assumed to be in the aim of interactive co-creation of value, typical only to the ecosystem. “Eco” would mean emphasizing the non-linear nature of innovation and the crucial role of collaboration in producing innovations to achieve sustainable development in non-linear environments.’⁵³

Nonetheless, some⁵⁴ consider that the innovation systems stem from institutional economics, while the ecosystems are complementary to this first meaning and are centred

⁴⁷ Paavo Ritala and Argyro Almpanopoulou, ‘In Defense of “Eco” in Innovation Ecosystem’ (2017) 60–61 *Technovation* 39.

⁴⁸ Ann Langley, ‘Strategies for Theorizing from Process Data’ (1999) 24 *The Academy of Management Review* 691 <<http://www.jstor.org/stable/259349?origin=crossref>>.

⁴⁹ Ritala and Almpanopoulou (n 47).

⁵⁰ Vaida Pilinkienė and Povilas Mačiulis, ‘Comparison of Different Ecosystem Analogies: The Main Economic Determinants and Levels of Impact’ (2014) 156 *Procedia - Social and Behavioral Sciences* 365.

⁵¹ Smorodinskaya and others (n 44).

⁵² Ben Spigel and Richard Harrison, ‘Toward a Process Theory of Entrepreneurial Ecosystems’ (2018) 12 *Strategic Entrepreneurship Journal* 151.

⁵³ Smorodinskaya and others (n 44) 5248.

⁵⁴ Jucevičius and Grumadaitė (n 34).

on the nature of successful innovation ecosystems and their capacity to produce synergies, being more than the mere sum of its parts.

Oh et al.⁵⁵ implies the pitfalls of the innovation ecosystem metaphor, calling it the ‘faulty analogy’. The distinguishing qualities of an ecosystem vs system seem to be:

- a more explicitly systemic nature (interconnections between actors are stressed)
- Digitalization or use of the ICT (Information and Communication Technology) and IT technologies.
- Open Innovation, where other than traditional actors are supposed to participate in the process.
- The mimetic quality or metaphoric value of the term, that appeals to the public, but can be not rigorous enough for scientific research
- A greater emphasis of specialised niches in industry value chains
- Greater importance of market forces as compared to the Government and NGOs (Non-governmental Organizations), implying a trend in privatization of innovation

Additionally, there are other quoted forms of ecosystems use⁵⁶ applied for city-based innovation ecosystems and districts, high-tech SMEs or start-ups centred ecosystems, incubators and accelerators are also promising the creation of an ecosystem, university-based ecosystems.

‘Eco’ would entail the nonlinear nature of innovation and stress the collaboration quid⁵⁷. Complex adaptive system (CAS)⁵⁸ would however also perform this role⁵⁹.

⁵⁵ Oh and others (n 45).

⁵⁶ Oh and others (n 45).

⁵⁷ Smorodinskaya and others (n 44).

⁵⁸ P Anderson, ‘Perspective: Complexity Theory and Organizational Science’ (1999) 10 Organization Science 216.

⁵⁹ Jucevičius and Grumadaitė (n 34).

Knowledge systems and information architectures compete and co-evolve in innovation systems⁶⁰.

In some cases, the innovation ecosystems can be seen as clusters (originated by Porter), generally one industry or company oriented local or regional agglomerations of companies and organizations from triple helix model. Global Value Chains (GVC) or Value Chain Management (VCM) would imply the specialization expansion of an innovation local or regional cluster to a global specialized network. In such an assumption for the notion of innovation ecosystem, digital platforms as enablers for cooperation in value creation can also be seen as one of them. The question would be that this kind of environments can provide for more than incremental innovation, not the disruptive, systemic one.

In 2011, the question of regulation of stability of equilibrium states of the innovation ecosystem was especially stressed by Jackson⁶¹, broadly quoted in the field. It brings forward the question of the tension between research and commercial economy, recuperating in a sense the Academia status. Neoliberal application as it is, it misses the ‘government’ side when not implied in the Academia sustainability. Of course, as already previously stated, the society question, or a commons approach is out of the reach of such conceptions.

⁶⁰ Elias G Carayannis and David FJ Campbell, ‘Open Innovation Diplomacy and a 21st Century Fractal Research, Education and Innovation (FREIE) Ecosystem: Building on the Quadruple and Quintuple Helix Innovation Concepts and the “Mode 3” Knowledge Production System’ (2011) 2 Journal of the Knowledge Economy 327.

⁶¹ Deborah J Jackson, ‘What Is an Innovation Ecosystem?’ [2011] Engineering Research Centers, National Science Foundation 1.

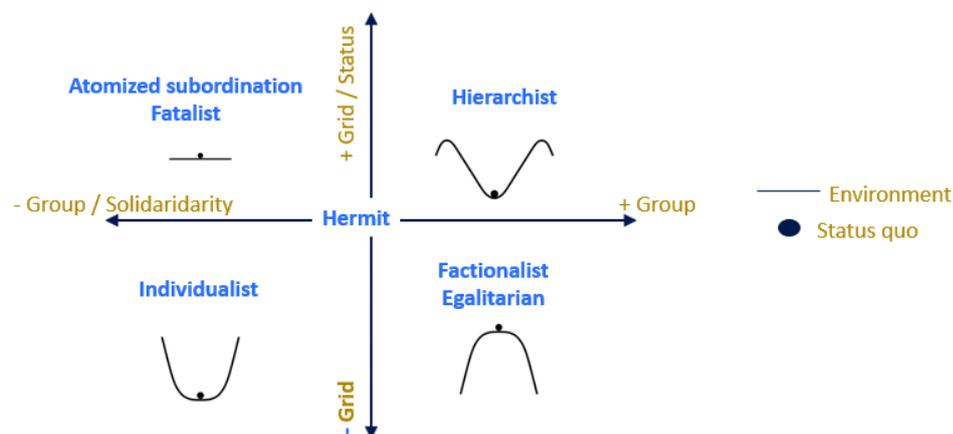
Grid-group culture theory applied for innovation ecosystems

There are many similar classifications regarding cultural theories proposed by different scientists, starting with Weber⁶² or Bernstein⁶³, however the grid-group cultural theory brings the simple, basic assumptions underlying the classification organization. Thus, it can also be easily applied to any walks of life.

Grid-group culture theory pioneer is Mary Douglas, however the first mention and understanding of the concept differs quite widely from its more developed and elaborated versions as stated even by herself⁶⁴, which are also the ones applied in this approach.

In this cultural theory, there are two axes which divide the world views, one is the group perception, or the solidarity grade between the members of the collective, the other is the grid, implying the structure level, i.e. perceived group pressure on the member, associated structural constraints (private or collective), status reliance. This gives four world views, with additional fifth one, called hermit, isolated one, free from the classifications.

Figure 3-3. Grid-group culture theory



⁶² Max Weber, *Economy and Society. An Outline of Interpretive Sociology*. (Guenther Roth and Claus Wittich eds, University of California Press 1978).

⁶³ Basil Bernstein, *Class, Codes and Control. Volume I Theoretical Studies Towards a Sociology of Language* (1971).

⁶⁴ Douglas (n 9).

Source: own elaboration, following Douglas⁶⁵ and Thompson⁶⁶.

The result is the split of the reality into four fields, signalling the typologies of world view and conception, i.e. ‘organising, perceiving and justifying social relations, usually called ‘ways of life’ or social solidarities’⁶⁷.

The high group and high grid will result in the Hierarchist, which perceives the reality as stable but having its inflection point(s), where it can go out of control by changing abruptly. This will be typical to the institutionalist approach, seeing the world through conflicting powers. The behaviour is controlled in reference to position in the social structure.

On the other end, there will be the Individualist, where everything depends on individual ability, the invisible hand of the market and conflict of interests’ point of view are typical for this field. The nature and environment are perceived as stable and self-regulating, with the ability to turn back to its original status, thus there is practically no need for worrying about the natural environment or social impact of individualists’ actions.

The low grid and high group levels will lead to the Egalitarian quadrant, typical to more enclave or interest communities, can be activists or open communities, for instance software programmers, but also terrorist groups. The networked internet world allows their propagation and greatly improves their impact on the overall socioecology. The nature is perceived as fragile. A commons perspective would find its way in this position.

And on the other side, there is a Fatalist position, typical to the individuals thoroughly determined by the social structure, without the power surpassing the one that allows one to survive, i.e. resigned fatalism of the masses with inequalities sometimes

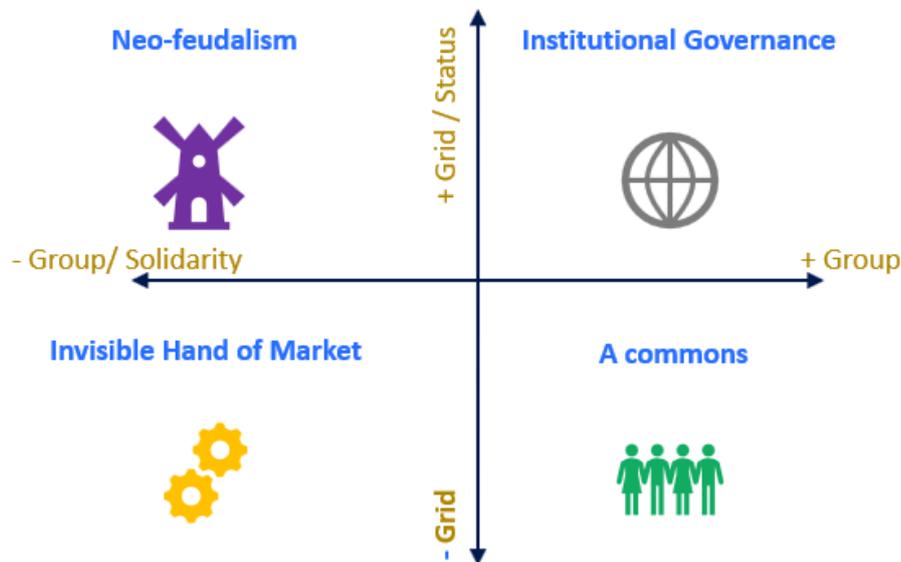
⁶⁵ Douglas (n 9).

⁶⁶ Michael Thompson and Marco Verweij, ‘The Case for Clumsiness’ (2004) 25 <https://ink.library.smu.edu.sg/cgi/viewcontent.cgi?article=1024&context=soss_research>.

⁶⁷ Thompson and Verweij (n 66).

expressed by the so-called neo-feudalism. The nature is perceived as capricious and following its own path.

Figure 3-4. Grid-group culture theory - governance



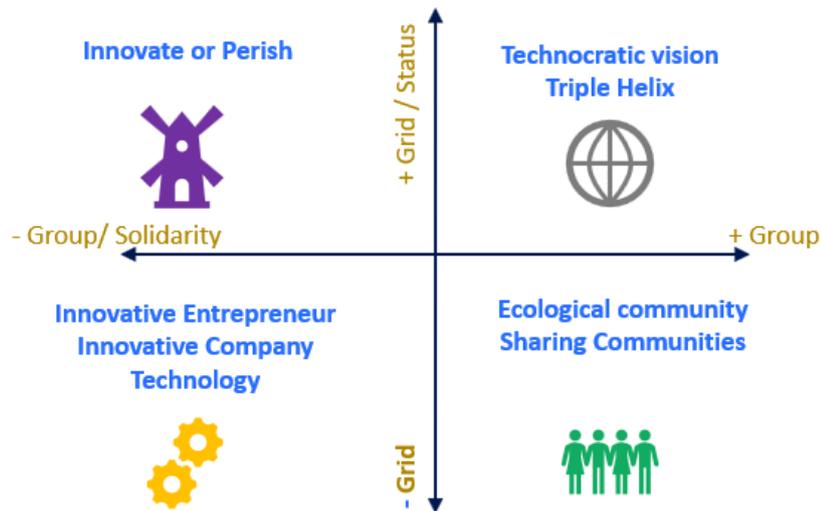
Source: own elaboration.

This model, even if represented in other similar approaches is both parsimonious and comprehensive. The idea is that each culture has all these positions represented and they compete against each other, at the same time however being complementary and the point is about striking the appropriate balance. None of the cultures even if dominant should avoid excluding the other ones. Some cultures are seen as more appropriate in the good times (individualist or fatalist), some other are recommended for the crisis, as their allow for the mobilisation and redistribution of resources when needed, being able to exercise the pressure in order to achieve the required goals⁶⁸.

If the main question of our times is the crisis of perception, the point of view of cultural theory, cultural platforms, gives a way for understanding the other. Following the grid-group culture theory the views on the innovation ecosystems can be distributed as follows.

⁶⁸ Please check also the blog entry (in Spanish): https://medium.com/@de_renata/concebir-realidades-complejas-9bb86cabf4d7 (Consulted on June, 8th 2020).

Figure 3-5. Grid-group culture theory – Innovation Ecosystems



Source: own elaboration.

The individualistic approach, which is prevailing in our current culture and civilization puts a strong accent on the role of innovative entrepreneur and company as well as technological progress.

The technocratic view, expressed by more institutional approach, for instance of the European Union institutions, put a strong accent on the Triple Helix and Smart Strategies expressed by the clusters.

Sharing and open communities, also including the ecological interest groups are the ones advocating for the change of the ways of life of the individuals and the communities, for instance simple life advocates for individual consumption decrease in order to address the ecological crises.

In this sense, the Innovation Helix approach, presented in this study can be seen as an overarching view of the different cultural positions as it includes especially the society and natural environment in the innovation ecosystem perspective⁶⁹, it brings an overarching sustainability-oriented vision.

⁶⁹ For the grid/group cultural theory perspective distribution on other subjects such us Future of Work, please see the blog entry (in Spanish): https://medium.com/@de_renata/dimensionando-soluciones-para-futuro-del-trabajo-38956a6b524c (Consulted on June, 8th 2020).

3.2. Work structure

Chapter 1

In the first chapter the notion of the innovation ecosystems is being introduced and its evolution is presented. Many times both network and ecosystem concepts are used as if they were the same, however, the network in principle involves no hierarchy and it lacks the dimensions of the environment interaction as defined by the author of the term ‘ecosystem’ Arthur Tansley in 1935⁷⁰, applied then to the botany. This term was adopted to the business world by James Moore in 1993⁷¹, however centred on the depredatory competition, which differs widely from the understanding of the original author of the term, where in order to thrive, the ecosystem actors need not only to compete but also to collaborate with each other on available resources, and in this way they are able to co-evolve, and to adapt jointly to external disruptions. It is vital from the society and civilization collective intelligence emergence and orchestration point of view, but also when transgressing the benefits only orientation of the economy, especially including there the natural environment consideration, leading to a ‘circular’ dynamics approach.

Systemness or the systemic character of the innovation patterns is exposed, making also explicit the limits of the present approach, both regarding the system disrupting and implicitly long-term character of innovations taken into account in the study and its, applied when necessary, limitation to the European Union outlook, as the developing countries specific perspective is out of the scope of the analysis. The European Union is seen as a region devoted not only toward innovation but also toward sustainability, in socioecological terms. This is an important convergence line of attitudes for this document.

⁷⁰ Stephen Trudgill, ‘Tansley, A.G. 1935: The Use and Abuse of Vegetational Concepts and Terms. Ecology 16, 284-307’ (2007) 31 Progress in Physical Geography 517.

⁷¹ Moore (n 39).

The theoretical framework provides for the understanding of actors in their different configurations of the evolution phases. It also explains the role of intermediary actors and together with the additional socioecological dimensions, their crucial role for the definition of the structural maturity of an innovation ecosystem. In this sense, multilevel perspective, brings an additional and matching global view of the sociotechnical landscape, in this case with reinforced consciousness implying natural environment. The pyramid of rules is to explain the way our understanding of the world shapes it and why the metamodern understanding is required in order to advance our civilization, helping to overcome sub-optimal lock-ins associated to ‘core rigidities’. Necessary collective intelligence loops of learning are explained, related to meta-innovation roles of the actors in the structural advancement of the ecosystem.

Chapter 2

The European Union considers that the innovation is one of the key aspects to strengthen in order to advance economy and socioecology of the region and the world. There are not only ‘explicit’ policies related to that but also the ‘tacit’ ones. The principal explicit policy is defined through the R&I (Research and Innovation) FPs (Framework Programmes). These FPs have the ability to shape the innovation ecosystems of the EU, thus their study is considered crucial from the conceptual point of view. For that purpose, the future Horizon Europe proposal was studied, through the lens of the innovation helix, conceptual model developed in the chapter 1, especially the actors’ perspective was considered relevant. The background for the study is given through the overview of the evolution of explicit policies of the EU in what relates to the innovation subject matter. These relates to the institutional framing achieved so far by the EU. Some of the presented institutions are multilateral in nature, however a further study of the hybrid intermediary organizations is out of scope of the research, due to its reach and complexity involved.

The international articulation with the rest of the world is also considered, mainly due to the global nature of challenges to be addressed. The process view is only drafted as due to the nature of the base material it is not so detailed to be included in a thorough way. It could be however an interesting line of future studies.

As the innovation subject matter is currently on its hype, the ‘good will’ declarations are checked against the budget assignments. To complete the picture, the

main tacit innovation policies and innovation funding institutions of the EU are also listed.

The aim of the interrogation of the innovation model, especially from its socioecological dimensions is centred on the directions provision for further sustainability orientation of the EU innovation strategy.

Chapter 3

The case study applying the innovation helix and especially actors' dimensions perspective is applied in two subsequent case studies regarding the innovation in the banking and monetary sector, however the last aspect is more developed in the second research.

The interest in this sector is based on the author' extensive experience working for the sector in different countries, mainly from the EU but also from other countries as Russia, regarding the financial institutions efficiency optimization. The experience is based on the point of view of IT systems which nowadays represent the banks functioning and real knowledge of the overall operational ways of the banks, many times lacking in the current entities due to the huge and many times fragmented legacy systems, with outsourced and thus also lost, in-depth knowledge. Needless to say, that banking sector is especially relevant for today's mainly capitalist economy as it is dealing with the money and capital, which is taking the prevalence over other traditional means of production such as labour and land. In this part the money role and characteristics are described in order to provide the base for further study. The question of decoupling of value versus its monetary expression is also raised, as previously stated. In this sense, the money supply is also relevant as it depicts the relation of the money quantity in different, in principle real economy related circles.

The evolution of policy and institutional framing of the banking sector in the EU is presented. Even if economic arena is the best integrated part of the EU, the banking and monetary Union still has many steps to be done, also the relevant parts related to fiscal policies. The imperfect integration is a ground for economic disequilibria, i.e. asymmetric shocks, frictions, distorted competence, tax evasion or corruption. The banking sector and its environment pressures and challenges are studied for the 'Industry'

side. Even if the sector is still considered as one of the more conservative, there is also a space for Fintechs, as well as new approach for cryptocurrencies, or blockchain.

Several scientific theories about the new approaches to banking models and dynamics, especially for money issuance are presented on the Academia side. Impact of the banking sector, especially due to its endemic weakness and proneness for crisis deepening if not directly generation, for the society and natural environment dimensions. This calls for the society attention on the banking sector functioning, which even if not easy to approach is more than required.

Chapter 4

In the last article/chapter the previous research outcomes are taken into account, to reinforce there the competitiveness and sustainability approaches, amplifying the question of money issuance from different actors' perspective and 'green transition' readiness of the banks. It introduces the metamodern perspective in what respects the collective intelligence third order learning loop application, i.e. changing the way of approaching the sector innovation and especially reinforcing the 'dare to know' dimension of the society.

It is allowed by the application and transgression of the proposed model of innovation helix in the structural innovation ecosystems maturity assessment. The last one, i.e. transgression is learned through a different approach to knowledge and its role in structuring the understanding of current reality as well as actionable responses. As in the rest of the study, the super-hybridity is applied, allowing for the model building based on the different converging, mainly digital, sources of information. The grid-group culture theory⁷² makes it more explicit and structured for insight.

The actors' judgment of the fields opportunities and challenges can stimulate a proper and comprehensive response, in terms of 'tactic and strategic priorities, regarding attention, action and resources allocation'. Due to its character this research is not exclusively confined to the European Union, as here the global geopolitics dynamics play an important role. European Union is only one of the relevant actors, but the US policy is

⁷² Weber (n 62).

so far the main protagonist on the stage. Thus, the global banking and monetary architecture overview is drafted, laying the ground for the following brief picture of the geopolitics of the fiat currencies. It needs to be stated that only the most important transnational organizations are presented, the detail of the intermediary organizations could be an interesting line of future studies, staying out of the scope of the current document.

In this sense, the international banking authorities are revised, providing for the external playing field determination. Traditional banking sector innovation standpoint is also revisited. Apart from fintechs, blockchain or digital currencies like Bitcoin, the private banks currency issuance proposals are also taken into account.

Academia part approaches the views on the ‘operational realities’ theories, with MMT and positive money.

Society part is also revisited with its approach toward inequalities associated to the capital dynamics but also bottom-up currencies and metamodern perspective on the sociotechnical landscape.

Green transition of the banks and natural environment currencies proposals complement the picture.

The developing countries perspective remains out of the scope of the document, however due to the metamodern ‘Ungleichzeitigkeit’⁷³ of the current societies, many of the views can implicitly include their reality and dynamics.

Metamodern perspective gives a structural base for the understanding and interoperability of the knowledge and action. As the banking sector is understood as the infrastructure for the economy, its operating system role, makes it difficult for questioning, corresponding in this way to a metamodern ‘structure of feelings’, hopefully enriched by this study, allowing for the ‘window of opportunity’ for the innovations to come.

⁷³ Ernst Bloch, *A Philosophy of the Future* (Herder and Herder 1970).

4. CHAPTER 1: INNOVATION ECOSYSTEMS IN THE EUROPEAN UNION – TOWARD A THEORETICAL FRAMEWORK FOR THEIR STRUCTURAL ADVANCEMENT ASSESSMENT⁷⁴

4.1. INTRODUCTION

It is a challenging subject to describe in a comprehensive manner the innovation ecosystems and the way they function. The awareness that a knowledge-based⁷⁵ or information⁷⁶ society functions according to different sets of dynamics than an industrial society focused mainly on manufacturing of tangible goods⁷⁷ is increasingly more important. New knowledge is destabilizing existing system elements and dynamics (rather stable in industrial economy) very rapidly making them evolve.

In order to describe this dynamic, it is necessary to define what is the meaning of a broad innovation ecosystem⁷⁸. In comparison to innovation system approach the innovation ecosystem line of study implies its more organic and evolving structure, depending on the conditions of each of its dimensions. Ecosystem is ‘an accommodation to the dilemma of reconciling social and biological facts in understanding of our

⁷⁴ This chapter was published together with Sara González Fernández Sara and Juan Mascareñas Pérez-Iñigo as an article in the Croatian Yearbook of European Law and Policy Vol. 14 [2018]. ISSN 1845-5662.

⁷⁵ Term popularized by Peter Drucker in his book “The age of discontinuity” from 1969.

⁷⁶ Term popularized by Machlup (n 22).

⁷⁷ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17) 18.

⁷⁸ Jackson (n 61).

species'⁷⁹. It also entails the perspective of (natural) environment⁸⁰ as something not necessarily always considered in the economic field. It challenges, as well, the perspective of the system openness shifting it to a closed one, with the need of circular approach⁸¹.

There is a large history on the innovation term use, starting with Schumpeter views from the beginning of the past century:

*Innovation as a new combination of productive elements is its industrial but also commercial application—a new product, process or technique of production; a new market or sources of materials or components supply; a new form of financial organization, reorganisation of an industry or commercial business.*⁸²

*Innovation is a process by which value is created for customers through public and private organizations that transform new knowledge and technologies into profitable products and services for national and global markets. A high rate of innovation in turn contributes to more intellectual capital, market creation, economic growth, job creation, wealth, and higher standard of living.*⁸³

What is innovation? There is no one single definition. But innovation as described in the Innovation Union plan broadly means change that speeds up and improves the way we conceive, develop, produce and access new products, industrial processes and

⁷⁹ Gary E Machlis, Jo Ellen Force and William R Burch Jr, 'The Human Ecosystem Part I: The Human Ecosystem as an Organizing Concept in Ecosystem Management' (1997) 10:4 Society & Natural Resources 347, 5.

⁸⁰ The relevance of the natural environment can be confirmed by the actions taking place related to Paris Agreement, for instance European Commission, 'The Road from Paris: Assessing the Implications of the Paris Agreement and Accompanying the Proposal for a Council Decision on the Signing, on Behalf of the European Union, of the Paris Agreement Adopted under the United Nations Framework Convention on Climate Change' <<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0110&from=EN>>.

⁸¹ Boulding (n 35).

⁸² Schumpeter (n 12) 184, 298, 479.

⁸³ Egils Milbergs, 'Innovation Vital Signs. Framework Report Update.' (2007) 5 <http://innovate.typepad.com/innovation/files/innovation_vital_signs_framework_report_v.2.8.pdf>.

services. Changes that create more jobs, improve people's lives and build greener and better societies.⁸⁴

Innovation is all the kind of change (not only technological) based on the knowledge (not only scientific) that generates value (not only economic one). (COTEC Foundation⁸⁵).

As it can be seen, innovation definitions start with the focus on the emergence of the innovation, increasingly they pay attention to societal functions fulfilment or environmental impacts. Along the time span, innovation is also starting to include less tangible, non-technical concepts for its output and in some cases as the last ones, its value and impact is not only limited to the economy but embraces society as well. Innovation is accelerating because of 'new information/digital applications, ubiquitous communication capabilities, and the international mobility of talent allowing the spurring of the collaborative advantage'⁸⁶.

The systemness, meant as the systemic character of innovation patterns⁸⁷ is the milestone of the approach that allows for the innovation assessment and boosting that is the objective of European Union⁸⁸. To define a system⁸⁹, it must be dynamic (constantly changing) and evolving (having emergent properties)⁹⁰, it is more than the system parts

⁸⁴ European Commission, 'Turning Europe into a True Innovation Union' 14 1 <http://europa.eu/rapid/press-release_MEMO-10-473_en.htm?locale=en>.

⁸⁵ <http://cotec.es/quienes-somos/presentacion/> (Consulted on January 10th, 2018).

⁸⁶ Milbergs (n 83) 2.

⁸⁷ Loet Leydesdorff, 'The Triple Helix , Quadruple Helix , ..., and an N -Tuple of Helices : Explanatory Models for Analyzing the Knowledge-Based Economy?' [2010] Available At: www.leydersdorff.net/Ntuple <www.leydersdorff.net/ntuple>; Jeremy Lent, *The Patterning Instinct. A Cultural History of Humanity's Search for Meaning*. (Prometheus Books 2017).

⁸⁸ European Commission, '2016 European Innovation Scoreboard' (2016) <<http://www.proinno-europe.eu/page/european-innovation-scoreboard-2009>>; European Commission, *Innovating for Sustainable Growth: A Bioeconomy for Europe* (2012).

⁸⁹ The father of the system theory is considered to be Ludwig Von Bertalanffy, *General System Theory* (George Braziller, Inc 1968).

⁹⁰ <https://medium.com/disruptive-design/tools-for-systems-thinkers-getting-into-systems-dynamics-and-bathtubs-1f961f7c4073>

due to the created synergies. It must be connected to elements, actors, agencies, nodes, stocks or ‘parts,’ and have a boundary, constraints, conditions and principles according to which system is working. Systems are defined by their interrelationships and their functionality or potential. In our complex⁹¹ world, system theory and thinking are crucial to make us able to understand the world’s functioning, also from the cognitive perspective⁹². ‘Culture shapes values and values shape history’⁹³. Therefore, it is so important to build an interpretative framework to provide some understanding into the complexity in the ‘world transfixed by the dazzle of technology’.

Hereby, it is to be presented the perspective of innovations that have the possibility of becoming ecosystem innovation, meaning that this kind of innovation implies the change of the system itself in the dynamic way. This can be traced back to Schumpeter (mainly through the ‘creative destruction’ concept) but also to Kondratieff with more than 50 years cycles based on the development of a specific innovative technology⁹⁴.

There are several challenges facing the bioeconomies, global one in general and the ones of the European Union in particular, i.e. global warming, inequality of the society, slow growth⁹⁵. These are the engines for new innovation fields of our times in the European Union. The free movement of knowledge, technology and researchers, known as the fifth freedom (after goods, people, services and capital) is in this sense the

⁹¹ Complex and not only complicated. Complicated is when the system can be described by its elements and their relation completely, in a complex system due to nonlinear relations and to feedback loops it can never be precisely described.

⁹² Draper LJ Kauffman, *Systems One : An Introduction to Systems Thinking* (Inc Future Systems ed, TLH Associates 1980); Lent (n 87).

⁹³ Lent (n 87) 27.

⁹⁴ Nikolai D Kondratieff, ‘The Long Waves in Economic Life’ (1935) XVII *The Review of Economic Statistics* 105; Carlota Pérez, ‘Las Revoluciones Tecnológicas Como Grandes Oleadas de Desarrollo Sucesivas - Primera Parte’ in Siglo XXI (ed), *Revoluciones Tecnológicas y Capital Financiero: la dinámica de las grandes burbujas financieras y las épocas de bonanza* (2004).

⁹⁵ European Commission, *The Knowledge Future : Intelligent Policy Choices for Europe 2050* (2015) <https://ec.europa.eu/research/pdf/publications/knowledge_future_2050.pdf>; European Commission, ‘A Journey into 2050 Visions and Policy Challenges’ (2016) <<https://ec.europa.eu/futurium/en/content/digital-futures-final-report-journey-2050-visions-and-policy-challenges>>.

EU potential field of improvement⁹⁶. European Union is being taken here as the location of a specific development stage of the innovation ecosystems, related to its general progress level, institutional logics involved and the common specificity of culture and its approach to innovation and change. For instance, for the developing countries, probably some assumptions would not be considered as crucial (like the inequality in China, process management culture, etc.) or other assumption would need to be taken into account (ownership structure, for instance)⁹⁷.

The objective of this document is to provide a comprehensive framework⁹⁸ for the description and assessment of the structural advancement related to maturity of an innovation ecosystem⁹⁹, including actors and processes. It is very important as in this way a more dynamic perspective can be reached, allowing for the distinction and highlighting of aspects naturally overshadowed or even overseen in a more static approach of standard innovation studies. At each level other actors are supposed to have a slightly different role, be more active and important, they also relate to each other in a different manner. The closer study of the intermediary actors¹⁰⁰ emerging in the process (together with the advancing innovation propagation) is another focus point. Their emergence and density are foreseen as indications of the innovative ecosystem advancement. From the process perspective¹⁰¹, the diffusion and use of innovation in

⁹⁶ Sara González Fernández and Juan Mascareñas Pérez-Iñigo, 'Una Estrategia de I + D + i Para La Unión Europea : Hacia La Quinta Libertad Básica' (2012) *Junio Ciencias de la administración* 25.

⁹⁷ Yuzhuo Cai, 'Implementing the Triple Helix Model in a Non-Western Context: An Institutional Logics Perspective' (2014) 1 *Triple Helix* 1.

⁹⁸ The framework's role is allowing for appropriately structured data collection and the following analysis of the fundamental indicators of innovation ecosystem advancement and performance.

⁹⁹ Geels, 'Processes and Patterns in Transitions and System Innovations: Refining the Co-Evolutionary Multi-Level Perspective' (n 10); Yuzhuo Cai, 'What Contextual Factors Shape "Innovation in Innovation"? Integration of Insights from the Triple Helix and the Institutional Logics Perspective' [2015] *Social Science Information* 0539018415583527
<<http://ssi.sagepub.com.proxy.library.uu.nl/content/early/2015/05/15/0539018415583527.full>>.

¹⁰⁰ Howard Partners, 'Study of the Role of Intermediaries in Support of Innovation' (2007).

¹⁰¹ Geels, 'Processes and Patterns in Transitions and System Innovations: Refining the Co-Evolutionary Multi-Level Perspective' (n 10); Juan Mejía-Trejo and José Sánchez-Gutiérrez, 'The Determinant Factors of Innovation Related with Customer Knowledge Management' (2014) 21 *Revista Universitaria Europea* 133.

static studies understood implicitly, need to be put forward. The feedback loops of learning and adopting innovation have a logical and hierarchical relationship to each other¹⁰². Thus, there is also a requirement to include the users/participants of the innovation in the equation¹⁰³.

Hopefully, the framework proposed in the following pages will amplify the vision of the contemporary innovation ecosystems work and organise the understanding of the way their measurement can evolve, deepening the dynamic perspective.

4.2. ACTORS DEFINITION - TRIPLE HELIX THEORY

For the purpose of the innovation ecosystem definition, the Triple Helix is to be applied as the most comprehensive framework for main actors' definition. It was defined first by Lowe, borrowing from the language of DNA cell biology¹⁰⁴, furtherly developed by Etzkowitz and Leydesdorff¹⁰⁵, however the idea of Triple Helix mechanism is drawn back even to ancient Mesopotamia as the irrigation system appliance¹⁰⁶. Increasingly its concepts are being applied in the policies being planned in the European Union and the way they are assessed¹⁰⁷.

The origins of Triple Helix are deeply rooted and can also traced back to the notion of 'triangle' defined by Sabato¹⁰⁸ of government, industry (productive structure) and

¹⁰² Mulgan (n 26).

¹⁰³ Frank W Geels, 'From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory' (2004) 33 Research Policy 897.

¹⁰⁴ Lowe (n 18).

¹⁰⁵ Etzkowitz, 'The Triple Helix - -University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development' (n 6).

¹⁰⁶ Etzkowitz, *The Triple Helix: University-Industry-Government Innovation in Action* (n 17).

¹⁰⁷ European Commission, 'European Innovation Scoreboard 2017' (2017) <https://www.rvo.nl/sites/default/files/2017/06/European_Innovation_Scoreboard_2017.pdf>.

¹⁰⁸ He is explicitly not claiming the originality of the concept but he is building on this structure the flow conceptualization of the construct Sabato and Botana (n 7).

science (science and technological infrastructure) interaction node where the technology and science are seen as the catalysts for political, economic and social change.

The triple helix, like the double helix of cell DNA, has both structural and functional attributes ¹⁰⁹. The innovation is destabilizing, and it is recombinant to all the elements. The triple helix metaphor also implies the spinning, evolving structure of the elements as the spiral of the helix intertwine ¹¹⁰.

Following the development of the Triple into Quintuple Helix theory ¹¹¹, one of the proposals for this research elaboration is an attempt of a slightly different arrangement for the elements leaving it with Triple Helix reframed with University/Academia, Government, Enterprise/Industry and additional dimensions to consider: Society and Environment ¹¹². In the sense of system feedback loops, just as intracellular feedback modulates DNA function, so the need to balance the elements in order to grow the appropriate structures of the society allowing the balanced coexistence with the (natural) environment.

Innovation Helix Elements and their basic role

Hereinafter, the different elements of the helix are described, drawing also their basic functions which change according to the distinct levels of configuration. ‘The triple

¹⁰⁹ Lowe (n 18).

¹¹⁰ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

¹¹¹ Elias G Carayannis and David FJ Campbell, ‘Triple Helix, Quadruple Helix and Quintuple Helix and How Do Knowledge, Innovation and the Environment Relate To Each Other?’ (2010) 1 *International Journal of Social Ecology and Sustainable Development* 41; Elias G Carayannis, Thorsten D Barth and David FJ Campbell, ‘The Quintuple Helix Innovation Model: Global Warming as a Challenge and Driver for Innovation’ (2012) 1 *Journal of Innovation and Entrepreneurship* 2 <<http://www.innovation-entrepreneurship.com/content/1/1/2>>; Elias G Carayannis and David FJ Campbell, ‘Developed Democracies versus Emerging Autocracies: Arts, Democracy, and Innovation in Quadruple Helix Innovation Systems’ (2014) 3 *Journal of Innovation and Entrepreneurship* 12 <<http://innovation-entrepreneurship.springeropen.com/articles/10.1186/s13731-014-0012-2>>.

¹¹² ‘Institutions are considered as forming the structural underpinning for the helix dimensions. They are considered as playing a role in dynamic innovation developments, rather than explaining inertia and stability’ by Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103)., 3.

helix is a platform for ‘institution formation’, the creation of new organizational formats to promote innovation, as a synthesis of elements of the triple helix’¹¹³.

In some way the three helixes are corresponding to knowledge, production and regulatory functions for civil society within a particular, definite location.

The Government is the ‘source of contractual relations that guarantee stable interactions and exchange’¹¹⁴, more specifically its role encompasses the set of institutional roles that through the legislation and administration formulates the policies and direct the resources to the other vertices¹¹⁵. Government is ‘the ultimate guarantor of societal rules of the game’¹¹⁶. Especially, in the laissez- faire model (described below) ‘the role of government is expected to be limited to clear cases of so-called ‘market failure’, when economic impetuses by themselves do not call an activity into existence’¹¹⁷.

Besides being important in macroeconomic conditions settings such as market access policies, regulations, standards, fiscal and monetary environment, taxes, interest rates, public policy conditions for R&D funding policy and intellectual property. Government is also responsible for infrastructure conditions especially relevant for the innovation such as IT infrastructure, or quality of physical infrastructure¹¹⁸.

Industry is the primary base of productive activities, it provides good and services for the society. Back in 1970-ies¹¹⁹ but also still valid in the public imaginary of today the main responsibility of the industry is to assure profits. In order to perform this role Industry ‘needs public infrastructure - not only physical infrastructure like highways and

¹¹³ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17) 31.

¹¹⁴ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17) 22.

¹¹⁵ Sábato and Botana (n 7).

¹¹⁶ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

¹¹⁷ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17) 29.

¹¹⁸ Milbergs (n 83) 11.

¹¹⁹ Following Milton Friedman or Simons.

airports, but also social infrastructure like good schools, safe neighborhoods, and effective legal systems¹²⁰.

University and other knowledge managing institutions called together as Academia are performing the role of the education (preservation and transmission of knowledge) and research (basic and applied), but also cultural memory. The socialization of youth and dissemination of knowledge are important core functions.

The Society and (natural) Environment roles are not considered in the basic stages of innovation ecosystem development, mainly due to the increased complexity of the actual world arrangement their role is understood as the arena for the actions of other helixes.

Innovation Helix Stages of Configuration

Triple Helix theory counts with 3 levels of configuration, the first two of them being rather introductory arrangements for the real dynamics of innovation helix¹²¹.

The very first stage of configuration is called statist model, where nation state, represented as Government, embraces Academia and Industry and leads the relations between them. This situation was represented by the ex-communist states modus operandi and, according to some, probably in all the countries all over the world before, during and immediately the so called, national emergencies, mainly after the World War II¹²². The horizontal collaboration between the academia and the industry at this very first stage can mainly be done through the human resources transference between these two vertices¹²³.

¹²⁰ <https://www.weforum.org/agenda/2013/11/what-role-should-businesses-play-in-society/> (Consulted on December 10th, 2018)

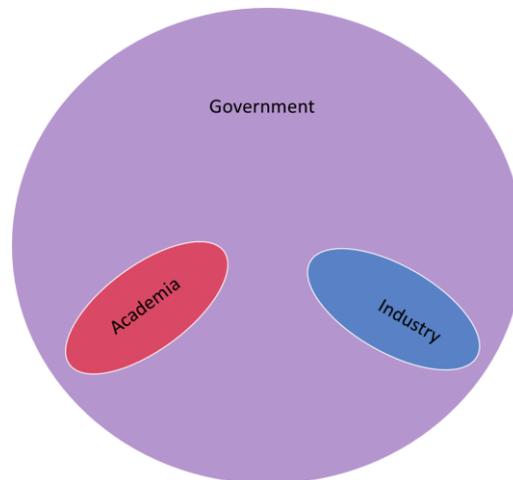
¹²¹ Henry Etzkowitz and Loet Leydesdorff, 'The Dynamics of Innovation : From National Systems and "Mode 2" to a Triple Helix of University – Industry – Government Relations' (2000) 29 Research Policy 109.

¹²² Lowe (n 18); Sábato and Botana (n 7); Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

¹²³ Sábato and Botana (n 7).

Specialized basic and applied research institutes, together with sectoral units for particular industries are characteristic for this model ¹²⁴.

Figure 4-1: The Academia-Government-Industry arrangement – statist model.



Source: Based on ¹²⁵.

The former Soviet Union, France, and many Latin American countries could, historically and partially at least, exemplify the statist model of societal organization ¹²⁶. ‘Bureaucratic coordination concentrates initiative at the top and tends to suppress ideas that arise from below’ ¹²⁷, thus this model is functioning sub-optimally for the requirements of the knowledge society.

The second stage of configuration is called *laissez-faire* and it is represented by relatively independent institutional spheres having strong borders dividing them and highly circumscribed relations among the spheres ¹²⁸. The actors interact only modestly across strong boundaries. The driving force in this configuration is the Industry as opposed to the Government in the statist model ¹²⁹. Collaboration is forbidden at the very

¹²⁴ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17) 27.

¹²⁵ Etzkowitz and Leydesdorff (n 121).

¹²⁶ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

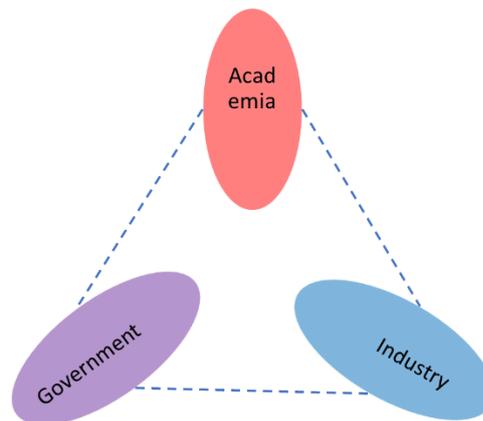
¹²⁷ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17) 15.

¹²⁸ Etzkowitz and Leydesdorff (n 121) 111.

¹²⁹ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

first stage to avoid the cartel practices in the Industry, afterwards however strategic alliances are being allowed and also the competition as a mix between rivalry and cooperation and collaboration.

Figure 4-2: The Academia-Government-Industry arrangement – *laisse-faire* model.



Source: Based on ¹³⁰.

It was perceived that such was the situation in the USA and also in Sweden ¹³¹. However, as the Government financed the public Universities, the allocation of such financing was always corresponding to its requirements as translating the desires for knowledge of the society, even with the underpinning of ‘intellectual freedom’ for basic research ¹³². Furthermore, the strong financing impulse for innovation provided by military investment of the government in the US related especially to the World War II, originating among others the Silicon Valley, where start-ups are initially offshoots of military programmes, is an evidence of the existence of such a regime more in the public imaginary as in the reality ¹³³.

¹³⁰ Etzkowitz and Leydesdorff (n 121).

¹³¹ Cai (n 99); Henry Etzkowitz, ‘The Triple Helix of University - Industry - Government The Triple: Implications for Policy and Evaluation’ (2002) 11 Working Paper 1 <http://www.sister.nu/pdf/wp_11.pdf>.

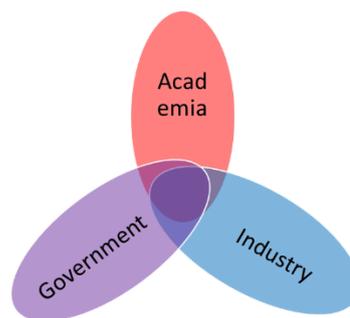
¹³² Lowe (n 18).

¹³³ Sábato and Botana (n 7).

The actors at this stage are supposed to communicate through intermediary organizations in order to maintain the purity of institutional spheres.

The third stage of configuration is called as triple helix balanced model, it is characterising the knowledge society as evolved version of the industrial one. It generates ‘a knowledge infrastructure in terms of overlapping’¹³⁴ between the three agencies, as shown in the figure below. It is to be thoroughly described in the next section.

Figure 4-3: The Academia-Government-Industry arrangement – Triple Helix model.



Source: Based on ¹³⁵.

Balanced Innovation Helix and its levels of configuration

The Triple Helix theory can be extended algorithmically into the n-tuple helices ¹³⁶ to include civil society as a strand ¹³⁷ and the glocal (global and local)¹³⁸ dimension of

¹³⁴ Etzkowitz and Leydesdorff (n 121) 111.

¹³⁵ Etzkowitz and Leydesdorff (n 121).

¹³⁶ Leydesdorff (n 87); Han Woo Park, ‘Transition from the Triple Helix to N-Tuple Helices? An Interview with Elias G. Carayannis and David F. J. Campbell’ (2014) 99 *Scientometrics* 203.

¹³⁷ Elias G Carayannis and David FJ Campbell, *Mode 3 Knowledge Production in Quadruple Helix Innovation Systems* (2012) <<http://link.springer.com/10.1007/978-1-4614-2062-0>>; Carayannis and Campbell, ‘Developed Democracies versus Emerging Autocracies: Arts, Democracy, and Innovation in Quadruple Helix Innovation Systems’ (n 111).

¹³⁸ Glocal dimension is not to be confused with the glocalization concept as mainly the marketing tool when the international products are adopted to the local culture particularities, where they are sold.

the helix. According to Etzkowitz ¹³⁹, effective interaction indeed requires the participation of the civil society, however, it is considered as one type of institutional logic supporting the ideal Triple Helix model rather than as an additional helix. We support this assumption, because the three strands are already the part of the society that nonetheless together with the environment consideration need to be asserted in the innovation helix arrangement of the contemporary world in general and in the European Union in particular.

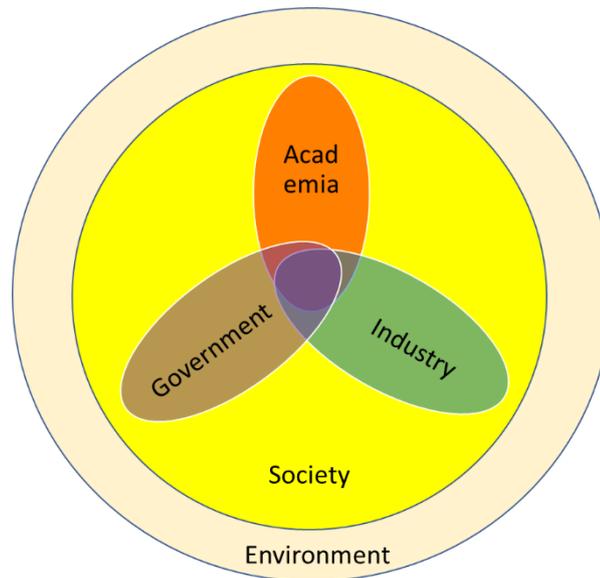
Local dimension is reclaiming the central position of cities and regions (even more neighbourhood-level micro-clusters) in the process of innovation and entrepreneurship, stating them as central organising unit for these processes whereas mainstream economic theory places them mainly at the scale of the firm, entrepreneur or national economy.

Creativity, innovation and entrepreneurship are considered as social processes that involve diversity of groups of people and assets and build off one another historically, they do not simply take place in cities or regions but in fact require them. In the cities and regions, scope and diversity trump scale and specialization of industrial societies ¹⁴⁰. These outcomes lead as to the figure shown below.

¹³⁹ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

¹⁴⁰ Richard Florida, Patrick Adler and Charlotta Mellander, 'The City as Innovation Machine' (2017) 51 *Regional Studies* 86.

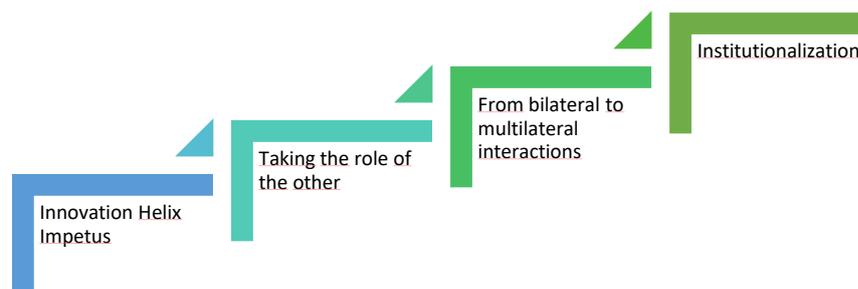
Figure 4-4: Triple Helix reframed.



Source: Own elaboration based on Triple/Quintuple Helix model.

There are several phases of the development of Innovation Helix balanced model distinguished, modifying them accordingly ¹⁴¹: ‘Innovation Helix impetus’, ‘taking the role of the other’ and ‘from bilateral to multilateral interactions’ and also the ‘institutionalization of the Innovation Helix’ ¹⁴².

Figure 4-5: Levels of configuration of Balanced Innovation Helix



Source: Own elaboration following ¹⁴³.

¹⁴¹ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

¹⁴² Cai (n 99).

¹⁴³ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17); Cai (n 99).

The Innovation Helix impetus stage takes place as Academia, Industry, and Government enter into a reciprocal relationship with each other, in various combinations and in which each attempt to enhance the performance of the other but from the perspective of the traditional roles of each of the strands ¹⁴⁴. These activities are mainly based and aiming at the regional level, within industrial clusters development dynamics. However, at this stage economy base is shifted toward the intellectual capital, knowledge capitalization and Academia becomes the driving force of progress. We argue that the society and environment are increasingly becoming an important point of consideration at this stage, because only the societal involvement and environment consideration can lead to the support of this dynamic giving them the necessary force.

‘Taking the role of the other’ stage ¹⁴⁵ means internal transformation of the helix strands in which, in addition to performing their traditional tasks, they assume additional ones to improve the innovation process functioning.

Academia starts to involve in Industry activities, mainly by patents, it is also becoming the source of venture capital, involving itself in incubating activity and spin-off companies’ creation apart from its traditional role of education and research, these last ones can also be modified for the inclusion of new programmes supporting this new focus.

In the Industry sector, companies start to give training at higher level and found their own laboratories or research centres, even “universities”.

Government or Governmental Agencies give support mainly through Venture Capital meaning capital for the innovative start-ups.

Society is becoming involved in the processes of industry, through the prosumers roles. Government starts to include deliberation and citizen participation axes in their decisioning processes and Academia involves the local and cognitive knowledge of citizens into their research.

Environment considerations at this stage should already be at the base of all agents’ actions.

¹⁴⁴ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17) 21.

¹⁴⁵ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17) 22.

A meta-innovation system is developed¹⁴⁶ when the helices interactions evolve from bilateral to tri- or even multilateral. An intersection of communications, networks, hubs and organizations among the helices is supposed to appear in this model. The multilateral interactions¹⁴⁷ suppose more interoperability inside the helix configuration, the cooperation evolves so that one sphere actions affect the other sphere, however they are maintaining their core identity. Here is where the collective intelligence¹⁴⁸ starts to take roots in the innovation ecosystem.

The interactions also result in the proliferation of hybrid, intermediary entities, such as incubators/accelerators, joint research centres, science or technology parks¹⁴⁹.

University is assuming entrepreneurial role, training not only individuals but also organizations in incubators, developing new products, entrepreneurship is fully integrated in the teaching and research functions. Consultation to the industry becomes included into the role of the university and furthermore liaison offices are created to identify appropriate industrial partners and allow smooth relationships functioning. Also, a third-party intermediary organization are being hired up to enable intellectual property transfer. Participative science through the mass data gathering and deliberative processes for ‘wicked’ questions is starting to be considered as one of the pillars of scientific proceedings.

¹⁴⁶ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

¹⁴⁷ “An interaction of two parties may become stuck, either in hyper-agreement or in excessive conflict, resulting in divorce. A third factor allows a dispassionate element to be introduced into the relationship, mediating, and potentially reducing, the tendency to overidentification on the one hand and escalation of divisiveness on the other” by Georg Simmel, *The Sociology* (The Free Press 1950).

¹⁴⁸ The term of collective intelligence by the basic meaning giving more wisdom to the team instead of the individual can be traced back even to Aristotle. However, the conception of ‘noosphere’ as the world brain is attributed to Vladimir Vernadsky and Teilhard George S Levit, ‘The Biosphere and Noosphere Theories of V. I. Vernadsky and P. Teilhard de Chardin: A Methodological Essay’ (2000) 50 Archives Internationales d’histoire des Sciences 160..

¹⁴⁹ Cai (n 99) 10.

“Learning by borrowing”¹⁵⁰ is also associated with this stage of the process, importing and adapting organizational models from abroad, as well as independent inventions. An example can be the import of the hybrid, intermediary organizations.

Following Cai ¹⁵¹ and process approach developed below we assume that there is another step in the Helix model development involving the institutionalization of the Innovation Helix concept and its associated activities, when they have become ‘a set of routines or practices that are reproduced over time and tend to serve as a cognitive framework structuring the actions of key actors’. The formal structures need the support of the organic development of values and attitudes that allow for the implementation of designed processes and relations ¹⁵². From the Multilevel Perspective this would mean the transfer from regime to landscape level through feedback loops and democratic process involvement¹⁵³.

4.3. MULTIVEL INNOVATION PROCESS PERSPECTIVE

For the innovation process depiction purpose, the Multilevel Perspective is to be applied, inspired by Rip and Kemp ¹⁵⁴ and further developed by Frank Geels ¹⁵⁵, with its three levels: niche, socio-technical regime and landscape.

This typology is based on the rules which guide actors by providing stability and directing perceptions and actions. Because rules tend to be reproduced, they were

¹⁵⁰ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17) 21.

¹⁵¹ Cai (n 99) 13.

¹⁵² Sábato and Botana (n 7).

¹⁵³ “There also enters the three level of rules mechanism, meaning regulative, normative and also cognitive ones” by Cai (n 99).

¹⁵⁴ Arie Rip and René Kemp, ‘Technological Change’ (1998) 2 *Human Choice and Climate Change* 327.

¹⁵⁵ Frank W Geels, ‘Technological Transitions as Evolutionary Reconfiguration Processes: A Multi-Level Perspective and a Case-Study’ (2002) 31 *Research Policy* 1257 <<http://www.sciencedirect.com/science/article/pii/S0048733302000628>>.

characterised as the deep structure or grammar of sociotechnical (ST) systems¹⁵⁶. As shown in the Pyramid of rules Figure 6 there are three types of rules.

Cognitive rules are the foundation of the nature of reality and the frames of reference through which meaning, or sense is established. Symbols like words, concepts, myths, signs or gestures exert their effect by shaping the meanings we attribute to objects and activities¹⁵⁷. Cognitive rules embody shared belief systems and expectations, which directed history¹⁵⁸ but also orient perceptions of the future and therefore steer actions in the present¹⁵⁹. As one way of viewing things is established it makes ‘blind’ the participants to another one.

Normative rules are emphasized by traditional sociologists starting from Simmel¹⁶⁰. These rules confer values, norms, role expectations, duties, rights, and responsibilities¹⁶¹. Sociologists argue that such rules are internalised as implicit beliefs through socialisation processes. Social and organisational networks are stabilised by mutual role perceptions and expectations of what is seen as a proper behaviour, there is however a two-way relationship or a bidirectional feedback loop between the history or tangible world and cognition along their evolution¹⁶².

¹⁵⁶ Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103) 910.

¹⁵⁷ Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103) 910.

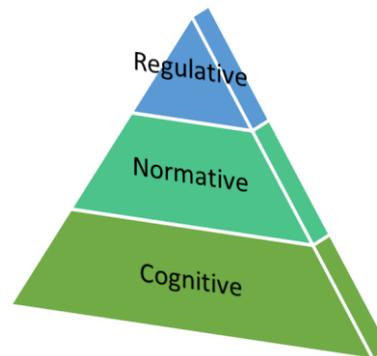
¹⁵⁸ Lent (n 87).

¹⁵⁹ Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103) 910.

¹⁶⁰ Simmel (n 147).

¹⁶¹ Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103) 904.

¹⁶² Lent (n 87).

Figure 4-6: Pyramid of rules

Source: Own elaboration.

The regulative dimension is made of explicit, formal rules, which constrain behaviour and regulate interactions, i.e. government regulations which structure the economic process¹⁶³. There, rewards and punishments are backed up with sanctions (e.g. police, courts). Institutional economists tend to highlight these formal and regulative rules¹⁶⁴.

Alignment between the rules is an important element of stability of the systems and regimes built upon them. More we progress in the pyramid, more socially controllable and changeable are the rules. Regimes are formed by social structuring of these rules. For the different multi-perspective levels, more rules are in force and action is more stable and structured as we progress from niche, through regime into the landscape. The term ‘institutional logics’ generally refers to broad categories of beliefs and motives systems that shape the cognition and behaviour of actors¹⁶⁵.

¹⁶³ Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103) 904.

¹⁶⁴ Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103) 904.

¹⁶⁵ Roger Friedland and Robert R Alford, ‘Bringing Society Back In : Symbols , Practices , and Institutional Contradictions’, *The New Institutionalism and Organizational Analysis* (1991) 252.

Niches constitute the micro-level where radical innovations are conceived and developed in its early stage. Niches are more radical as they deviate on more rules¹⁶⁶, thus there is more space available to go in different directions and try out variety, even if in some dimensions they stick to existing rules¹⁶⁷. Niches try to address the sociotechnical regime and landscape issues.

Sociotechnical regimes imply technological trajectory and patterns the way technology is being applied in economy and society. However, core capabilities can become ‘core rigidities’. ‘Learning is cumulative in the sense that it builds upon existing knowledge and refines it. Competencies, skills, knowledge also represent a kind of ‘cognitive capital’ with sunk investments’¹⁶⁸. The same goes true for the existing infrastructure, physical (associated with ‘hardness’ but also organizational or legal one. ‘Powerful incumbent actors may try to suppress innovations through market control or political lobbying. Complementarities between components and sub-systems are an important source of inertia in complex technologies and systems’¹⁶⁹. The lifestyles of the people are dependent on existing status quo.

Sociotechnical landscape constitutes ‘an exogenous environment beyond the direct influence of niche and regime actors (macro-economics, deep cultural patterns, macro-political developments, already existing infrastructure, natural environment)’¹⁷⁰, in a more utilitarian way it can also have characteristics of ‘national mindset’¹⁷¹. Sociotechnical landscape would need to provide the instruments for the external

¹⁶⁶ GPJ Verbong and Frank W Geels, ‘Exploring Sustainability Transitions in the Electricity Sector with Socio-Technical Pathways’ (2010) 77 *Technological Forecasting and Social Change* 1214 <<http://linkinghub.elsevier.com/retrieve/pii/S0040162510000752>> accessed 5 October 2017.

¹⁶⁷ Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103) 912.

¹⁶⁸ Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103) 910; Mulgan (n 26).

¹⁶⁹ Geels, ‘From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory’ (n 103) 911.

¹⁷⁰ Frank W Geels and Johan Schot, ‘Typology of Sociotechnical Transition Pathways’ (2007) 36 *Research Policy* 399, 410.

¹⁷¹ Milbergs (n 83).

accountability structure for the actors, their disciplining and eliciting of correct information, thus avoiding the trap of revelation principle¹⁷². It should also lead to avoid the sub-optimal innovation ecosystem lock-ins for considerable periods of time¹⁷³. Leydesdorff proposes the overcoming of the problem by the actors' differentiation and integration¹⁷⁴. The external accountability structure and bottom-up learning processes with their loops¹⁷⁵ should avoid 'reification of system (or states and interstate dependency-relations) as barriers to innovation'¹⁷⁶.

From the collective intelligence perspective, groups are encountering 'triggered hierarchies', many questions are automated and only when they encounter difficulties higher levels of hierarchy are called, bringing additional resources, power and knowledge. There are three learning loops distinguished¹⁷⁷: adopting ideas, thought and action within a given paradigm, then in some situations (when the difficulty encountered requires it and collective intelligence is working) calling for the second loop and changing or creating new categories and models to think with, and in a further set of situations associated with the third loop, redesigning the very framework for conceiving the knowledge or rethinking how to think¹⁷⁸. Organizational hierarchies often struggle to operationalize all three loops because the latter two are so likely to threaten the status of leaders or experts.

¹⁷² Herbert Gintis, 'Why Schumpeter Got It Wrong in Capitalism, Socialism, and Democracy' [1990] Challenge Magazine 1 <<http://www.umass.edu/preferen/gintis/SchumpeterChallenge.pdf>>.

¹⁷³ Geels, 'From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory' (n 103).

¹⁷⁴ Loet Leydesdorff, 'The Triple Helix of University-Industry-Government Relations' [2012] Scientometrics 14.

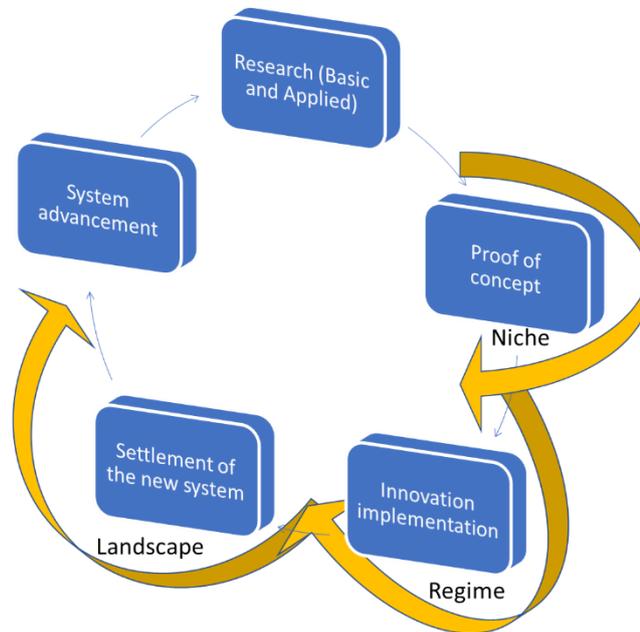
¹⁷⁵ Mulgan (n 26).

¹⁷⁶ Leydesdorff (n 174) 2.

¹⁷⁷ Mulgan (n 26).

¹⁷⁸ Sometimes when the answer to the question cannot be found, there is a need to change the question itself.

Figure 4-7: MLP-based Innovation loop



Source: Own elaboration based on MLP.

4.4. MATCHING MLP WITH TRIPLE HELIX REFRAMED

Both perspectives are to be carefully matched to allow for the study of a determined innovation ecosystem, as previously announced from its advancement¹⁷⁹ point of view. It includes process perspective but also the institutional one, involving the roles undertaken by each of the actors (as shown in the Triple Helix reframed perspective), the way they relate to each other and the intermediary entities development.

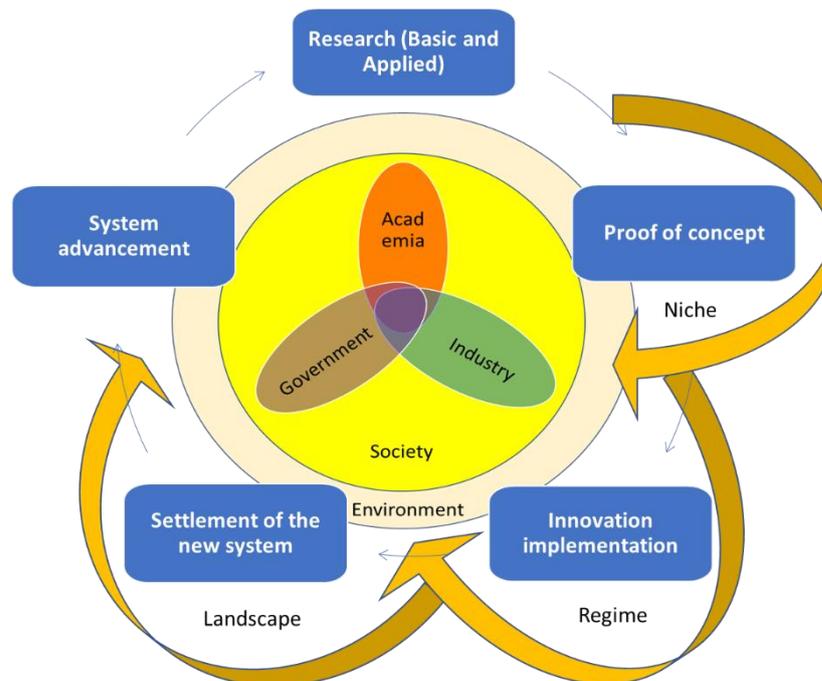
From the Multilevel perspective the typology of four transition pathways¹⁸⁰: transformation, reconfiguration, technological substitution, and de-alignment and re-alignment, is proposed. These pathways display differentiated combinations of timing and nature of multi-level interactions. This approach is centred in the sociotechnical

¹⁷⁹ Geels, 'Processes and Patterns in Transitions and System Innovations: Refining the Co-Evolutionary Multi-Level Perspective' (n 10); Cai (n 97).

¹⁸⁰ Geels and Schot (n 170).

regimes; technical regimes and the related ‘technological trajectories’ first described by Nelson and Winter¹⁸¹ and enriched with broader sociological perspective by Bijker¹⁸².

Figure 4-8: Innovation Loop with actors involved



Source: Own elaboration based on Triple Helix and MLP

The multi-level perspective says that system transitions takes place due to the interactions between processes at three levels having their reflection in the figure above: the innovation need to be discovered and translated into practice, proof-of-concept need to be run and after this building of internal momentum, through learning processes, furthermore price/performance improvements, and what is very important also, the support from powerful groups which have joined in the process, changes at the landscape level start raising the pressure on the regime and destabilisation of the regime creates windows of opportunity for niche-innovations to burst¹⁸³. It can also lead to the

¹⁸¹ Nelson and Winter (n 37).

¹⁸² Wiebe Bijker, ‘Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change’ 390.

¹⁸³ Geels and Schot (n 170) 400.

understanding of ‘valley of death’¹⁸⁴ casuistic that is one of the main problems to overcome for promising novelties and ideas to become real world innovations¹⁸⁵. For some, the main question here is the translational research funding and its operationalization through firms’ incubations understood as a move from an idea past the basic discovery stage towards and through prototyping, proof-of concept tests or scale-up and implementation¹⁸⁶.

Creative industry schema adds another step to this process, i.e. ‘adoption and adaptation of a novel product or service to human lifestyles, along with its retention and normalization by a population of carriers’¹⁸⁷. Adoption process needs to occur also in the social markets¹⁸⁸.

Probably, this process point of view would lead to the following linear/loop sequence: the innovation process would start with society at the landscape level that requires changes through governmental pressure, government impulses universities to work on the solution development and industry allows for its implementation and propagation. This loop would lead to the society evolution, restructuring the needs and allowing for another loop.

This process perspective can also be seen in the panarchy scheme, however these are related more to the natural ecosystems, ecological and socioecological ones, there four

¹⁸⁴ Jackson (n 61); Thomas W Peterson, ‘The Role of the National Science Foundation in the Innovation Ecosystem’ <<https://www.nsf.gov/eng/iip/innovation.pdf>>.

¹⁸⁵ Frank W Geels, ‘Ontologies, Socio-Technical Transitions (to Sustainability), and the Multi-Level Perspective’ (2010) 39 *Research Policy* 495.

¹⁸⁶ Peterson (n 184).

¹⁸⁷ J Potts, ‘Art and Innovation: An Evolutionary View of the Creative Industries’ [2007] *ARC Centre of Excellence for Creative Industries* 1, 6; Carayannis and Campbell, ‘Developed Democracies versus Emerging Autocracies: Arts, Democracy, and Innovation in Quadruple Helix Innovation Systems’ (n 111).

¹⁸⁸ Potts (n 187).

phases are described: “exploitation”, “conservation”, “release” or “creative destruction,” a term derived from Schumpeter ¹⁸⁹; and “reorganization” ¹⁹⁰.

4.5. HYBRID, INTERMEDIARY ORGANIZATIONS IN INNOVATION HELIX

A very important aspect is not only the organization appearance or existence but also the density of the innovation space regarding different actors and their interactions. Only in this way an innovation ecosystem can become a self-sustaining regenerative source of economic and social development. Especially early-stage innovative activities thrive under agglomeration ¹⁹¹. Research, design, testing, and even the manufacture of new products and technologies are supposed to demand environments where all actors congregate together. As these products become mature, however, the benefits of co-location are probably not so relevant anymore ¹⁹².

Below there is a brief description of the hybrid intermediary organization which characterize more mature innovation ecosystems. Their number (density), composition and outreach are considered indicative for the innovation ecosystem advancement.

Science Park also related to as Technopolis, meant in the first term a place for large firms to locate R & D units, and in the second term, ways to collaborate with academic researchers and recruit promising students. Science parks are currently being reformulated into multipurpose entities. It includes newly organised universities, research centres with liaison offices, technology transfer offices serving as integrators of the triple helix actors through intellectual property transfer or clusters focused on particular themes. Furthermore, science parks serve as a receiving point for newly generated successful

¹⁸⁹ Schumpeter (n 12).

¹⁹⁰ Nicholas M Gotts, ‘Resilience, Panarchy, and World-Systems Analysis’ (2007) 12 Ecology and Society.

¹⁹¹ Florida, Adler and Mellander (n 140).

¹⁹² Florida, Adler and Mellander (n 140).

firms and may also establish an incubator facility to start new companies ¹⁹³. Recently it can be seen that a suburban-style scientific park is not a very good location for start-ups which prefer the urban ones with their diversity and thus creativity potential.

The technology transfer offices traced to early XX century are thought to expand the field of research into spheres more applicable by the Industry. Supporting early innovation stages, it can help researchers to identify additional resource to explore the practical implications of their findings, it can give students and graduates the idea of how to recognize a patentable invention, identify the possibility of commercialization of the research and also support “the proof of concept” phase of research application and finally disseminate the knowledge through publication and expansion of research which results also in the ‘advertising’ to potential licensees. The ability to file provisional patents quickly reduces, if it does not eliminate, the potential conflict between publication and patenting ^{194 195}. There can be also centres for cross border technology transfer like IRC ¹⁹⁶ - Innovation Relay Centres Network. Consulting offices with looser relation to Academia are another kind of intermediary organizations in the innovation process.

Academia can also arrange multidisciplinary centres in order to attract greater amount of founding, allow for large-scale projects implementation, together with the new physical facility or expensive research instrumentation. A centre is a succession of strategic alliances to achieve a longer-term goal, also in the regional development.

Accelerators, Incubators and so-called Company Builders are the next hybrid actor to consider in further stages of the innovation progress, at the start-up company advancement.

Incubators are usually ‘physical spaces attached to a knowledge centre (university, research institute, business school, etc.) to help commercialise its own start-ups and foster

¹⁹³ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

¹⁹⁴ As the exclusive licenses and patentable inventions become the goal of university laboratories secrecy can start to be an issue, even the peer review system is challenged (as not paid, many times not thoroughly run, also externalized to the universities).

¹⁹⁵ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

¹⁹⁶ <https://www.eirma.org/node/69242> (Consulted on December 10th, 2018)

business ideas from its network in exchange for a monthly rental fee'¹⁹⁷. Incubators were initially established to speed up knowledge flow and technology transfer from university to industry. The early origins of incubators and also technology transfer offices can be brought back to Edison's "Invention Factory" founded in the late XIX century, which was trying to systematize the invention and commercialization of technology. A similar model can be currently seen in private/networked incubators developed around some technology and working on a common business model of firm formation. As it also supplies capital it can be related to venture capital firms started in the early post-war period which are the second source of incubation activities. The third one would be an extension of the corporate R&D or development labs. When the technology was not a core to the corporate business, they were also given ways to develop through so called "skunk works". Sometimes they were establishing internal corporate incubators, too. They can be considered some kind of test, the corporate employees could venture into new activity and come back to the corporation when it was not successful, company can share its costs attracting new investors but retaining the rights (to purchase) when the spinoff developed favourably. Xerox even recognized it as a profit centre. They are very prone to disappear during crisis and reappear in the more prosperous times. Its essential purpose is to teach a group of people to act as an organization.

The field of incubators originally created in MIT starts to be developed also by industry and non-governmental organizations (NGOs), these last ones organising cooperatives to help poor people possibly in the depressed areas. Furthermore, associations of incubators can also evolve in order to perform special missions. At the end, also the different government levels become involved in the incubation activities. Beyond firm-formation incubation is part of a broader framework for filling gaps in clusters, increasing the organizational density of regions and introducing new organizational capabilities into society¹⁹⁸.

Accelerators are generally implying an application process which is open to all, and a pre-seed investment is there exchanged for a minority stake in the start-up. Support

¹⁹⁷ Eduardo Salido, Marc Sabas and Pedro Freixas, 'The Accelerator and Incubator Ecosystem in Europe' (2013) 9.

¹⁹⁸ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

is limited in time and includes events and also an intensive coaching and mentoring and the programme itself is organised there in sets or groups of start-ups starting at the same time¹⁹⁹. It begun with Y-combinator in the US

In a company builder start-up support model, new business opportunities are usually sourced from the company builder founder's know-how in an area or sector. Main characteristics are: 'work through market validation before putting a team together, almost full ownership of the start-up and bootstrapping during initial phases using the founder's resources'²⁰⁰. It is typical to Berlin area.

There are many other kinds of initiatives that encourage entrepreneurship and start-ups progress, but most are 'either focused on broader areas of incidence or on a particular aspect of entrepreneurship'²⁰¹. A general trend towards greater specialisation within the acceleration and incubation sectors can be distinguished.

Venture capital is the third important intermediary actor to appear in the more mature innovation ecosystem, it is supposed to be much more than financial investment mechanism or instrument, an engine of regional renewal. Its original idea was to provide the funds for early stage innovations, however especially private venture capital companies at later stages of venture capital cycle²⁰² trying to minimize risk and maximize profits in a very short run, become more focused on later stages of innovative companies' developments. It has a downstream drift, because private capital tends to accentuate the business cycle and the herd effect, making of it a second, instead of the first mover due to more and more conservative approach and financing the second-stage imitators with minor variations rather than originators of the business concept, they are weighing heavily on the private venture capital firms²⁰³. The extreme short-term growth can also be antagonistic to the long-term company performance.

¹⁹⁹ Salido, Sabas and Freixas (n 197) 9.

²⁰⁰ Salido, Sabas and Freixas (n 197) 9.

²⁰¹ Salido, Sabas and Freixas (n 197) 9.

²⁰² Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

²⁰³ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

Public venture capital even if veiled or underground in especially liberal economies can indeed be involved in earlier stages providing seed capital for basic research and therefore offers more possibility to promote the discontinuous innovation and is more stable across business cycles. Optimally, public and private venture capital should be complementary, a growing number of universities start acting also, as the organization that is at the origin of the technology has a better chance to take part in the value that is created, not being so in case of intermediary organisations. The caution for the universities venture capital must be taken for not diverting excessively the support projects for influential faculty members.

Individual angels or angels' syndicates can be also proper to fill-up the gap as the venture capital becomes increasingly concentrated in the areas with significant knowledge and financial strength for high growth fields and extraordinary profits, on the later stage of innovation process. These are mainly successful individuals which take this as an alternative option for retirement and for staying "in the game"²⁰⁴. Angels are willing to assume greater risk, are less volatile especially in the economic downturn times and can also provide the new ventures with the business and technical expertise. The likelihood of an angel investment is higher as compared especially to private venture capital.

Government and Academia (also Foundation) venture capital is steadier in nature and can provide the capital for overcoming business cycle (countercyclical) and for the earlier stages of innovation venture formation. Their partnering can provide a funding source for less-favoured fields and less venture capital-intensive regions. It focuses more on the creation of new industries and jobs, seeking long-term economic growth.

An innovative way of providing financing can be done through crowdfunding, or going further on into the innovation chain, Initial Coin Offerings (ICOs)²⁰⁵. This last one is a type of crowdfunding that allows investors to buy the company participations through tokens which is the exchange value within the business model backed up by the

²⁰⁴ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

²⁰⁵ <http://spanishfintech.net/actualidad-y-tendencias-del-mercado-icos-2018/> (Consulted on December 10th, 2018).

blockchain. Value of the token understood in this way as the presale of company services is to be upgraded accordingly to the business expectations of the start-up. Furthermore, tokens can be exchanged in its market applying minimum conversion rate checked out through the blockchain system ²⁰⁶.

For leveraging different actors' involvement Innovation Hubs ²⁰⁷ for stimulating and articulating innovation networks and clusters ²⁰⁸, embryo of innovation ecosystems. On the side of government (especially urban, can be local or regional) and society the Innovation, Living, Media, Eco or Social Labs ²⁰⁹ are put in place. These labs can be used for experimental, isolated test environments for the design of big processes, i.e. sandboxes to check for the experimental legislation.

4.6. INNOVATION HELIX ELEMENTS WITH THEIR META-INNOVATION ROLES

In the advanced innovation ecosystems processes the traditional roles of the actors are being transformed. All the actors together need to join their efforts in the research support, especially the applied and translational ones, and the firm formation and support to bring the ideas into the market and allow their spreading and constitution of the new sociotechnical regime and landscape. This spreading can be done especially together with the society by the participative and deliberative approach. At all process stages, the environment should be carefully considered.

Another significant factor in the innovation ecosystem advancement has roots in the existence of "slack" in the culture, which 'permits a divergence from established

²⁰⁶ <http://spanishfintech.net/hacia-nuevo-mercado-intercambio-tokens/> (Consulted on December 10th, 2018).

²⁰⁷ <https://ec.europa.eu/digital-single-market/en/digital-innovation-hubs> (Consulted on December 10th, 2018).

²⁰⁸ Howard Partners (n 100).

²⁰⁹ Bastiaan Baccarne and others, 'Governing Quintuple Helix Innovation: Urban Living Labs and Socio-Ecological Entrepreneurship' (2016) 6 Technology Innovation Management Review 22.

patterns and activity which is not merely devoted to reproducing the existing society but is aspiring to change it'²¹⁰. This slack can be produced by the introduction and promotion of lateral and vertical expertise mobility from one social sphere to another, as it can stimulate collective intelligence emergence ²¹¹ through hybridization, invention, and innovation of new social formats, allowing institutional cross-fertilization ²¹². By its name it is related to the geocultural assets of the society and their state of art as the arena for communication and transformation, reactivation and recomposition of the public democratic sphere. There the narrative and productive diversity is a key for development, social cohesion, resilience and democratic participation of the society ²¹³. Thus, one of the strategic innovative knowledge transmitters across the levels is the creative industry or art ²¹⁴, together with the design that brings to the picture not only the stimulae for ideas creations but also its propagation in the regimes and incorporation into the sociotechnical landscape. However, similarly to the Academia its contribution is mainly dynamic and thus overseen in the static pictures of the standard innovation approaches.

The Academia role is especially relevant in the education and basic or blue-sky research as mainly in the case of the research it seems to be the only actor able to perform that with a decisive public support. Science is and should become increasingly multi or inter or even trans-disciplinary and multi or inter or even trans-organizational. In this sense art and artistic research involvement are crucial ²¹⁵.

²¹⁰ Boulding (n 35).

²¹¹ Mulgan (n 26).

²¹² Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

²¹³ Fundación Alternativas, 'Informe Sobre El Estado de La Cultura En España 2017. Igualdad y Diversidad En La Era Digital' (2017) <http://www.fundacionalternativas.org/public/storage/publicaciones_archivos/6cd717bd9f96c0d102a67139fa3ea3ac.pdf>.

²¹⁴ Potts (n 187); Carayannis and Campbell, 'Developed Democracies versus Emerging Autocracies: Arts, Democracy, and Innovation in Quadruple Helix Innovation Systems' (n 111).

²¹⁵ Peterson (n 184); Carayannis and Campbell, 'Developed Democracies versus Emerging Autocracies: Arts, Democracy, and Innovation in Quadruple Helix Innovation Systems' (n 111).

As it was already seen, in the more advanced stages of innovation ecosystem development, Academia has also the role of “wealth creation”²¹⁶ through capitalization of knowledge, which in principle is the main role of the Industry ²¹⁷. The industry implication in the university research support is deemed to be complementary to public spending²¹⁸ and it should not only be the response to lowering the public R&D spending or public image requirement ²¹⁹ which obliges university to enter the allegiances. Another concern is related to the commercialization of the new breakthrough technologies at the very beginning financed with public money but at the very end exploited mainly with and by the private Industry. The university governance problem arises as its concentration on exploitable short-term research erodes the knowledge base formation for future discoveries, moreover, challenging the existing status-quo.

The university needs to leave its ivory tower and implicate itself in the economic activity but also in the society, through the participative science, allowing for more interactive roles and transformative learning on both sides.

In the advanced innovation ecosystems universities are also supposed to accomplish their important roles as enablers, catalysators for networks formation, and even leaders, of regional economic, institutional and social development and in the regional innovation systems²²⁰.

²¹⁶ As the university becomes increasingly entrepreneurial the figure of Professor-of-practice PoP appears which means individuals performing dual roles, at the university and the industry. In such a case conflict of interest coexist with the confluence of interest, as some state “no conflict, no interest” Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17). Strategies for dealing with conflicts include publicly stating dual affiliations and removing oneself from decision- making when two competing organizations are involved.

²¹⁷ Etzkowitz, ‘The Triple Helix - -University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development’ (n 6).

²¹⁸ Following the rule: “you need to put money to generate knowledge, you need to put knowledge to generate money”.

²¹⁹ Lowe (n 18).

²²⁰ Louise Kempton and others, ‘Universities and Smart Specialisation’; Renata Kubus, ‘Política Regional de I+D+i En La Unión Europea’, *XV Congreso Internacional de Contaduría, Administración e Informática - Universidad Nacional Autónoma de México* (2005).

There are also Academia tasks that are in many cases forgotten but stem from their very origin and these are ‘the promotion of the general powers of the mind so as to produce not mere specialists but rather cultivated men and women, as well as “the search for truth”, and the transmission of a common culture and common standards of citizenship’²²¹. Therefore, in the contemporary education STEM fields (Science, Technology, Engineering, Mathematics) are overshadowing social sciences, not saying anything about Art (and Design), however some include it into primary equation (STEAM)²²². Jerome Bruner goes further on in defining the primary role of education as ‘preparing the students for unforeseeable future’, in this sense the generic abilities to learn, collaborate and create are becoming key, especially because the costs of learning these traits at later stages are much higher in comparison to accessing the knowledge²²³.

During the periods of more radical change, other Academia commitments need to be considered as ‘the role in the building of new institutions of civil society, in encouraging and facilitating new cultural values, and in training and socialising members of new social elites, i.e. society transformation role’²²⁴.

The Government role is not only relevant in the market failure overcoming and roles providing for the socio-economic game through monetary policy, tax policy, standards, procurement, economic regulation, health care and education policy, market access, and others²²⁵. It is essential in the basic research vitalizing and financing²²⁶ and incubation, also venture capital providing for the very new ideas and technologies.

²²¹ Committee appointed by the Prime Minister under the Chairmanship of Lord Robbins, ‘The Robbins Report’ (1963) <<http://www.educationengland.org.uk/documents/robbins/robbins1963.html>>.

²²² <http://stemtosteam.org> (Consulted on December 10th, 2018).

²²³ Mulgan (n 26).

²²⁴ J Brennan, R King and Y Lebeau, ‘The Role of Universities in the Transformation of Societies’ (2004) 7 <<https://www.open.ac.uk/cheri/documents/transf-final-report.pdf>>.

²²⁵ Egils Milbergs, ‘Measuring Innovation for National Prosperity Innovation Framework Report’ (2004); Peterson (n 184).

²²⁶ Peterson (n 184).

The current state administration and validation role in regulating the market operative is being disrupted by blockchain²²⁷, allowing for the distributed control through confirmation among the users supported by the network. They are already currently used for food banks of United Nations, environmental protection or the voting systems²²⁸. Related to that tendency the digital crypto/currencies are also emerging, replacing in some parts of the monetary system Central Banks and Clearing Houses and other intermediaries, apart the speculative bubble²²⁹.

The government opens to the society and introduces the forms of participative democracy in the “wicked” problems assessment. Democratic governance, especially in the context of the knowledge society where (over)application of scientific rationality to public policy making with ever more vital role of professional expertise is found by many as a critical issue of our times, Fischer stated that: ‘the division between those with and without expert knowledge will be one of the basic sources of social and political conflict in the new century’²³⁰. Technocratic ways of thought and action (as demonstrated) is prone to grow apathy toward the political institutions reflected as such in attitudes and behaviours of citizens. Social and technical complexity of modern societies is easily turned into the main excuse to deny citizens a place and voice at the decision-making table, while it appears that citizens participation understood as the deliberation on the issues affecting their own lives not only gives meaning to democracy, legitimize policy development and implementation but also ‘plays an important educational and psychological role in the social development of the individual citizen’²³¹.

²²⁷ <https://www.blockchain.com> (Consulted on December 10th, 2018).

²²⁸ <https://www.agorarsc.org/el-criptoismo-la-proxima-revolucion-economica/> (Consulted on December 10th, 2018).

²²⁹ Douglas Rushkoff, *Throwing Rocks at the Google Bus. How Growth Became the Enemy of Prosperity*. (Profile 2016).

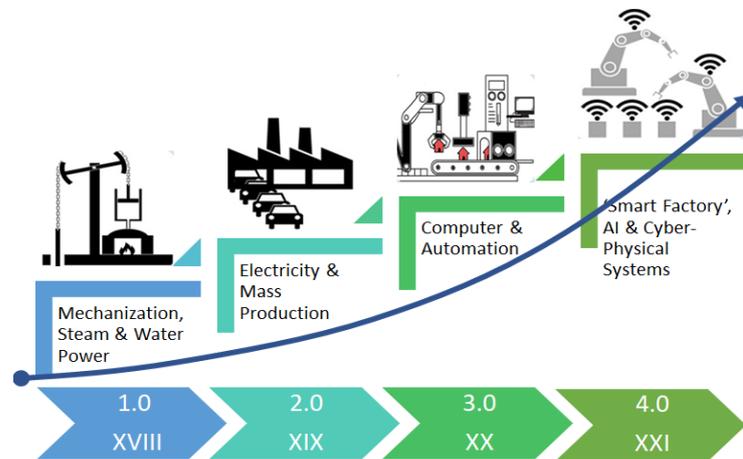
²³⁰ Frank Fischer, *Citizens, Experts, and the Environment: The Politics of Local Knowledge* (Duke University Press 2000) X
<https://books.google.co.uk/books?hl=en&lr=&id=Lz7_JKAIp4kC&oi=fnd&pg=PR6&dq=Citizens,+experts+and+the+environment.+The+politics+of+local+knowledge&ots=IFrjm6Rgcw&sig=iLOWkYcdGkai ze4tYCI1rOoVz_E>.

²³¹ Fischer (n 230) X.

The raw material of the democracy is individual creativity and collective imagination. At a time of immense atomization, there is a need to shift the culture of the society ²³² back and toward its basic ideals—and especially the cultural institutions must lead the way ²³³.

Currently the concept of Industry 4.0 ²³⁴ is being established. Due to 3D printing, nanotechnology (sensors), digitization, Internet of Things, all the production processes are becoming more flexible, less resource consuming and in many cases, can lead to the replacement of product by the service.

Figure 4-9: Industry 4.0



Source: own elaboration, different sources.

The Industry role becomes important for the education part in the advanced innovation ecosystems, especially for the applied and translational research. Afterwards, it is important not only in the role of internal implicit innovation ²³⁵, but also incubation,

²³² Jordi-Jesús Muñoz, ‘Intercultural Europe : Cultural Diversity in the EU and the Debate on a Common European Cultural Identity’ (2017) 30 Papeles de Europa 149.

²³³ https://ssir.org/articles/entry/civic_engagement_why_cultural_institutions_must_lead_the_way (Consulted on December 10th, 2018).

²³⁴ The term of Industry 4.0 has its origin in 2010 Hannover Trade Fair, developed by German National Academy for Science and Engineering - Acatech: <https://www.bmbf.de/de/zukunftsprojekt-industrie-4-0-848.html>; <https://www.plattform-i40.de/I40/Navigation/DE/Industrie40/WasIndustrie40/was-ist-industrie-40.html> (Consulted on December 10th, 2018).

²³⁵ Pedro Canovas Tamayo, ‘Innovación Tecnológica y Crecimiento En La Unión Europea’ (2014) 20 Revista Universitaria Europea 137.

firms' formation and related activities, also in providing the venture capital. The overwhelming requirements of strict industry costs and therefore price control need to be carefully reconsidered as there is a risk of their externalization to the society when the workers with short-term contracts and low income, necessarily require the support from public money, if not for surviving while working, afterwards for the retirement and health and welfare issues in general ²³⁶. The industry can also promote the development in the marginalised parts of the society, providing for more inclusiveness and treating the beneficiaries as the clients and a part not only of the problem but also of the solution.

Business assuring profits is not sufficient in a complex hyperconnected world scenario of today. Industry requires the society, as customers that can afford their products, and also needs educated, motivated, ethical employees and reliable, efficient suppliers. That means that 'businesses benefit from social stability and broad prosperity'²³⁷.

Companies and entrepreneurs are increasingly trying to apply open innovation strategies and, in this way, increasingly performing as 'hubs for an ecosystem of suppliers, customers, infrastructure and sources of knowledge'²³⁸. 'Business models are striving to link and leverage these external innovation assets to create new possibilities for optimizing the value of the whole and also the power of collaborative advantage'²³⁹.

Thoughtful, considerate, ambitious and farseeing attitude of business and Industry (as far as societal norms and values are concerned) is also focused on counteracting the negative effects of economic processes acceleration due to globalization (free-trade,

²³⁶ Jordi Merino Noé, 'La Mediación de Los Regímenes de Bienestar Sobre Las Condiciones de Trabajo, Empleo y Salud En La Población Asalariada Europea' (2018) 30 Papeles de Europa 125 <<https://revistas.ucm.es/index.php/PADE/article/view/58671/52859>>.

²³⁷ <https://www.weforum.org/agenda/2013/11/what-role-should-businesses-play-in-society/> (Consulted on December 10th, 2018).

²³⁸ Milbergs (n 83) 2.

²³⁹ Milbergs (n 83) 2.

increased foreign investment and the movement of capital) and find its expression in forms of Corporate Social Responsibility (CSR) and furthermore in civic involvement²⁴⁰.

Civic involvement of the Industry has its relationship with being a good ‘corporate citizen’, implying a cultivation of respectful relations with various stakeholders. Corporate Social Responsibility is often described as a ‘voluntary responsibility that transcends the demands of national legislation and encompasses human rights and environmental and social issues’²⁴¹. However, CSR even if trying to take roots in the sustainable development, is a narrower concept than civic involvement.

As the ecosystem is evolving in the digital world era (3D printing but also for instance energy production²⁴²) prosumers (producers and consumers at the same time) role is becoming more prominent in the original Industry settings but also through the deliberative practices that allow the thorough participation in the Government and Academia activities.

Thus, the society is taking an active role in the advanced innovation ecosystem. Society Mindset is a characteristic affecting the innovation, it includes ‘youth interest in science, cultural factors, and science literacy, entrepreneurial attitudes and openness to collaboration’²⁴³. On the other hand, art interest can also be used as a predicament for the innovation and entrepreneurship at personal level²⁴⁴.

It is indeed possible to propel the evolution of the society mindset and innovate new forums, i.e. participatory inquiry that can positively side-step what has the chance of becoming an impasse between citizens and experts, but they need to be organized, facilitated and furthermore nurtured. Not being a magic cure for all social and economic

²⁴⁰ Goren Noren, ‘The Role of Business in Society’ [2004] Svenskt Näringsliv 1 <[http://www.svensktnaringsliv.se/migration_catalog/the-role-of-business-in-society_532870.html/BINARY/The role of business in society](http://www.svensktnaringsliv.se/migration_catalog/the-role-of-business-in-society_532870.html/BINARY/The%20role%20of%20business%20in%20society)>.

²⁴¹ Noren (n 240) 3.

²⁴² Kirsi Kotilainen and others, ‘Prosumer Centric Digital Energy Ecosystem Framework’ [2016] Proceedings of the 8th International Conference on Management of Digital EcoSystems - MEDES 47.

²⁴³ Milbergs (n 83) 11.

²⁴⁴ Laura Niemi, ‘The Arts & Economic Vitality. Relationship between the Arts, Entrepreneurship & Innovation in the Workplace.’ (2012).

problems, participatory inquiry holds out ‘the possibility of bringing forth new knowledge and ideas capable of creating and legitimating new interests, reshaping the understanding of existing interests, and, in the process, influencing the political pathways along which power and interests travel’²⁴⁵.

A real cause to concern is that innovation tends to exacerbate existing imbalances, displacement and substitution favours easily a few selected actors. To counter this tendency the smart regional specialisation has emerged as engaging local actors due to their local proximity. Furthermore, a separate domain of geography of innovation is dealing with its spatial allocation. Challenging the methodological emphasis of scientific experts on ‘generalizable, technically rational knowledge’, ‘postpositivist theory underscores the importance of bringing in the local contextual knowledge with sociocultural orientation of the ordinary citizen’²⁴⁶. Participatory inquiry has the potential to provide new, local knowledge that is not within reach of more abstract empirical methods. It is especially crucial for the new knowledge related to the environmental issues and impacts, where there is a high level of wickedness, scientific uncertainty, and it is the society that is becoming the real laboratory for acquiring the knowledge of the consequences of its implementation, i.e. in case of nuclear power stations, where little was known about the consequences of moral hazards till the ‘almost completely safe’ installation or products prove not to be so²⁴⁷.

More discursive, participatory mode of policy expertise is required with a new understanding of the expert as ‘specialized citizen’²⁴⁸ as opposed to current increasingly technocratic, elitist policy-making processes. From this perspective it can also be understood as the roles exchange, scientists taking the role of facilitation and citizens taking the role of scientist in some sense.

Explicitly developing on Carayannis and Campbell: the social dimension and furthermore democracy are crucial because the institutional configuration and

²⁴⁵ Fischer (n 230) XII.

²⁴⁶ Fischer (n 230) XII.

²⁴⁷ As in the case of Chernobyl or Japan earthquake.

²⁴⁸ Fischer (n 230) XIII.

arrangements of Industry, Academia and Government should ‘serve society, and the society should serve the people and individuals as humans (and not the other way around)’²⁴⁹, always bearing in mind the (natural) environment.

The Environment stands here for the physical (natural) localization of the innovation ecosystems. Building on Soddy: ‘The problems standing in the way of well-being and prosperity are an unsound, never challenged modern monetary system and a lack of consideration and understanding of the physical reality underlying economics. What in modern school passes for economics is really the study of debt or chrematistics. Chrematistics, as the study of wants and demands and of how they exchange for one another, is more plainly termed commerce’²⁵⁰.

For innovation, a region or localization (especially cities megapolis), as a space for knowledge, consensus and thus innovation itself²⁵¹ are key notions. “Critical mass” is in this sense a concentration of research resources on a particular topic, from which technological ideas can be generated. It is especially relevant when different actors become implicated and provide for the gaps overcoming strategy, many times resulting in creation of a hybrid organization focused on innovation and regional development.

This also responds to the changing approach to the economy from what Boulding²⁵² called the transition from open “cowboy economy” to the closed “spaceman economy”. The illimitable plains ready for discovery and exploitation are replaced with the Earth becoming a ‘single spaceship without unlimited reservoirs of anything, either for extraction nor pollution’²⁵³, thus it is when also cyclical ecological system and therefore the circular economy enters consideration. Circular economy concept was first

²⁴⁹ Carayannis and Campbell, ‘Developed Democracies versus Emerging Autocracies: Arts, Democracy, and Innovation in Quadruple Helix Innovation Systems’ (n 111) 2.

²⁵⁰ Frederick Soddy, *Wealth, Virtual Wealth and Debt. The Solution of the Economic Paradox*. (Britons Publishing Company ed, 2nd edn, Distributed Proofreaders Canada 1933) 78, 81.

²⁵¹ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

²⁵² Boulding (n 35).

²⁵³ Boulding (n 35).

introduced formally by Pearce and Turner in 1989²⁵⁴. The difference between the two types of economic approach is seen in the attitude towards throughput, consumption and production. In the open, cowboy economy the throughput is the measure of success of the economy, i.e. Gross National Product (GNP) would be a rough measure of that. Following Boulding ‘the essential measure of the success of the (closed spaceman) economy is not production and consumption at all, but the nature, extent, quality, and complexity of the total capital stock, including in this system the state of the human bodies and minds’²⁵⁵. So that the aim of a closed spaceman economy is the stock maintenance with a lessened throughput thanks to the technology. Human and natural environment welfare need to be considered anyway, being it a stock or a flow. From a cognitive history perspective, this would be the change from the cultural metaphor of “conquest of nature” to the “web of life”²⁵⁶.

The introduction of social dimension into the circular economy framework is ongoing²⁵⁷. Social innovation and collaboration economy based companies are especially important in this sense. Furthermore, they can be seen as the Proof-of-Concept laboratories for public policy, activating change makers at the community level.

There are also modern forms of management of organizations, schools or local communities called sociocracy²⁵⁸ that can be traced back to the August Comte seen by him as “the social order of the future”. Sociocracy supposes management in circles where everybody’s opinion is supposed to be considered and consent is required. It is appealing

²⁵⁴ David W Pearce and R Kerry Turner, ‘Economics of Natural Resources and the Environment’ (1990) 73 378.

²⁵⁵ Boulding (n 35).

²⁵⁶ Lent (n 87).

²⁵⁷ Allan Murray, Keith Skene and Kathryn Haynes, ‘The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context’ (2017) 140 *Journal of Business Ethics* 369.

²⁵⁸ <http://sociocracy30.org> (Consulted on December 10th, 2018)

to uncover the potential of collective intelligence. Dragon Dreaming²⁵⁹ is another of this innovative management methodologies bearing in mind sustainability in all dimensions.

The joint framework also allows for the new approach of sustainability governance known as Transition Management²⁶⁰, leading to the policy recommendations that can be discerned in the process.

4.7. CONCLUSIONS

The conceptual framework developed in this study is aimed at providing a more comprehensive and dynamic perspective of the innovation ecosystems, showing the actors and the processes for the innovation origination and further disruption. It pretends to complement already existing research on the subject.

It is to be used as a tool to apply for the assessment of the maturity of the innovation ecosystem, the research at the European Union level can be run for the EU in general and also for the countries, studying all the actors/innovation helix strands involved and their stage of innovative capacity development. Static conditions of three helixes: Government, Academia and Industry are already quite well studied, for instance in the European Innovation Scoreboard²⁶¹.

Thus, especially the dynamic conditions are foreseen to be the main input of this study, i.e. kind of interrelations between different helixes would be a good indicator,

²⁵⁹ <http://www.dragondreaming.org> (Consulted on December 10th, 2018)

²⁶⁰ Derk Loorbach, 'Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework' (2010) 23 *Governance* 161; B Elzen, *System Innovation and the Transition to Sustainability: Theory, Evidence and Policy* (Edward Elgar Publishing 2004); Umberto Pisano, 'Transition Management as a Governance Tool for Sustainable Development' 11; Felix Rauschmayer, Tom Bauler and Niko Schöpke, 'Towards a Governance of Sustainability Transitions: Giving Place to Individuals' 97.

²⁶¹ European Commission, 'European Innovation Scoreboard 2017' (n 107).

especially tri- or multilateral agreements²⁶², together with the circular approach or participative democracy and science involvement and developments.

From the process perspective, especially the innovation (entrepreneurship) incubation seems to play a vital role. Thus, the actors' implication assessment can be envisaged. Intermediary organizations in the European Union, such as science parks, incubators and venture capital, as well as different forms Innovation Hubs or Labs are to be revised. Social innovation initiatives, such as collaborative, sharing economy²⁶³ are also spreading, it will be interesting to study them, also in some cases as the Proves of Concept (or sandboxes) for further public policy innovations.

The end part of the innovation process development (institutionalization or landscape level spreading) is however also found as an interesting way to check the innovation propensity of the country or European Union as a such. Art and society involvement at this stage are found to be crucial.

It is important to add that there are also additional elements not directly related to the Innovation but influencing their rate and direction²⁶⁴ as the general economic environment conditions, especially global ones.

Three different kinds of the relations are distinguished in the Innovation Ecosystems, intrarrelations inside each vertex, defined by the capacity to perform their roles, vertical and more complex horizontal interrelations among different vertices: university, industry, society and their (natural and local) environment and extrarelations between the innovation ecosystem and its external environment, understood as the collaboration with other countries/regions ecosystems²⁶⁵. Especially, the possibility of fruitful collaboration with other innovation ecosystem depends thoroughly on its

²⁶² Bilateral agreements are quite also quite well studied, for instance María Bujidos-Casado, Julio Navío-Marco and Beatriz Rodrigo Moya, 'Análisis de La Innovación En Colaboración de La Empresa Europea Con La Universidad : Evolución 2008 -2014' [2017] Revista Universitaria Europea 23.

²⁶³ Pablo Rodrigo Torralba and Sara González Fernández, 'Economía Colaborativa : Una Nueva Actividad Económica Para Un Nuevo Sistema' (2018) 28 Revista Universitaria Europea 23.

²⁶⁴ Milbergs (n 83).

²⁶⁵ Sabato and Botana (n 7).

development and advancement level, at some very basic stages it can lead to the dependency on foreign technology and brain drain ²⁶⁶. This holds true also for the innovative companies' reallocation to the more advanced innovation ecosystems environments where they have their needs better attended through the denser and better articulated interconnection of the system.

This innovation ecosystem framework can also be checked for the innovation sector development, such as the nanotechnology sector, it can give another perspective of the framework use, allowing to check for the stage of the innovation development and actors' preparation for a specific sector case.

The indicators choices are to be based on their appropriateness for the framework and also availability. The density of the innovation ecosystem is considered basic for their advancement. However, more networked system does not necessarily mean a more intelligent one. "Collective intelligence can be light, emergent and serendipitous, but more often it needs to be consciously orchestrated, supported by specialist institutions and helped by common standards" ²⁶⁷. In the process we can connect the technology with the power of human intelligence. For this purpose, we need to carefully revise the learning loops, especially their more evolved levels.

The participative process to assess the proposed framework can hopefully be run, establishing the procedure and ways to include it in the findings of these Innovation ecosystems studies.

As expressed by Fischer, the importance of academia and knowledge is 'lodged less in the central position of the expert in the decision-making structures than in the impact of expert discourses on the way we understand and organize the world'²⁶⁸.

²⁶⁶ Sábato and Botana (n 7).

²⁶⁷ Mulgan (n 26).

²⁶⁸ Fischer (n 230) 2–3.

5. CHAPTER 2: INNOVATION ECOSYSTEMS IN THE EU: POLICY EVOLUTION AND HORIZON EUROPE PROPOSAL CASE STUDY (THE ACTORS' PERSPECTIVE)

5.1. INTRODUCTION

In Europe, there are the “explicit” policies, where innovation is not only acknowledged but also at the very heart of its objectives, and there are “tacit” ones where innovation can be recognized within other general policies. This makes the overall innovation picture highly complex. The data landscape regarding the subject is additionally fragmented, from a temporal as well as from a definition angle. Some areas of data are replicated several times and others are lacking. Additionally, 5–7 years of framework of approaches have been reinforcing these tendencies. In sum, it is quite problematic to bridge the innovation information; even more, when it comes to the agreement about further directions for innovation development in the highly complex EU landscape, as is the case with the Horizon Europe proposal²⁶⁹. For this purpose, this subject needs to be fully understood and afterwards revised.

If Europe aims to be more innovative and achieve overall progress and sustainability, there is a need for analytical tools that enables the assessment of the maturity and structural advancement of innovation ecosystems and their determinants. The first²⁷⁰ of these set of articles about the Innovation Ecosystems in the EU, elaborates such a tentative theoretical framework, a model through which the understanding can be grounded.

²⁶⁹ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ 57.

²⁷⁰ Sara González Fernández, Renata Kubus and Juan Mascareñas Pérez-Iñigo, ‘Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment’ (2018) 14 CYELP - Croatian Yearbook of European Law and Policy 181 <<https://www.cyelp.com/index.php/cyelp/article/view/310>>.

EU innovation policy is regarded as a cornerstone in the evolution of configuration of innovation ecosystems. Thus, the aim of the present document is to carry on the European policy case study, applying the proposed analytical framework, on the key innovation policy document, i.e., Horizon Europe FP proposal. Firstly, the general history of the innovation policies in the EU and the evolution of the institutional framing is briefly introduced to prepare the background and underpinning for further research, presenting the scenario of the Horizon Europe FP proposal emergence and application. The institutional arrangement is included; nonetheless, only European Union policy centred institutions are disclosed, as they are the ones directly affected. Even if some of them are multilateral in nature, connecting EU governance level, industry (i.e., small and medium enterprises) and academia, the thorough examination of the innovation intermediary institutions is out of scope of the present work. However, this part can be dealt with in a future desirable line of studies, because their density and emergence are pondered as a decisive feature of the structural maturity of innovation ecosystems.

Secondly, the Horizon Europe proposal document is analysed applying the theoretical framework for structural advancement assessment of innovation ecosystems, in this case, their policy determinants. In this way, the main innovation helix actors positioned in Horizon Europe can be disclosed: Government (the European Union level), Academia, Industry (established companies and start-ups), together with Society and Natural Environment which are particularly relevant for socioecological transformation and sustainability. The international articulation of the innovation between the EU and the rest of the world, is taken into account too. The questions such as a climate change cannot be addressed by one country or region only, collaboration and co-competition are indispensable.

From the multilevel innovation process perspective, as this is a general innovation policy strategy evaluation, just general indications are to be found here; they are included mainly in the Industry or business dimension descriptions. Nonetheless, the process viewpoint could be an interesting subject for another study with other base materials to be examined.

The foreseen budget assignments (even if changing slightly during the approval process) are considered a paramount reality check for declarations of intention. Main tacit

innovation policies and funding institutions with synergies to Horizon Europe are listed in order to complete the thorough picture.

International tendencies and complementary aspects are also included to provide the reframing and discussion ground for the structural advancement of the innovation ecosystems of EU depicted by its strategic policy.

Through creating and applying a living model of the innovation world which can be constantly interrogated and improved, the authors aim to contribute to the discussion about the European innovation policy evolution including therein the socioecological dimension revision and strategic implementation directions that are essential to reach progress and sustainability.

5.2. MATERIALS AND METHODS

The purpose of this work is the qualitative analysis of the innovation policies of the European Union (EU), as a next step after the establishment of a tentative framework for the assessment of the structural advancement of EU innovation ecosystems ²⁷¹ (Figure 1). In particular, the Horizon Europe proposal ²⁷² is investigated, under the scope of a multilevel innovation process ²⁷³ perspective but concentrated specifically on the “reframed innovation helix” ²⁷⁴ actors division and assignment. This is a necessary

²⁷¹ González Fernández, Kubus and Mascareñas Pérez-Iñigo, ‘Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment’ (n 270).

²⁷² European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269).

²⁷³ Geels, ‘Ontologies, Socio-Technical Transitions (to Sustainability), and the Multi-Level Perspective’ (n 185).

²⁷⁴ Etzkowitz and Leydesdorff (n 121).

dimension between the framework building and the assessment of a particular sector of economy, i.e., banking ²⁷⁵.

The mapping of innovation actors and processes gives a more dynamic and comprehensive approach, providing an understanding of the (eco)system. The systemness is a meaningful topic here, especially from the point of view of evolving character of innovation patterns. A system is more than the sum of its parts, because it counts on the synergies between them. In this sense, it becomes even more imperative to have these parts or, in this case actors, well defined and well-conceived; moreover, their determinants, roles, and potential in the “straightforward” process rules of the innovation game. These actors need to complement, compete, and interact together, thus, allowing for collective intelligence emergence and orchestration ²⁷⁶ (p.113).

As a result, it can help the adaptation to threats, handling force and mobilizing long-term resources. From the sustainability prospect, different actors (for example, business, the European Commission, universities, social or ecological organizations) are allowed to make claims, resolve conflicts, or demand sacrifices. Shared views of a model, its standards, quality, and purpose, as well as the focus and cultures of learning, are vital.

This model or framework can be defined as an attempt on the agreement of how to define and discover the truth about the innovation ecosystem, how this ecosystem works and what motions are far-reaching, thus is worthy of attention and action. It is also an economizing tool for a strong collective, since the members can think more quickly and efficiently together. This is so because the model is a starting point for individual and collective intelligence. We experience the world through the models, and data and observations (history or evolution paths included) can be refracted only through them. The concept of the innovation applied here is centred on disruptive innovation, corresponding especially to developed economies, its value and impact emphasize society and the natural environment, allowing the socioecological transformation necessary for the achievement of sustainability.

²⁷⁵ Renata Kubus, ‘Innovation Ecosystems in the EU: Banking Sector Case Study’ (2019) 30 *Revista Universitaria Europea* 23 <<http://www.revistarue.eu/RUE/012019.pdf>>.

²⁷⁶ Mulgan (n 26).

The actors' definition and its theoretical background is thoroughly described in the proposed framework ²⁷⁷, applied as a qualitative, analytical tool. Only the main concepts are to be reminded for a better understanding of this paper as an autonomous document of the set, which can be read apart.

The Triple Helix ²⁷⁸²⁷⁹ idea is rooted in the Sabato triangle ²⁸⁰ concept of a government, industry and science interaction node, corresponding to regulation, production, and knowledge functions for a society living in a particular (natural) environment. In modern times, the society becomes more active. Due to new technologies, social forces display more agency. The natural environment subject, related to climate change and sustainability, stays in need of a new agency as well. Thus, the reframed innovation helix with five dimensions is regarded here as a more reasonable framework for innovation strategy assessment.

The level of evolution of each of the innovation actors is out of the scope of the present document, as it would require more detailed information which cannot be found at the Horizon Europe proposal evaluation stage.

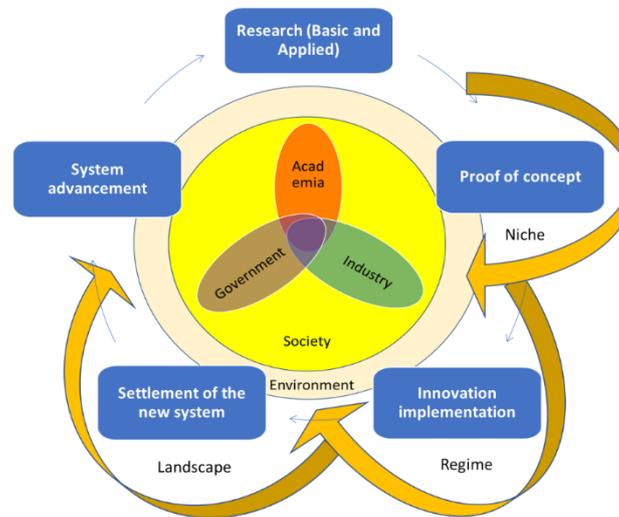
²⁷⁷ González Fernández, Kubus and Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment' (n 270).

²⁷⁸ Lowe (n 18).

²⁷⁹ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

²⁸⁰ Sábato and Botana (n 7).

Figure 5-1. Reframed Innovation Helix: Process loop with the actors involved.



Source: Own elaboration ²⁸¹.

In general, data (even if highly fragmented) and information about innovation in the EU is available and present, e.g., the data about the FPs are accessible almost fully and in real time. The question is to acquire a comprehensive, global but practical knowledge which is not easy to assemble. Two levels of information can be distinguished: Very global and very detailed, while a middle layer is rather lacking in almost every area. The public is, thus, easily prone to manipulation as almost nobody has the ability to fully process the details which can be underpinned directly to the global level, creating the subjective structures to countersign the interests of the proponent and to defend whatever ideologies, sometimes even contradictory ones.

The proposal document of Horizon Europe ²⁸² studied below is fluctuating, notwithstanding the main lines are maintained, even if slightly reformulated. It should be said that the changes have not affected, so far, the main Horizon Europe proposal document, introduced in a more detailed manner further on. They are being announced somehow seamlessly, without an easily identified notification and the source of changes,

²⁸¹ González Fernández, Kubus and Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment' (n 270).

²⁸² European Commission, 'COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination' (n 269).

by just introducing the new version—first in a mixed way and then the modified one—as if it was always so (see, for instance, the renaming of the first pillar from Open to Excellent Science)²⁸³.

The global megatrends of social and climate/ecological change are the lighthouse focus of this analysis, providing an overall, comprehensive, cognitive framework, not exclusively detailed but giving relevant insights for action and the orchestration of innovation in order to propel collective intelligence and sustainability.

Institutional and Regulatory Framing for Innovation Policies in the EU

In this part of the document, the evolution of regulatory and institutional framing for innovation policies in the EU is presented. These materials convey an underpinning for the examination of the Horizon Europe proposal, as it depicts its operational context and impact roots for innovation ecosystems. The basis for the study is provided by the EU treaties analysis from the innovation angle. The main institutions summarized have definition outlines in their website information. It follows with the brief introduction of the overall picture of Framework Programs for Research and Innovation (R&I).

Research and Innovation Policies in EU Treaties

As shown in the Figure 2, R&I Policy within the European Communities, can originally be found in the Treaty constituting the European Coal and Steel Community (ECSC)²⁸⁴, formally established by the Paris Treaty of 1952 (dates of coming into force) and the creation of CERN—the European Organization of Nuclear Research in 1954, and afterwards the EURATOM (European Atomic Energy Community) Treaty from 1958²⁸⁵ where the Joint Research Centre (JRC) was created, as well as the Council Resolution

²⁸³ [11–13]

²⁸⁴ European Union Law, ‘Treaty Establishing the European Coal and Steel Community’ [1951] EU legislation 1.

²⁸⁵ Council of the European Union, *The Euratom Treaty Consolidated Version* (2010) <http://europa.eu/eu-law/decision-making/treaties/pdf/consolidated_version_of_the_treaty_establishing_the_european_atomic_energy_community/consolidated_version_of_the_treaty_establishing_the_european_atomic_energy_community_en.pdf>.

from 1974²⁸⁶ on "the coordination of National policies and the definition of actions of community interest in the field of science and technology".

In the 1983, the ESPRIT Programme²⁸⁷ was introduced with the "consortium" only 50% support by the EU founding (significant to innovation process from the multilateral agreements angle, i.e., requiring different actors' interaction) and inclusion of EFTA countries; in the next year, it was followed by the first Framework Programme (FP) 1984–1987. Already since 1987, with the Single European Act²⁸⁸, science became an EU competence and it gave the research and technological development policy a new and explicit basis founded on the concept of "Framework Programs" for five-year periods. The Maastricht Treaty from 1993²⁸⁹ introduced the co-decision procedure of the Council and Parliament for their approval and redefined the objective of the Community Research, Technology and Development (RTD) policy.

After the Treaty of Amsterdam, which entered into force in 1999²⁹⁰, the unanimity condition of the Council decisions was replaced with the vote by qualified majority for the approval of co-decisions in the FP.

The new and current Treaty of the European Union, signed in Lisbon and in force since 2009²⁹¹, devotes several articles to R&D policy, replacing the ones of the Treaty of Amsterdam. The focus is on coordination and rules of the policy as well as the European

²⁸⁶ Council of the European Communities, 'Council Resolution of 14 January 1974 on the Coordination of National Policies and the Definition of Projects of Interest to the Community in the Field of Science and Technology (OJEC C7/29.1.1974)' (1974) 1 Official Journal of the European Communities 7.

²⁸⁷ Patrick Van Hove, 'Esprit , the European Strategic Programme for Research and Development in Information Technology' [1989] Esprit 34.

²⁸⁸ Council of the European Union, 'Single European Act' (1987) L 169 Official Journal of the European Union.

²⁸⁹ European Communities, *Treaty on the European Union (Maastricht Treaty)* (1992) <https://europa.eu/european-union/sites/europaeu/files/docs/body/treaty_on_european_union_en.pdf>.

²⁹⁰ European Union, *Treaty of Amsterdam* (1997) <<http://europa.eu.int/eur-lex/en/treaties/dat/nice.html>>.

²⁹¹ EPC, 'Treaty of Lisbon Amending the Treaty on European Union and the Treaty Establishing the European Community, Signed at Lisbon, 13 December 2007' (2007) 50 European Parliament and Council OJ C 306 1.

Space Policy. In 2012, the Green Paper (state of the Innovation Union) ²⁹² on Common Strategic Framework was published, followed in the next year by the communication for international cooperation in this field.

Figure 5-2. Timeline of research and innovation policies in the EU Treaties.



Source: Own elaboration.

European Framework Programmes for R&I

In the history of the EU, seven Framework Programmes have already been implemented. The current one under implementation, named Horizon 2020, is claimed to be the biggest R&I funding program in the world; it takes up about 8 per cent of the European Commission budget, and about the same share of total government R&D spending across the EU.

The forthcoming 9th FP for 2021-2027 was proposed in 2018 and is called Horizon Europe. It is based on the Treaty of the Functioning of the EU (TFEU), titled ‘Industry’ and ‘Research and technological development and space’ (Articles 173, 182, 183, and 188) ²⁹³. The Euratom research and training programme is based on Article 7 of

²⁹² European Commission, ‘From Challenges to Opportunities: Towards a Common Strategic Framework for EU Research and Innovation Funding’ 15.

²⁹³ Council of the European Union, ‘Consolidated Version of the Treaty on the Functioning of the European Union’ [2012] Official Journal of the European Union 47 <<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:12012E/TXT&from=EN>>.

the Euratom Treaty²⁹⁴. Horizon Europe relies on subsidiarity and is a shared (parallel) competence of the EU (Article 4(3) TFEU). In the following sections, the 9th FP will be thoroughly described and analysed from perspective of the innovation ecosystem, especially the actors' perspectives.

In general, none of the FPs were a revolution but rather an evolution, presenting a revamped structure, covering new challenges along with striving for simplicity.

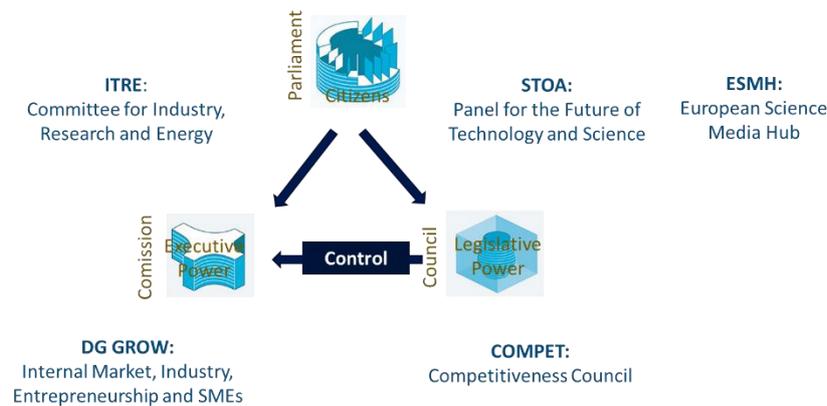
EU Research and Innovation Entities

Even if there has been an effort to create the framework for common European Research and Innovation Policy, at the institutional level, the corresponding R&I entities are not clearly distinguished.

Inside the troika of EU institutional pillars (in general shown in the Appendix A and innovation in the Figure 3), i.e., the European Commission, the EU Council and the EU Parliament, this policy has been put together with other wide areas. Inside the European Commission it is DG GROW—the Internal Market, the Industry, Entrepreneurship and SMEs. For the European Parliament, there is ITRE—the Committee for Industry, Research and Energy; as well a Panel for the Future of Technology and Science (STOA) launched in 1987, which not only conducts Technology Assessment and Scientific Foresight projects and organises events, but also recently started running the European Science Media Hub (ESMH) which aims at promoting the relations between Parliament, scientists, media and citizens. Inside the Council of the EU, we have COMPET—the Competitiveness Council, which covers the policies like internal market, industry, research and innovation as well as space.

²⁹⁴ Council of the European Union, *The Euratom Treaty Consolidated Version* (n 285).

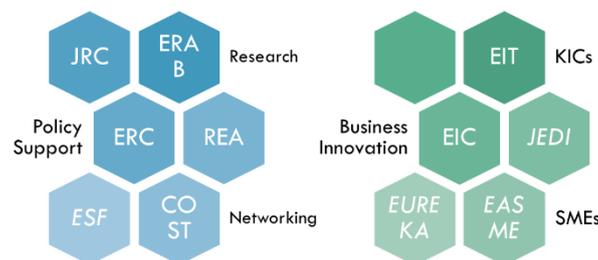
Figure 5-3. The troika of EU institutional pillars from an innovation perspective.



Source: Own elaboration.

Below, in the Figure 4, the main EU R&I entities are presented. These are the main ones from: the historical viewpoint, their global scope and their consideration at the EU and FP level. Joint Research Disruptive Initiative (JEDI) and European Science Foundation (ESF) are interesting examples of initiatives launched outside of the EU main policy stream.

Figure 5-4. EU Innovation Entities landscape



Source: Own elaboration. *In italics*: ancillary entities.

- Joint Research Centre (JRC)—EU Science Hub

The JRC is centred on the scientific advice provided to policy makers. Together with the Policy departments of the European Commission, it operates 6 knowledge centres for: Food Fraud and Quality, Territorial Policies, Migration and Demography, Disaster Risk Management, Bioeconomy and Global Food Security. It should be said that the JRC pillars of operations are much larger in extent: A fairer and more competitive economy, the digital transformation, a Union that protects and towards a sustainable Europe. In Horizon Europe, it is foreseen to play a strong role in Pillar II. JRC has recently been recalibrating its image towards the citizens and customer service.

- European Research Area Board (ERAB)

The ERAB together with the European Commission has been promoting Europe as an open space for knowledge and growth. It includes experts from academia, industry, and civil society. It was constituted in 2008, replacing the 2001–2007 functioning European Research Advisory Board.

- European Research Council (ERC)

The ERC and its Executive Agency (ERCEA) were funded in 2007 together with the 7th FP. It manages the Horizon Programmes and executes and implements calls for proposals for funding. It aims at supporting frontier research on the basis of scientific excellence and has currently seven working groups. Gender balance, open access, innovation and relations with Industry, widening European and strengthening international participation, key performance indicators (KPIs), and science behind the projects.

- Research Executive Agency (REA)

Similarly, to ERC, REA was funded in 2007 to help the management of the 7th FP (different programmes). It supports various DGs—Directorate-Generals of the European Commission.

- COST

The European Cooperation in Science and Technology (COST), founded in 1971, is an intergovernmental framework for international cooperation forming pan-European research networks among nationally funded research. It has 38 states and one cooperating member. In 2013, the COST Association was established by its members.

- European Science Foundation (ESF)

The ESF was set up in 1974 in Strasbourg and, at the beginning, concentrated on pan-European funding (competence of the European Commission). It was discontinued in 2014 and is currently providing scientific services such as peer reviews. In 2011, it created Science Europe to promote its interests in Brussels and strengthen ERA. In 2017, Science Connect was created for the support of scientific decision-making.

- European Institute of Innovation and Technology (EIT)

The EIT, created in 2008, helps business, education and research besides public authorities (the so-called “knowledge triangle”) from different levels to join forces through KICs—Knowledge and Innovation Communities—and become international consortia. Their aim is in general to advance knowledge and innovation in critical fields, but, in particular, it is to develop new innovative products and services, start up the companies, and train the new generation of entrepreneurs. It is considered a first stage towards a knowledge economy. The EIT operations from 2014 are defined by its Strategic Innovation Agenda (SIA).

- European Innovation Council (EIC) pilot

The EIC is a reinforcement of ERC, currently being launched. It aims to bring together innovators, small companies and scientists and creates a one-stop shop to bring the ideas from laboratories into the market. It will have two funding instruments: Pathfinder and Accelerator, correspondingly for early stage and for development and market deployment.

- Join Research Disruptive Initiative (JEDI)

Recently being established and mirroring the US DARPA (Defense Advanced Research Projects Agency), is JEDI, called a European Moonshot factory. It is to be controlled by participating governments supported by the Commission, rather than driven and run by the Commission. The legal distinction could make it easier for the agency to perform military research, barred from Horizon 2020, invite UK participation post-Brexit, or the funding of “European universities”, formed by creating networks of existing universities that offer new EU-wide diplomas.

JEDI aims at bringing a breakthrough technology with speed, higher expectations, and massive risk taking. Its four big missions are: Decarbonizing the world, securing a human-centric digital transition, massively improving healthcare and exploring new frontiers.

- EUREKA

EUREKA platform was funded in 1985 and it is an intergovernmental distributed network (involving EU) supporting the R&D&I cooperation, promoting and supporting market-oriented projects in this area. It helps to get the financing for the companies involved in its projects through its “quality seal”. It looks for synergies with FPs and ERA.

- EASME—Executive Agency for Small and Medium-sized Enterprises

Created in 2014 (in replacement of the Executive Agency for Competitiveness and Innovation) by the European Commission for the fields of SME support and innovation, environment, climate action, energy, and maritime affairs. It has been set-up to manage on behalf of EC several EU programmes.

Horizon Europe Proposal

The Horizon Europe proposal ²⁹⁵ is the main material of the research in this paper. In this part of the document, the basic notions of the Horizon Europe FP are presented, together with the pack of other proposal documents regarding it. The three-pillar structure is briefly introduced, followed by the corresponding budgetary disposal.

Other policies and financing sources with synergies and tacit innovation content are stated as well.

Horizon Europe Basis and Package

For Horizon Europe, the “Lamy” High Level Group conclusions on maximising the impact of EU R&I Programmes ²⁹⁶ were taken into account and enforced by its mission-oriented proposal. Five key criteria were established to select them ²⁹⁷. In 2017,

²⁹⁵ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269).

²⁹⁶ European Commission, *LAB - FAB - APP. Investing in the European Future We Want. ‘Lamy’ Report.* (2017).

²⁹⁷ Mariana Mazzucato, *Mission-Oriented Research and Innovation in the European Union: A Problem-Solving Approach to Fuel Innovation-Led Growth* (2018) <https://ec.europa.eu/info/sites/info/files/mazzucato%7B_%7Dreport%7B_%7D2018.pdf>.

the EU Innovation Council was set up following the recommendations of High Level Group of Innovators²⁹⁸. Another High Level-Strategy Group²⁹⁹ on industrial technology proposed the redefinition of KETs (Key Enabling Technologies).

Horizon Europe targets are based mainly on the Agenda for Jobs, Growth, Fairness and Democratic Change and global policy priorities (the Sustainable Development Goals)³⁰⁰; a target of investing 3% of the Union's GDP on research and development and on the Communication "A renewed European agenda for Research and Innovation—Europe's chance to shape its future"³⁰¹. Besides, it was previously agreed in the Rome Declaration of 25 March 2017³⁰².

The Horizon Europe package³⁰³ consists of proposals for:

- A Framework Programme for Research and Innovation entitled "Horizon Europe", including laying down its rules for participation and dissemination (as per the Treaty on the Functioning of the European Union – 'TFEU'), a specific programme to implement "Horizon Europe" ('TFEU'),
- A Research and Training Programme under the Euratom Treaty complementing Horizon Europe,
- associated impact assessment and legal financial statements.

²⁹⁸ European Innovation Council, 'Europe Is Back : Accelerating Breakthrough Innovation'.

²⁹⁹ European Commission, 'RE-FINDING INDUSTRY. Report from the High-Level Strategy Group on Industrial Technologies', *Conference Document 23 February 2018* (2018).

³⁰⁰ European Commission, 'COM(2018) 306 Final: A Renewed Agenda for Research and Innovation - Europe's Chance to Shape Its Future', *The European Commission's contribution to the Informal EU Leaders' meeting on innovation* (2018).

³⁰¹ European Commission, 'COM(2018) 306 Final: A Renewed Agenda for Research and Innovation - Europe's Chance to Shape Its Future' (n 300).

³⁰² Council of the European Union, 'The Rome Declaration' 2.

³⁰³ European Commission, 'COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination' (n 269).

Defence research is apart of the FP and is included in the regulation for the European Defence Fund for this period. The EU Space Program is envisaged to bring synergies.

In Horizon Europe, two current legal acts are merged (the Framework Programme and the Rules for Participation and Dissemination).

Horizon Europe Structure

The three pillars vision of Horizon Europe is based on the previously elaborated vision for the EU Future, i.e., Open Science, Open Innovation and Open to the World ³⁰⁴; however, the openness to the world has been reformulated because of struggles against global challenges and industrial competitiveness. Open Science and Open Innovation are to be bottom-up oriented (researcher or innovator driven), while the Global challenges and Industrial Competitiveness are bottom-down (determined by strategically defined EU policy priorities). On the way to approval process, the Open Science pillar was once more renamed Excellent Science. This reflects an internal struggle between bibliometrics excellence and research openness which is not so much concentrated on the bibliographic scores Below, in the Figure 5, the version based on the current proposal of Horizon Europe ³⁰⁵ is presented, even if in ancillary EU documents it is modified.

³⁰⁴ European Commission, *EU Open Innovation, Open Science, Open to the World - a Vision for Europe* (2016) <http://europa.eu/rapid/press-release_SPEECH-15-5243_en.htm>.

³⁰⁵ European Commission, 'COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination' (n 269).

Figure 5-5. Horizon Europe—the 3 pillars structure.



Source: ³⁰⁶ (p. 3), based on ³⁰⁷.

Horizon Europe Budgetary Structure

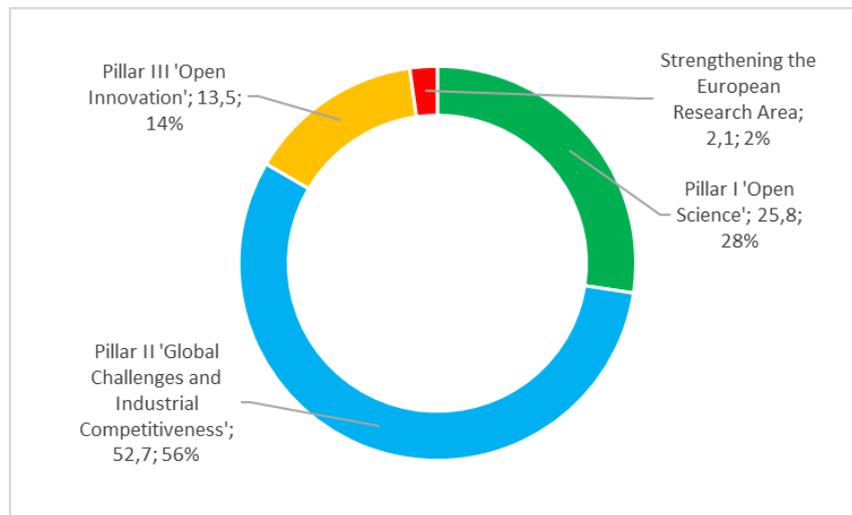
Budget assignment is presented in general lines in Figure 6 and, in more detailed manner, in Figure 7. Numbers are based on the studied Horizon Europe Proposal ³⁰⁸. Undeterred by some fluctuations, they were used to maintain the general lines. In the first part of the revision and approval process, the number being proposed were raised, but in the second part, they were lowered, so that at the end they are rather close to original proposal. Clearly the majority of funds is oriented toward Pillar II, while the basis for the pillars—Strengthening of the European Research Area—is only a minor 2% part of it.

³⁰⁶ European Commission, ‘Eu Funding for Research and Innovation 2021-2027 the Main Features of Horizon Europe What’S New?’ 3.

³⁰⁷ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269).

³⁰⁸ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269).

Figure 5-6. Horizon Europe Budget disposal (main lines), in current prices, billions of Euros.

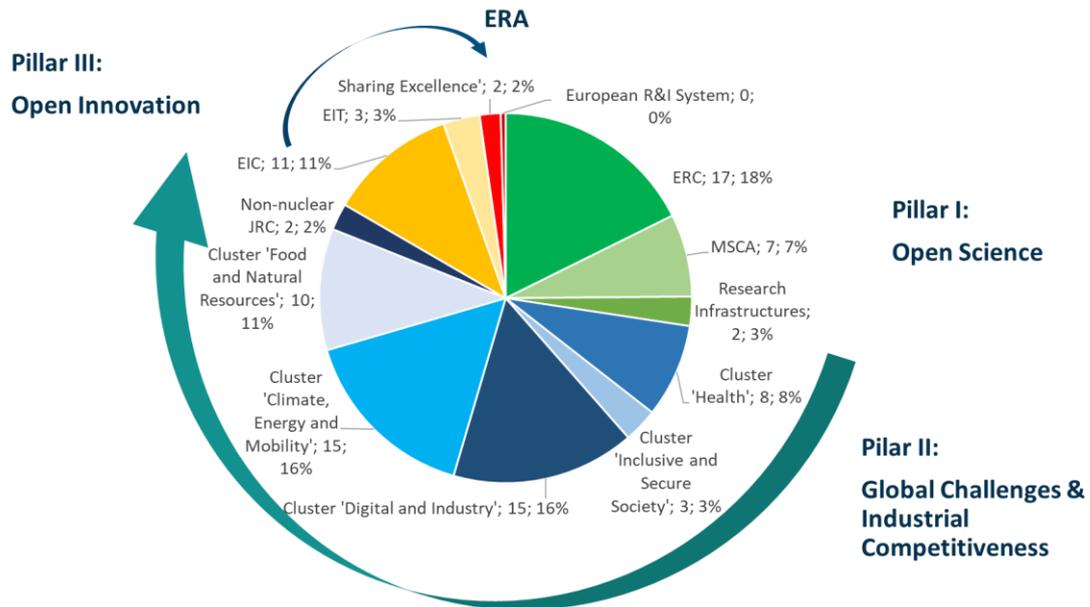


Source: Own elaboration based on the data from ³⁰⁹.

The detailed information about the budget disposal is shown in the Figure 7. Pillar I ERC together with Pillar II Clusters “Climate, Energy and Mobility” and “Digital and Industry”, are summed up by almost 50% of the budget, notwithstanding EIC and Cluster “Food and Natural Resources” which have relevant assignments in the budget as well.

³⁰⁹ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269).

Figure 5-7. Horizon Europe Budget disposal (details), in current prices, billions of Euros.



Source: Own elaboration based on the data from ³¹⁰. Colours are in line with Figure 6.

Tacit Innovation Programs and Budgeting with Synergies to Horizon Europe

The programmes with synergies for Horizon Europe include among others ³¹¹ (p. 14):

- The common agricultural policy (CAP);
- the European Regional Development Fund (ERDF); with its focus on building infrastructure for research and innovation ecosystems, modernisation of public and private sectors, cooperation networks and clusters;
- the European Social Fund (ESF+);

³¹⁰ European Commission, 'COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination' (n 269).

³¹¹ European Commission, 'COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination' (n 269) 14.

- the European Space Programme;
- the Single Market Programme;
- the Programme for Environment and Climate Action (LIFE);
- the Connecting Europe Facility (CEF);
- the Digital Europe Programme (DEP);
- the Erasmus Programme;
- the InvestEU Fund;
- and the external action instruments (Neighborhood, Development and International Cooperation Instrument (NDICI) and Instrument for Pre-accession Assistance (IPA III)).

As presented, the overall innovation picture of the European Union that emerges is highly complex. The common EU budget is dominated by agricultural and regional funding, which together comprise of more than two thirds of the overall budget. Strategic R&I amounts to only 8%.

In order to reinforce the available funds for critical EU policies in the future, there are some proposals of new taxes on the 27 remaining EU countries. These could include an EU-wide carbon-based air flight ticket tax; a carbon border adjustment tax; a fuel tax; a net wealth tax; a financial transactions tax; or a common corporate tax base. The EU does not currently have the power to control national tax rates, and any change to this would require a unanimous vote by all members.

As for the “tacit” innovation budget assignment, the following sources for innovation financing are stated apart from “strategic” financing of Horizon Europe:

- ESIF—European Structural and Investment Funds will contribute to smart growth on the basis of the submission of a Smart Specialization Strategy.
- EFSI—European Found for Strategic Investments managed by EIB—European Investment Bank. It helps to finance strategic investments in key areas such as infrastructure, research and innovation, education, renewable energy and energy efficiency, environment, agriculture, digital technology, education, health and social projects. Through the EFSI, the EIB Group is able to provide investment for higher-risk projects, risk finance for small and medium-sized enterprises (SMEs), besides including the additionality principle by mobilizing member states

and private financing. The rationale of EFSI is to allow the EIB Group to take higher risk and mobilize private capital to mobilize additional financing for strategic investments and SMEs and mid-caps ³¹².

ESIF and EFSI, being different and separate mechanisms, are envisaged to be combined together at project or financial instruments level to achieve coordination, synergies and complementarity ³¹³. The ESI Funds can be used to support the risk-bearing capacity of an EFSI Investment Platform in the form of a "layered fund", and leverage other sources of finance, most notably private investors as well as NPBs (National Promotional Banks) ³¹⁴.

5.3. RESULTS

Actors in the Innovation Process of Horizon Europe

Horizon Europe ³¹⁵ (p. 13) is promising a new approach towards more impact-focused partnerships, including: academia, industry, member states and philanthropic foundations. It is aimed at correcting the plethora of partnerships, which need to be rationalised and consolidated, avoiding overlaps and duplications.

There are three levels of partnerships foreseen:

- Co-programmed based on Memoranda of understanding or contractual agreements.
- Co-funded based on single, flexible program co-fund action.
- Institutionalised partnerships (article 185 or 187 of TFEU and EIT Regulation on KICs and the Strategic Innovation Agendas (SIAs) for the periods of FPs).

³¹² Stefan Appel, 'Complementarities between European Fund for Strategic Investments (EFSI) and European Structural and Investment Funds (ESIF)' 24 <http://ec.europa.eu/education/events/2015/docs/esif-efsi-complementarities_en.pdf>.

³¹³ Appel (n 312).

³¹⁴ European Commission, 'COM(2015) 361 Final. Working Together for Jobs and Growth: The Role of National Promotion Banks (NPBs) in Supporting the Investment Plan for Europe.' 14.

³¹⁵ European Commission, 'COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination' (n 269) 13.

Further on, different actors of the EU innovation policies are studied in more detail, following the Horizon Europe proposal, together with other collateral policies which can bring more effectiveness to them.

Government

The EU Regulatory framework is under revision to check if it hinders or encourages innovation. The Commission Initiative of Better Regulation ³¹⁶ or The Interinstitutional Agreement for Better Law-Making ³¹⁷ takes the innovation perspective into account. It has led to better public, especially cross-border, procurement procedures.

As for the Member States, they are implementing national reforms in the areas of R&I; measures such as self-assessment tools, country review pilots and learning seminars are in place for this purpose. Thus, in March 2015, the Policy Support Facility was launched. Moreover, countries are given specific recommendations for the R&I area in the context of the European Semester.

The Commission will seek as well to implement a pilot on “innovation deals”, which is a new bottom-up approach to assess and clarify regulatory obstacles for innovative solutions, by setting up agreements with private stakeholders and national public authorities.

New monitoring tools to benchmark the innovative behaviour of public administration are being put in place together with the OECD.

In principle already in the Horizon 2020, it was stated that the European Union is becoming an actor in the innovation process. Common mission and partnership areas orientation and citizen involvement seem to be two outstanding points. Mission orientation should help the assessment of excellence and impact not only the individual project or action but also at the portfolio level for a specific goal and within a set timeframe. More efficient science-policy interface should “address better policy needs and strengthen the impact of research and innovation in developing, supporting and

³¹⁶ European Commission, ‘Better Regulation Guidelines - SWD(2015) 111 Final’ (2015).

³¹⁷ European Union, ‘Interinstitutional Agreements of the European Union and the European Commission on Better Law-Making’ (2016) L 123 Official Journal of the European Union 1.

implementing Union policies”³¹⁸ (p. 17). In this sense, tools such as the Scientific Advice Mechanism have been put in place to ensure that policy making takes into account science criteria or is more evidence-based.

The evolution lines of the FP recommended by different studies are concentrated on the simplification, support of breakthrough innovation, increase of inner synergy within EU programmes, openness, international cooperation strengthening and the rationalisation of the funding landscape³¹⁹. There are some remarkable advancements in management ways as well, i.e., the increase of legal certainty or reduction of administrative burden (standard procedures), with arrangements in place such as cross reliance on audits, rearrangements of cost options, the Mutual Insurance Mechanism or the seal of excellence for proposals exceeding the threshold of requirements but not funded due to the lack of budget available, which opens the way for them to receive support from complementary sources.

In the question of the interconnection between especially the start-ups and other innovation actors, the new rule for procurement, even if mainly to be addressed by other synergy policies, can become a far-reaching driving force for innovation strengthening, as there is a huge budget that could potentially become involved in innovation development and implementation. Fourteen percent of the EU GDP is spent through public procurement, accounting for 2 trillion €³²⁰.

There are two types of procurement considered at FP level, which are especially relevant for innovation: Pre-commercial and public procurement of innovative solutions. A pre-commercial procurement means “the procurement of research and development services involving risk-benefit sharing under market conditions, and competitive development in phases, where there is a clear separation of the research and development

³¹⁸ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269) 17.

³¹⁹ European Commission, *LAB - FAB - APP. Investing in the European Future We Want. ‘Lamy’ Report.* (n 296).

³²⁰ World Economic Forum, ‘Innovate Europe. Competing for Global Innovation Leadership’ (2019) <www.weforum.org>.

services procured from the deployment of commercial volumes of end-products”³²¹ (p. 27). Public procurement of innovative solutions means “procurement where contracting authorities act as a launch customer for innovative goods or services which are not yet available on a large-scale commercial basis, and may include conformity testing”³²² (p. 27).

The government sector can become a role model for the adoption of the innovative solutions, creating large and stable demands before the commercial market is made available. Be that as it may, the bureaucracy and long payment times can be an inhibitor in this sense, as start-up companies do not have deep-pockets and cannot wait long for the project and money to materialise.

Regulations especially for newly created innovative technology can be better and more safely prepared (temporally and geographically limited) in a collaborative way through the regulatory sandboxes.

In principle, the government sector can and should make its data and services available and reusable, enabling the Academia and GovTech, RegTech or LegTech start-ups innovation based on them. Academia should get the data available at the first stage, as the partner responsible mainly for its exploitation; at further stages the companies could be made available for this kind of access. Public data use is more easily sold when the reason is the development of science and not private profits. GovTech companies aim for the creation of digital solutions for government. In this sense, the digitization or eGovernment services are a prerequisite. The government platforms should allow the interoperability-by-default and open government interfaces. LegTech companies are helping the joint creation of a legal environment for innovative solutions. RegTech start-ups are aimed at the regulatory subjects.

³²¹ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269) 27.

³²² European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269) 27.

Academia

In the Horizon Europe ³²³, substantial investment in scientific and technological research and innovation is recognized as the first of levels of action in order to improve the national R&I systems efficiency and quality.

Pillar I “Open Science”, is based on 3 lines: the European Research Council (ERC), the Marie Skłodowska-Curie Actions (MSCA) and research infrastructures (see Figure 5). The naming of “Open Science” was anyhow changed in the European Parliament Legislative Resolution of 17th April 2019 ³²⁴ (p. 9, 45), being mainly rephrased to “Excellent and Open Science” with “Excellent” first or in bold, and finalised as “Excellent Science”.

Open Science is to go beyond “Open Access” to publications and should foster the principle of the data to be FAIR: Findable, Accessible, Interoperable, and Re-usable. Research data management plans should become open, thus, strengthening the European Data Space ³²⁵, using European Open Science Cloud—EOSC when possible.

EOSC ³²⁶ was launched in November 2018 where researchers are able to get one-stop-shop access to data from any laboratory or scientific discipline across Europe. As stated in its website, it is aimed at a “virtual environment with open and seamless services for storage, management, analysis and re-use of research data, across borders and scientific disciplines by federating and interconnecting existing scientific data infrastructures run by commercial and publicly-funded providers, adding software, metadata, data registries and other tools needed to glue these existing services together”, currently dispersed across disciplines and the EU Member States’.

³²³ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269).

³²⁴ European Parliament (n 283).

³²⁵ European Commission, ‘COM(2018) 232 Final. Towards a Common European Data Space.’ 15.

³²⁶ European Commission, ‘EOSC (European Open Science Cloud) Declaration: Data Culture and FAIR Data’ 5.

It is complemented by the Open Science Policy Platform and Open Science Monitor. As for the Open Science Monitor, it is one of the sources to run the evaluations by the European Commission. Another collateral discussion is the handling of confidential and/or classified information.

Even if the award criteria for Horizon Europe are based on excellence, impact and quality and efficiency of the implementation, the research and ERC take almost exclusively the excellence as the criterion. It refers mainly to the publication in highly considered journals with impact factors (citations) and, in general, the high costs of publishing (bibliometrics excellence). To some extent it can be regarded as helping the maintenance of the status quo of already well-established research institutes from richest EU countries, concentrating there the flow of the EU budget for R&I and propelling the oligopoly of publishing platforms. With the excellence criteria, science resembles entering closed circles: scientific research's final aim seems to be the quotation in other scientific research in order to be recognized and bring funding for the author/s to proceed with further scientific research. The National Science Foundation from the US uses criteria such as the wider impact (on the society etc.), intellectual merit and also, but not only, peer esteem (which can be expressed by an impact index/citations of publications).

In principle, in European policies, there is indeed a will to introduce a new set of research assessment indicators, such as research integrity. It can make the knowledge more reliable, efficient and accurate as it can be more easily compared with other available research, but it is rather difficult to find the basis for the hope to make them this way, better understood by society and more responsive to its needs.

The current configuration and practices of the publishing market oligarchy are under suspicious regard and boycotts of many publications due to their practices have stifled the growth of public access to knowledge and has made slower the advance of Open Science, at the same time dangerously becoming the main force in the dysfunctional, ever more dependent, publishing market. Some consider that the ethos of “radically collaborative science” is entering into allegiances with “platform capitalism”³²⁷, leading to “bibliomatrix” relations with researchers.

³²⁷ Philip Mirowski, ‘The Future(s) of Open Science’ (2018) 48 *Social Studies of Science* 171.

ERA is seen as a genuine single market for knowledge, research and—more recently—innovation, enabling researchers, institutions and businesses to circulate, compete and co-operate across borders. This certainly includes training enough researchers and, even more, promoting interesting employment conditions.

Part of “Strengthening European Research Area” has its objectives of sharing excellence with less performing R&I countries (teaming, twinning, ERA chairs, etc.) and reforming and enhancing the European R&I System by the next generation Policy Support Facility. Despite bold objectives for ERA, which include the FP support, furthermore modernising European universities, supporting enhanced international cooperation between science, society and citizens, the money devoted to this purpose are a small fraction of the budget.

The ERA needs important levels of public investment, thus the rules for the EU’s Regional Cohesion Policy aim at making innovation a priority for all European regions, supporting “Smart Specialisation Strategies”, developing related research infrastructures and a level playing field for competition between researchers and institutions ³²⁸.

Industry

Business Innovation is given high consideration in EU innovation policies, above all in terms of budget assignment. Industry is dealt with as the main channel through which Horizon Europe is to be realised (through the creation of sustainable jobs and growth). The business environment should become more innovation friendly and less risk averse. The innovation is to be supported throughout its cycle and this commitment is highlighted several times. Full engagement of the Industry is envisaged, including all its levels from individual entrepreneur to SMEs to big corporations. Pillar III of “Open Innovation” is focused on the process view of innovation, overcoming the “valley of death” and the scaling-up of companies. The institutions such as EIT and the recently created EIC should serve this purpose. EIC is to offer a one-stop-shop for high-potential innovators, bridging the investment towards InvestEU, which is seen as crucial.

The aims of innovation, digitisation and decarbonisation, notably through KET’s investment, are seen as the main objectives for Industry and the future. Conceptually

³²⁸ European Commission, *The Knowledge Future : Intelligent Policy Choices for Europe 2050* (n 95).

difficult, the market failures or suboptimal investment situations should be overcome without the distortion of competition.

The pillar of “Global Challenges and Industrial Competitiveness” is addressed at the Industry, divided into in principle cross-dimensional clusters, in a hope of incentivising “cross-disciplinary, cross-sectoral, cross-policy and international collaboration” through their intervention areas.

The pillar of “Open Innovation” is focused on the entrepreneurship as the main force driving the breakthrough innovations into the market and allowing its spreading through the scaling-up. EIC (Pathfinder and Accelerator instruments) and EIT (KICs) are the main partners from the EU side in this process. In particular, Accelerator is seen as the instrument to help overcome the “valley of death”. “Support schemes provided by the EIT should benefit to EIC beneficiaries, while start-ups emerging from EIT KICs should have access to EIC actions ” ³²⁹ (p. 21). Education of entrepreneurs and support for start-ups seem to be the key.

One of the points to develop in the innovation ecosystem is the collaboration between the corporations and start-ups ³³⁰. It is a question that is not so easily assessed. The corporations are obliged by their rules of functioning to fulfil several auditing criteria which require in turn to fulfil several rules like the robustness of their partners or the presentation of several proposals to choose from in a procurement. While opting for an innovation start-up, both of these conditions cannot be fulfilled, as the start-up by its nature is a newly created company without big history to rely on and when the solution is innovative, there is only one such company to choose from. Innovative projects with start-ups are thus processed with difficulty through the corporate structures and proceedings. Furthermore, recent fashion of innovation “agile” areas through which the corporations are collaborating with start-ups, have had a huge difficulty of reconciling their output with the innovation efforts already going on in the business as the usual structures, which want to be likewise innovative and centred on business operations and

³²⁹ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269) 21.

³³⁰ World Economic Forum (n 320).

budget. At the end, in many cases, the innovation collaboration with start-ups becomes not only agile, but also very light, with small budgets being invested. It is so, because efforts are rather centred on the innovation branding than real doing.

Outside Horizon Europe, the Smart Specialization Platform, called the S3 Platform, was created to provide advice to EU countries and regions for the design and implementation of their Smart Specialisation Strategy (S3). Besides, there is a specific instrument called COSME for strengthening the Small & Medium Enterprises (SMEs) which provide 85% of new jobs created. COSME funds the European Enterprise Network (EEN) to help access EU SME financing, but also open the markets (internationalisation), supporting entrepreneurs' expertise, lessening regulatory burden for this type of companies and creating business-friendly environment.

In Horizon Europe, it is vital to rationalise the Union funding landscape, including, by streamlining, the range of partnership initiatives and co-funding schemes.

Blended finance, combining non-repayable EU funds and repayable funds from other public/private finance institutions and investors is leveraging private and public funds. EIT/Horizon Europe blended finance is “a combination of a grant or a reimbursable advance with an investment in equity”³³¹ (p.29). It allows the financing of emerging and frontier markets, especially for SDG.

InnovFin—EU Finance for Innovators of EIB has been applied in Horizon 2020. In a like manner, the European Venture Capital Funds were established together with European Venture Capital Passport.

Society

In Europe there is a big issue of the communication between European Union institutions and society, which was broadly and bluntly acknowledged by the failed EU constitution in 2005³³². Even if the constitution was somehow retrieved through the Lisbon Treaty, there were several efforts to better approach the citizens: Plan D for

³³¹ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269) 29.

³³² Muñoz (n 232).

Democracy, Dialogue and Debate³³³ or the Europe for Citizens program. The intention was to foster a broad public debate through the visits of the Commissioners to the Member States, through the European Round Tables for Democracy, better use of the Europa Direct network and through the European Goodwill Ambassadors (similar to the United Nations). Especially, bearing in mind the May 2019 elections for the European Parliament, there is a strong bet for increasing citizen participation in the voting and for the acknowledgment of the benefits of the EU by the broader public.

In this sense, there are several efforts to make European communication more attractive and accessible in cyberspace (social networks), like EU Tube on YouTube. These communications fall into two categories: 1–5 minutes announcement of some policies which are visual but with almost no substance in the content, and 30 minutes to two hours lectures about Europe. It is hard to get some user-friendly information with some substance in the content, i.e., 10–15 minutes, even about such basic topics like the most basic EU Policies.

Recent democratic governance practices include the proposals of direct Society participation in the decisions concerning it, at EU, national and local level. There is an EU Public Consultation site for expressing the opinions on the scope, priorities and added value of EU actions for new initiatives, or evaluation of existing policies and laws, and also for the Horizon Europe proposal itself³³⁴.

Over and above, there is a Futurium platform where the society was invited to score EU policies related to the future³³⁵, or to discuss policies, with different groups such as Digital4science to enable citizens to participate together with researchers in the design of future policies and work programmes.. Another example is the Kuorum.org online platform which helps the government and enterprises to innovate through the online participation.

³³³ European Commission, ‘COM(2005) 494 Final. Plan-D for Democracy, Dialogue and Debate’ 25.

³³⁴ European Commission, ‘Orientations towards the First Strategic Plan Implementing the Research and Innovation Framework Programme Horizon Europe VIA WEB OPEN CONSULTATION’ 142.

³³⁵ European Commission, ‘A Journey into 2050 Visions and Policy Challenges’ (n 95).

The participation in this kind of platforms and public consultations is indeed in need of improvement, especially due to their limited attractiveness, user-friendliness and transcendence, i.e., connection between the effort put in the participation and the results of it, especially for the participant.

In case of Horizon Europe, the public consultation, is de facto limited to Pillar 2, as it can be seen in the large and rather unnecessarily complex document of Orientations³³⁶, including the Sustainable Development Goals mindset and reframing EU future policy priority to: Protective, competitive, fair, sustainable and influential Europe. There, the protective side is focused on civil security for society, that in principle should be related to defence matters and a fairness dimension is almost exclusively related to health issues, because social cohesion (and inclusiveness) is stated but not really developed.

One of the three levels pondered in Horizon Europe in order to improve the quality and efficiency of national innovation systems is to “ensure that European citizens get supported through what will be a fast and, for some, turbulent transition driven by innovation, digitisation and global megatrends such as artificial intelligence and the circular economy”³³⁷ (p. 4). In principle it seems that it is strongly oriented toward the Future of Work, but there is no such articulated line of work.

Horizon Europe sees a meaningful relationship of society and science as a crucial question. It pretends to “engage and involve citizens and civil society organisations in co-designing and co-creating responsible research and innovation agendas and contents, promoting science education, making scientific knowledge publicly accessible, and facilitating participation by citizens and civil society organisations in its activities”³³⁸ (p. 4). Culture and arts involvement are increasingly acknowledged as the ways for achieving new quality of sustainable innovation. The tools for that are seen in the R&I

³³⁶ European Commission, ‘Orientations towards the First Strategic Plan Implementing the Research and Innovation Framework Programme Horizon Europe VIA WEB OPEN CONSULTATION’ (n 334).

³³⁷ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269) 4.

³³⁸ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269).

communication and outreach campaigns targeting general public. Dissemination, exploitation (especially stressed) and knowledge diffusion should help all the actors and are supposed to be done by the EU and the beneficiaries.

In Horizon Europe Pillar II, Global Challenges and Industrial Competitiveness is to take forward societal challenges but it is not clear how it is going to take society along this path.

Notwithstanding, there is a part of the innovation policies centred on social innovation. Social innovation is understood as “innovations that are both social in their ends and in their means, remaining open to the territorial, cultural, etc. variations it might take. So, the social is both in the how, the process, and in the why, the social and societal goals you want to reach”³³⁹ (p. 5). This is developed into the platform for solutions to global challenges, implying different actors of the process: Public authorities (with a special accent on the renewal capacity it can bring for them), private companies, and third sector organisations. As for Horizon Europe, it considers mainly foundations in the last category.

Social innovation implies the assumption of a more active role of the society, not only as mere consumers but as prosumers. It can be conjointly addressed at the needs of vulnerable groups in society, integrating social, economic and, recognized only in some cases, environmental aspects. They imply co-production and co-creation Citilabs, makers spaces, residences and sites. Social innovation characteristics imply more openness to knowledge sharing, multidisciplinary, hybrid and integrative approaches (broader and more varied communities). Moreover, social innovation environments are participative and more empowering, enhancing society’s capability to act, they demand rather than supply led and adapted to particular, local conditions. In some sense they mirror the practice of citizen science, but instead of research and science development they promote solutions and social economy/entrepreneurship, in this way impulsing collective intelligence. The stages are similar to multilevel perspectives but without the R&D. Nonetheless, the social innovation community was disconnected at the beginning of 2019. TRANSIT project for transformational impact of social economy was discontinued in

³³⁹ European Commission, ‘Guide to Social Innovation’ 15.

2017. At least, there is an information about that on the respective websites. It can be seen, moreover, as hype in the crisis times³⁴⁰, also because the updated documents are difficult to find.

Innovation culture in Europe requires a closer involvement of society³⁴¹. It is foreseen to involve society in all the stages of innovation cycle. In this way, innovation ideation can be enriched and seen as more relevant and acceptable and, in this way, it can be easier to uptake. Citizens and users should be at the centre of new open innovation policies³⁴².

Inclusiveness of innovation is indeed needed and can be achieved through better mainstreaming and simpler access rules. Gender equality is in this sense one of the concerns of Horizon Europe, namely, the participation of women in STEM, technology and encouraging them to have a more active role in the technology entrepreneurship³⁴³.

Models of crowdfunding for research are envisaged as enriching the approach and involvement of society³⁴⁴, although they can become a tool to take out the responsibility of other actors for complying with it. Crowdfunding models are under evolution and their different forms are approaching modes of action of the business angels or venture capital, allowing for more granular investment (less capital and more participants); however, the final costs in terms of commissions, interests, processing time investment, etc. are rather less competitive.

Above this, there is a concept of citizen science referred as “general public engagement in the scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools

³⁴⁰ U Pisano, L Lange and G Berger, ‘Social Innovation in Europe. An Overview of the Concept of Social Innovation in the Context of European Initiatives and Practices’ (2015) 36 ESDN Quarterly Report 25.

³⁴¹ Canovas Tamayo (n 235).

³⁴² European Commission, ‘State of the Innovation Union 2015’ (2014).

³⁴³ World Economic Forum (n 320).

³⁴⁴ European Commission, *The Knowledge Future : Intelligent Policy Choices for Europe 2050* (n 95).

and resources”³⁴⁵ (p. 9). In the European Union such practices are already at its highest state-of-art, introduced in Denmark in the Consensus Conference, where a participatory process involving citizens is used to complement scientific reports and affect political decisions.

Natural Environment

There is no specific pillar or line of action that referring to natural environment in Horizon Europe, yet it reflects “the importance of tackling climate change in line with the Union's commitments to implement the Paris Agreement and the United Nations Sustainable Development Goals, this Programme will contribute to mainstream climate actions and to the achievement of an overall target of 25% of the EU budget expenditures supporting climate objectives”³⁴⁶ (p. 24). This target in principle is to be achieved through the marker system, used at the “appropriate” level of disaggregation.

The Eco-innovation Action Plan (EcoAP), was adopted by the Commission in 2011. An eco-innovation is “any innovation that makes progress towards the goal of sustainable development by reducing impacts on the environment, increasing resilience to environmental pressures or using natural resources more efficiently and responsibly”³⁴⁷ (p. 3).

The EU’s 7th Environment Action Programme (7EAP) set out a vision of “living well within the limits of the planet”, including the need to “turn the Union into a resource-efficient, green, and competitive low-carbon economy” by 2050.

The European Resource Efficiency Knowledge Centre (EREK) was launched in 2018 to help European companies, especially SMEs, save energy, material and water costs. They make available tools, information and business opportunities that show new and better ways to be resource efficient and benefit from circular economy business

³⁴⁵ European Commission, ‘White Paper on Citizen Science for Europe’ 1, 9 <papers3://publication/uuid/BD703F43-F5B0-4C72-8EAD-CD58E492A0D6>.

³⁴⁶ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269) 24.

³⁴⁷ European Commission, ‘Decision No 1639/2006/EC on Establishing a Competitiveness and Innovation Framework Programme (2007 to 2013)’ [2006] Official Journal of the European Union 3.

models which turn waste into an asset. The Circular Economy Package was presented first in 2014 and amended in 2015³⁴⁸. As a part of it an Action Plan was included³⁴⁹. Be that as it may, this subject was already initially developed in the 2011 Roadmap to Resource Efficient Europe³⁵⁰.

The European Circular Economy Stakeholder Platform is also in place. Extended Producer Responsibility (EPR) schemes provide the producers with the incentives to take into the consideration the full life cycle of the product, many times exerted collectively through the Producer Responsibility Organizations (PROs). Even financial contributions paid by producers to EPR schemes were foreseen to be modulated based on the costs necessary to treat their products at the end of their life. All these commitments are in line with the U.N. 2030 Agenda for Sustainable Development and the G7 Alliance on Resource Efficiency. This action plan is additionally instrumental in reaching the Sustainable Development Goals (SDGs)³⁵¹. The Ecodesign Directive from 2009³⁵² however, pertinent only to energy-related products, considers energy efficiency. In the future, issues such as reparability, durability, upgradability, recyclability, or the identification of certain materials or substances are to be envisaged.

The Commission further promotes best practices in a range of industrial sectors through the “best available technique reference documents” (BREFs) and Best Available Techniques Conclusions (BATCs).

The SEE (Sharing Experience Europe Platform) of the ECIA (European Creative Industry Alliance) is focused on strengthening the role of creative industries and, in

³⁴⁸ European Commission, ‘Circular Economy Package: Four Legislative Proposals on Waste’ 12.

³⁴⁹ European Commission, ‘Closing the Loop - An EU Action Plan for the Circular Economy COM(2015) 614 Final’ 21.

³⁵⁰ European Commission, ‘Roadmap to a Resource Efficient Europe COM(2011) 571 Final’ 26.

³⁵¹ European Commission (n 349).

³⁵² European Council, ‘Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 Establishing a Framework for the Setting of Ecodesign Requirements for Energy-Related Products (Recast)’ (2009) L285 Official Journal of the European Union 10.

addition, it is being applied to policy-making to accelerate the introduction of design in the process of innovation ³⁵³.

International Cooperation in the Innovation Policies of Horizon Europe

For the Commission, international cooperation is a tenet of research policy. It wants to be at the centre of a web of global science and technology. The Horizon Europe FP is based on the concepts and definitions of the World Trade Organization, the Frascati Manual for Research ³⁵⁴ and the Oslo Manual for Innovation ³⁵⁵, Technological Readiness Levels—TRL.

The EU designed Framework Programmes are supposed to be as open as possible to participation from across the globe as this raises excellence and visibility, support trans-national mobility and attracts the best talent ³⁵⁶ (p. 3). An advisory body of the European Council, called the Strategic Forum for International Science and Technology Cooperation (SFIC), provides the forum to discuss the priorities among the MS (Member States).

There are several forms of collaboration ³⁵⁷:

1. Coordinated Calls are agreed through joint steering committees with international partner countries. The EU and a third country agree upon the content, funding, evaluation procedures, timing and other procedures, but both of them issue legally separate calls which run in parallel. For instance, the agreement with Japan.

³⁵³ Anna Whicher, ‘See (Sharing Experience Europe) Platform Impact’, *EDII Coordinators Meeting* (2014).

³⁵⁴ OECD, *The Measurement of Scientific, Technological and Innovation Activities. Frascati Manual*. (2015).

³⁵⁵ European Commission and OECD, ‘Oslo Manual’ 1.

³⁵⁶ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269) 3.

³⁵⁷ Philip Hines, ‘Going Global. Enhancing International Cooperation in EU Research and Innovation’ (2017).

2. Joint Calls are jointly managed with a third country. It includes third countries scientific and technological organizations and agencies, international organizations and non-profit legal entities.
3. Another form of cooperation can involve Third Party Entities from industrialized countries (so, without funding) which are unable to sign a grant agreement. Participants from those countries must be contracted to a regular participant who must obtain the intellectual property rights from the third party as if results were generated by the full participant itself.

There are several categories of countries involved, for calls as well as for innovation prizes ³⁵⁸ (p. 35). They can be split into two groups:

1. “Associated countries”—EFTA/EEA can act as EU MS (Norway, Israel, UK after Brexit). Acceding countries, candidates and potential candidates as well as the countries covered by the European Neighbourhood Policy are to follow the terms of their respective agreements.
2. Third countries and territories—with a good capacity in science, technology and innovation, committed to a rule-based, democratic open market economy.

The European Code of Conduct is to be applied. Human cloning and genetic modifications or human embryos only for the purpose of research are in principle excluded from the Horizon Europe financing framework. Ethics and security checks are to be run at any time of the research, if needed. There are strict rules regarding transparency (bearing in mind Intellectual Rights Protection), non- discrimination, equal treatment, sound financial management, proportionality and competition. To attract entrepreneurs from third countries, Europe is envisaging the extension of the Blue Card Directive to them. For scientists from third countries, a scientific visa is available.

There is an option for participation from third countries by becoming a part of Consortium, where in general only one, from at least three participants, is from the EU

³⁵⁸ European Commission, ‘COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination’ (n 269) 35.

MS or associated countries. ERC and EIC have the possibility to directly involve one or more legal entities with the same requirement.

Entities from the third countries exceptionally can benefit from calls while being in principle from low- or middle-income countries (the increase of their share in the research funding is one of the Pillar II aims) and if the country is identified in the Commission work programme or is deemed essential to implement the action.

The Commission issues a bi-annual report on the implementation of the international cooperation strategy, that includes a set of country-specific roadmaps for R&I cooperation. Furthermore, the Commission has formal science and technology agreements with several third countries that are guided, reviewed and reported by joint steering committees.

Beyond the FP, EU participates in many multi-lateral R&I initiatives such as the Intergovernmental Panel on Climate Change (IPCC) and the Global Earth Observation System of Systems (GEOSS) that will link satellite systems worldwide, also regional initiatives as EaPConnect (Eastern Partnership), to develop a regional EaP Research and Education Network of Centres of Excellence and its interconnection to GEANT was launched in June 2015 (S. Commission, 2016). EU works with the OECD and other organisations to improve cooperation on framework conditions³⁵⁹. The participation of legal entities established in the third countries and international organisations is promoted in Horizon Europe

In the future, Europe is envisaged to allow more bottom-up collaboration—with third-country applicants approaching the EU for open funding calls, not restricted by topic area or a pre-defined R&I framework.

Bottom-up cooperation could be advanced, not through potentially expensive and burdensome project calls, through the exchange of researchers. Long-term scholarships, lasting more than the one-year standard today, encourage the exchange of people and ideas, fostering links between countries. The Marie Skłodowska-Curie actions were very popular and effective. In the sense of international talent attraction, European Union

³⁵⁹ Hines (n 357).

should probably better leverage its competitive advantage in diversity and quality of life
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The COST Association has been expanding its international scientific networking activities, as a low-cost way to bring together researchers across borders. Additionally, EUREKA's GlobalStars instrument allows member-states of EUREKA to form partnerships in third countries to create an open call, with topics and funding agreed between them. Participants can then apply through their respective and amended national R&I procedures.

5.4. DISCUSSION

Explicit but also tacit European Innovation Policies are gaining momentum. From what can be seen in Horizon Europe, the knowledge triangle³⁶¹ or triple helix³⁶² actors are explicitly considered: Government, Academia and Industry, with additional dimensions such as Society and Natural Environment are nonetheless at the tacit level only. The authors consider strong socioecological orientation as a paramount requirement for sustainability. A richer understanding, communication and action is required, based on shared models, codes, roles and rules. In this way, more “we” quality can be reached, making the EU more resilient and thus setbacks and defeats can be coped with more optimally. In a geopolitical scale such as the EU one, there is also a greater risk of delusion and capture by special interests³⁶³. Thus, the EU innovation ecosystem should be able to reinvent itself as a system of intelligence, where all actors can act in a more comprehensive and integrated way, having shared views of standards and quality with a shared purpose. A model is a tool for thinking, applying it, actors can better complement, compete and interact with each other. A revision of living innovation ecosystems strategy

³⁶⁰ World Economic Forum (n 320).

³⁶¹ Sábato and Botana (n 7).

³⁶² Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

³⁶³ Mulgan (n 26).

policy against a comprehensive and dynamic framework is the main contribution of this paper. Observations, inputs and data are refracted through models which are tied to identity and experience of reality.

Generating options and correcting errors of reasoning is vital for strategies. There are several efforts regarding the policies of the EU which are always present. One of them is simplicity. Even if it is one of the main aims, from the outside the policies look ever more complex. The learning can be that this is due to the ever-evolving reality, consequently the casuistic to attain the results becomes more cumbersome. This can override (collective) intelligence if new models are not configured. According to the statements which seem rational, the landscape, even if becoming more complex, is less complicated to manage and to find a way through it for the actors. The administrative burden, related to the auditing and accountability exigencies, now includes several measures to alleviate it. Continuity of the policies can be helpful as well, but it collides with the changes, even if seen as improvements. The grants mechanism is counterproductive in this sense, as by its nature it is a one-shot project, even if extendable, this extension is only palliative. Another aspect is a bottom-up approach calling for high quality expertise of the “bottom” or general citizenry and very good institutional arrangements, thus reinforcing the position of the already strong players. After this thorough research process, the authors have learnt that while more omnipresent is the mantra or repeated are some declarations of intentions, more pervasive can be its effects on status quo maintenance and escalation. For instance, in the 7th Framework Programme that ran from 2007 to 2013, Eastern countries only won four per cent of the total EU research budget. In the current Horizon 2020, that number has improved, but only by 0.4 per cent. The lion’s share of funding continues to go to research institutes and companies in the UK, Germany, France and the Netherlands, an exception being Spain. In the meantime, in Horizon Europe, there is only an expressed concern regarding outermost regions (mainly old colonies and Canary Islands) about improving the participation rates of countries with weaker R&I muscle.

Below we present the main conclusions from the previously exposed results of the analysis of innovation actors.

At the Government level, the innovation approach evolved in the EU towards networks and clusters, mainstreaming innovation into sectorial policies and with the EU

itself acting as an innovator³⁶⁴. Apart from the general revision of the policies and their possible impact on the innovation, it tries to be more approachable thanks to EU-declared missions and be closer to citizens and also scientists through a scientific advice mechanism for policy institutions. A serious asset lies in public procurement as when it opens to innovation, it can provide much needed funding. The authors recommend that regulatory sandboxes for innovation and the opening of government data for scientific research and RegTech or LegTech companies are other implicitly far-reaching lines of action.

As for the Academia, data and research processes and the openness of results are burning questions while the exclusiveness of excellence criterion and the current development of the global publishing markets affecting the European ones require closer revision.

Acting at the EU level allows the investment in the segments of R&I which are more difficult to be promoted at other levels, as it is for high risk and long-term venture. It can be achieved thanks to “sharing the risk and generating breadth of scope and economies of scale”.

For the Industry, the creation of the EIC should bring reinforcement of the innovation policies and funding. An imperative is here the process approach, supporting the start-up companies in the “valley of death” and scaling-up parts of their development. Collaboration with the big corporations is of relevance, as they can become customers or partners, bridging the financing for innovation. Several initiatives are undertaken to improve Venture Capital participation in European innovation schemes. They fall behind the US standards—these are not developed in the Horizon Europe apart from stating that the blended finance tool is a foreseen step to improve financing on the border of public and private entities.

There is a strong orientation of efforts towards Society, which is to be informed and, what is more, invited through hopefully more interactive and participative processes. Not only information diffusion, but also citizen science or social innovation processes

³⁶⁴ European Commission, ‘State of the Innovation Union 2015’ (n 342).

(not so the collaborative economy ³⁶⁵) are encouraged, however their real implementation will need further checks. There is a huge space for improvement in the interaction dimension with society, especially when fake news and tribalism are rampant on the social networks, provoking distrust and an easy harbour for populist, and in general, nationalist and anti-European parties.

Natural environment participation in the innovation is limited to the implicit budget assignment commitment of 25%. Other programs especially related to circular economy are crucial, as probably the innovation sector has the best ability to implement them, while starting from scratch.

European Partnerships seem to be the initiatives allowing the joint participation of different actors, including the EU itself, where market, regulatory and policy uptakes are considered jointly with research and innovation.

Anyway, European Union markets are split by comparatively small countries and in some cases by regions, with different regulatory landscapes and rules for functioning, they are fragmented, and it is much more difficult to scale-up companies and overcome the valley of death. Indeed, it is true for talent acquisition across different countries and access to capital. There are very few pan-European VCs ³⁶⁶. The difference is much deeper in what is referred to as the innovation approach of culture—attitudes toward challenging the status quo or risk-taking are very different.

None of the new big tech giants are based in the EU, thus it is rather difficult to harness their deep-pockets for innovation. The platform economy has many depredatory results on economic, social and environmental landscapes, thus the first runner advantages can be overturn by a more balanced and sustainable approach. Following the example of China, many of these platforms, which at the beginning would require significant technological investment can be now quite easily made and replaced by pan-European platforms with more ethical aims (i.e., Facebook).

³⁶⁵ Rodrigo Torralba and González Fernández (n 263).

³⁶⁶ World Economic Forum (n 320).

As it can be seen from this study, EU policy regarding innovation is highly complex, many initiatives are fragmented, others are doubled in several lines of action. The nomenclature is changing quite frequently. It is difficult to track the progress of different initiatives or entities on the web, as each of them seems to be created at a specific point of time (during the project execution period) and not updated very frequently, if at all. Only in some recent cases when policy is discontinued, this fact is stated. If not, checks on other sites to guess what has happened are indispensable. Each policy is presented as the most important and comprehensive one. When objectives are not attained, it is not easy to find explanations, but several forecasts and other future dealing elaborations are very popular nowadays, even if it is obvious that their importance is mainly psychological, allowing everybody to believe that we can somehow control the future which by its nature is not controllable ³⁶⁷.

In the Horizon Europe proposal ³⁶⁸, the criteria of scientific, social and economic impact pathways are taken into account, but from the authors' point of view, they are not seen from the actionable perspective of the actors of each dimension. Scientific imprint is measured as the creation and spreading of high-quality new knowledge, skills, technologies and solutions. Societal impact takes on the implementation of the EU policies and supports the uptake of innovative solutions in society and industry. Economic impact relates to fostering of all forms of innovation, market deployment is especially emphasized in this sense. The matching of these criteria to the aims of each of the dimensions is rather difficult. The science orientation towards the diffusion of new technologies or solutions, can be rather oriented to the industry role. Societal impact is based on the assumption that the EU Policies are a direct instrument focused on society. A collectively intelligent, knowledge-based and future (of work) oriented society objective is missing. Economic impact conveys the impression of being related to the number of innovations entering the market. Addressing global challenges is the aim of all these criteria. These same criteria should be matched on the evaluation side of the

³⁶⁷ Dan Gardner, *Future Babble: Why Expert Predictions Fail and Why We Believe Them Anyway* (The Random House Group ed, Clays Ltd 2011).

³⁶⁸ European Commission, 'COM(2018) 435 Final: Proposal Establishing Horizon Europe - the Framework Programme for Research and Innovation, Laying down Its Rules for Participation and Dissemination' (n 269).

proposals for project budgeting. Close to real-time monitoring is one of the concerns, with the detailed information about the participants and their applications, but cross-cut multidimensional comprehensive perspective is difficult to find.

A monitoring and evaluation system is crucial for the estimation of the innovation policies and FP impact, R&I is recognized as crucial to fulfil the Union priorities, in particular for jobs and growth, the Digital Single Market, the Energy Union and climate action. The evaluation is to be based on the Interinstitutional Agreement ³⁶⁹ in order to “strengthen evidence-base for policy-making”. They are useful, not so much because of the allowance for measurements, but for the detection of the improvements’ possibilities. Some, especially in the business-related field claim that “what cannot be measured does not exist” which the authors consider one of big conceptual problems of our times, as imperfect measurements add a certainty to the ignorance and no respect for the unknown seems to be required (unknown “grey point” in this way ceases to exist in the controlled landscape). As Daniel J. Boorstin said: “the greatest obstacle to knowledge is not ignorance, it is the illusion of knowledge”. Connected to the mechanism of psychologic cognitive dissonance, it is a real scour.

The monitoring and benchmarking of innovation across Europe as well as with its main international partners are implemented through tools as the Innovation Union Scoreboard ³⁷⁰, the Regional Innovation Scoreboard and the Innovation Output Indicator which provide regular updates on the subject. They elaborate several indicators for the innovation assessment. Be that as it may, they are rather static in nature.

The aim of this research is covered by providing the EU innovation policies with historical evolution and structuring. Thus, a dynamic and comprehensive picture of innovation policies in general, and in Horizon Europe in particular, is created, assessed by the actors’ roles in the innovation process and their appropriateness for advancement and sustainability.

³⁶⁹ European Union, ‘Interinstitutional Agreements of the European Union and the European Commission on Better Law-Making’ (n 317).

³⁷⁰ Hugo Hollanders and Nordine Es-Sadki, *2018 European Innovation Scoreboard* (European Union 2018) <<https://ec.europa.eu/growth/sites/growth/files/infographic-innovation-scoreboard-2018-map-full-size.png>>.

This assessment framework can be used for further studies of innovation policies or sectors innovation; for instance, a banking sector case study has already been run ³⁷¹. Nonetheless, it is more oriented towards the developed countries prospect, taking into account good institutional governance and democracy structures. As stated in the original document of innovation model, in the third world countries, some additional factors and processes should be taken into account while others would not be relevant.

Regarding future possible studies, a research of intermediary innovation institutions would be a far-reaching field for research, as there is a foreseen strong correlation between their quality and density on one side and the maturity and structural advancement level of the innovation ecosystems on the other. Notwithstanding, after preliminary revision, the information landscape in this phase is far from a good outlook.

The innovation process perspective is another interesting line for scrutiny, but it would require other materials for innovation strategy examination, Horizon Europe being too general in this aspect.

Probably, from the innovation ecosystems frame of reference, it would be interesting to assess the Future of Work or Sustainability through the lenses of a proposed model, checking different actors and processes for levels of advancement and orientation.

³⁷¹ Kubus (n 275).

6. CHAPTER 3: INNOVATION ECOSYSTEMS IN THE EU: BANKING SECTOR CASE STUDY³⁷²

6.1. INTRODUCTION

Following the establishment of a tentative framework for the structural advancement of the EU Innovation ecosystems³⁷³³⁷⁴, this article provides the views on its banking sector dimension.

In the traditional theories of economics there are three traditional factors of production: land, work and capital³⁷⁵³⁷⁶. In recent times, however capital is inexorably taking the lead and diminishing the participation of other factors in the global income (or the distribution between profit and wages and thus inequality)³⁷⁷³⁷⁸. Not surprisingly, there is a huge capital ownership concentration.

In this sense, banking sector is different from the other sectors because of its direct relation to money and crucial structure providing for capital and thus for capitalism.

³⁷² This chapter was published as an article in the Revista Universitaria Europea (RUE), N30 [2019], ISSN 1139-5796.

³⁷³ González Fernández, Kubus and Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment' (n 270).

³⁷⁴ González Fernández, Kubus and Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment' (n 270).

³⁷⁵ Smith (n 13).

³⁷⁶ Smith (n 13).

³⁷⁷ Rushkoff (n 229); Thomas Picketty, *Capital in the Twenty-First Century* (Harvard University Press 2014) 33;298.

³⁷⁸ Rushkoff (n 229); Picketty (n 377) 33;298.

Money in principle is understood as a mean of exchange ³⁷⁹, an advancement to direct exchange of goods (value) called barter. It can be almost anything, however some consider money only as a mean through which the taxes can be paid. Money is also a unit of account; or ‘a common denominator of values’ ³⁸⁰ as the value ³⁸¹ of the things is reported in terms of money. There are many issues regarding this function of money as some consider that this is question of social convenience, and value is not really linked with the price expressed in monetary terms. Adam Smith distinguishes between ‘value in use’ and ‘value in exchange’, stating furthermore that ‘the things which have the greatest value in use have frequently little or no value in exchange; and, on the contrary, those which have the greatest value in exchange’ ³⁸². Likewise, due to the commodification of our lives, this difference is being subject to heated discussions. There are quite many that consider that currently we assist to a deepening process of unlinking the value with its monetary expression, i.e. money. The third function of money is the store of (easily exchangeable) value ³⁸³, however changing with inflation or deflation. There are also different types of money: commodity one (with an intrinsic value) and fiat (currency) money which value is backed by some authority as state. In this document, we also provide for other distinction between the central and (antonymic to it) local currency ³⁸⁴. What is a basic condition for money is its acceptability.

Money supply is defined as “the total quantity of money in the economy at any one time”³⁸⁵. The easiness at which the money can be converted into currency is called liquidity. There are several measures of money, starting from the narrower one, called

³⁷⁹ J Laurence Laughlin, *The Principles of Money* (Original 1, Cambridge University Press 1919); Frank A Fetter, *The Principles of Economics, with Applications to Practical Problems* (Online edi, The Century CO 1905) 61; Smith (n 13).

³⁸⁰ Fetter (n 379) 64.

³⁸¹ Laughlin (n 379).

³⁸² Smith (n 13) 16.

³⁸³ Fetter (n 379) 65.

³⁸⁴ Rushkoff (n 14).

³⁸⁵ <https://open.lib.umn.edu/principleseconomics/chapter/24-1-what-is-money/> (Consulted on December 10th, 2018).

M1 to the widest one called M4. The question is that the money related to real economy (M1-M3) are only a small fraction (2-5% depending on author, date or location) of the wider expression of monetary supply, i.e. M4, being the money in place on the financial markets.

According to Schumpeter and Laughling³⁸⁶, credit should mobilise capital and make it more efficient, in this way leading to an increase in product, it shouldn't increase the available capital³⁸⁷.

Besides, banking is mainly concentrated on the provision of purchasing power to the entrepreneur, banks are the bookkeeping centre of the economy and act as society accountants. Hereby there will also be provided a theory³⁸⁸ where banking sector is also the principal source of money creation by credit expansion. Banking is traditionally rather a conservative sector, because this is where money or the value is stored and redistributed. These are serious question and the innovations are not being taken easily into account.

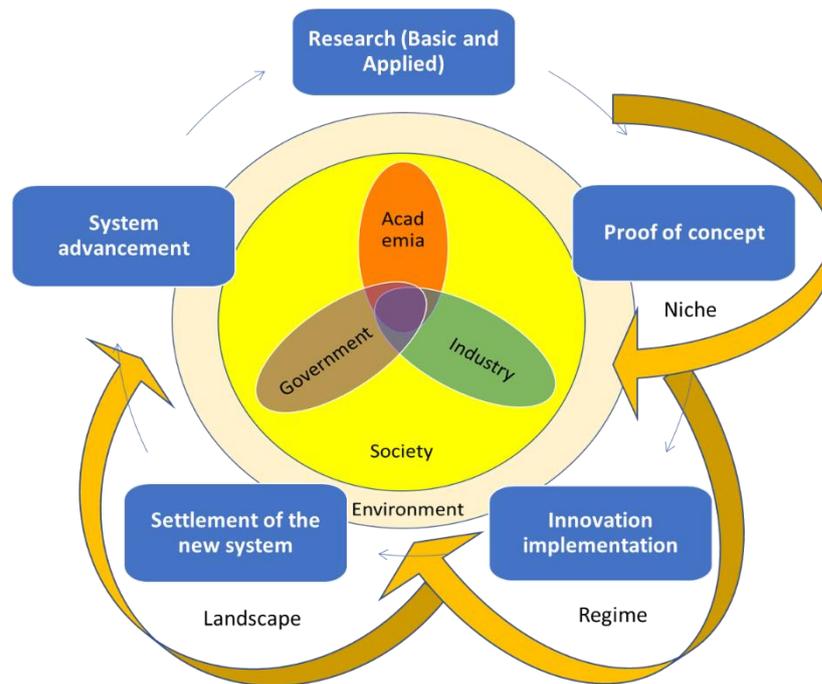
As in the other innovation ecosystem we are seeing the five main actors: Government (the European Union level), Academia (scholars' views), Industry (banks and recently fintechs), together with Society and (Natural) Environment. Responding to global megatrends such as social change; shifts in global economic power; climate change and technological breakthrough, in this research of innovation ecosystems these dimensions and their views and ongoing innovation efforts are going to be studied in order to reach an overall, comprehensive picture, not so much detailed but providing in this way new insides.

³⁸⁶ Laughlin (n 379).

³⁸⁷ Joseph Schumpeter wrote that if the entrepreneur is the (Spartan) king, the bankers are the Ephors of the Market, who were leaders together with the kings (p. 182) due to their ability of awarding the purchasing power. As a curiosity, he even stated that it can be said that Banker creates money through the creation of claims against themselves (p.181).

³⁸⁸ Richard A Werner, 'How Do Banks Create Money, and Why Can Other Firms Not Do the Same? An Explanation for the Coexistence of Lending and Deposit-Taking' (2014) 36 International Review of Financial Analysis 71.

Figure 6-1: Innovation Loop with actors involved



Source: Chapter 1 ³⁸⁹

6.2. INSTITUTIONAL FRAMING FOR BANKING IN THE EU AND ITS CHALLENGES

Hereby the institutional framing for banking is studied on the EU level, mainly from legal and historical perspectives, providing also for the challenges facing the banking sector.

³⁸⁹ González Fernández, Kubus and Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment' (n 270).

Legal bases for the monetary and banking policy in the EU

The European Union wants to advance toward an economic and political Union. However, so far advancements were done mainly in the economic arena. This is primarily achieved through fiscal and public spending policy line and the other line is the monetary policy³⁹⁰. The developments of these and other EU policies are characterised by their different speeds in geographic and policy matters implementation, which can be one of the main reasons of disequilibria observed mainly during the unfavourable conditions, i.e. crisis. The main EU objective is to coordinate the efforts of its Member States (MS) in order to avoid frictions, which can be distorting the competence or leading to the tax evasion, or corruption. One of the important aims is also to guarantee the democracy rule, very important in view on new resurgence of populism in Europe and in general all over the world.

The aims of the economic union are fixed in the point 3.3. – Internal Market of the Treaty of the European Union and 3.4. for economy and monetary union with euro as currency establishment³⁹¹. This is furtherly developed in the Treaty on the Functioning of the EU (TFEU)³⁹², economic policy being regulated between the articles 119 and 126. As stated in the article 119.3 ‘(...) *these activities shall include a single currency, the euro, and the definition and conduct of a single monetary policy and exchange-rate policy the primary objective of both of which shall be to maintain price stability and, without prejudice to this objective, to support the general economic policies in the Union, in accordance with the principle of an open market economy with free competition*’³⁹³. In the further points the will of cooperation in policy terms of the MS is stated, the EU Council is given the power of intervention in case of difficulties, and the European Central

³⁹⁰ MA Muñoz and A Santamaría, *Política Económica , Financiera y Fiscal 2017* (Centro de Documentación Europea 2017).

³⁹¹ Council of the European Union, ‘Consolidated Version of the Treaty on the Functioning of the European Union’ (n 293) 5.

³⁹² European Union, ‘Consolidated Version of the Treaty on the Functioning of the European Union’ (2010) 20007/C 30 Official Journal of the European Union 155 <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:115:0047:0199:en:PDF>>.

³⁹³ European Union, ‘Consolidated Version of the Treaty on the Functioning of the European Union’ (n 392) 52.

Bank is forbidden to authorize the overdrafts in order to create a stable banking system. The monetary policy is defined in the articles 127-133 of the TFEU.

History of the monetary and banking policy in the EU

As for the history of the monetary and banking Union, it can be started with Bretton Woods ³⁹⁴ agreement reached in the 1944. In the 1960s, several theories emerged, among them the ‘optimum currency areas’ ³⁹⁵ by Robert Mundell which was and still is a (not reached) model for the EU. In this decade, severe turbulences were observed, causing the appreciation of the German Mark and depreciation of French Frank. They were threatening the objectives of prices stability in the EU, so that, in 1968 the Barre Plan ³⁹⁶ is proposed, stating the economic integration in three phases: monetary integration, fiscal union and common budgetary policy. In the 1970s, collapse of the Bretton Woods System and the renewed need of monetary stability due to the aforementioned crisis lead to the establishment of the ‘currency snake’³⁹⁷ or ‘the snake in the tunnel’ which was aimed to limit the exchange-rate fluctuations and is considered as an essential first step for the monetary union establishment. The fluctuation was furtherly being limited afterwards and in the 1978 a European Monetary System (EMS) with its European Currency Unit (ECU) was created. In 1995 the decision was reached to replace the accounting currency by euro, which was introduced in 1999. The Single European Act ³⁹⁸ of 1987 was another relevant however collateral step for progressing in the EMS; Exchange Rate Mechanism – ERM, Financial Support Mechanism – FSM and European Monetary Cooperation Fund – EMCF were the based supporting institutions for the EMS.

³⁹⁴ John H Williams, ‘The Bretton Woods Agreements’ (1945) 21 *Proceeding of the Academy of Political Science* 40.

³⁹⁵ Robert a Mundell, ‘A Theory of Optimum Currency Areas’ (1961) 51 *The American Economic Review* 657 <<http://www.jstor.org/stable/1812792>>.

³⁹⁶ Elena Rodica Danescu, ‘The First and Second Barre Plans’ [2012] *Cvce* 1 <http://www.cvce.eu/obj/the_first_and_second_barre_plans-en-a27c0587-77ad-479e-a644-cb56dbaf9c90.html>.

³⁹⁷ (European Parliament, 2015)

³⁹⁸ Council of the European Union, ‘Single European Act’ (n 288).

Delors Report ³⁹⁹ produced in the 1989 marked a milestone in the EU construction. It propelled the adoption of Maastricht Treaty⁴⁰⁰ on the European Union with its criteria on harmonization or requirements to enter the EMU and eurozone. In 1994 the EMCF is replaced by European Monetary Institute ⁴⁰¹ which is the forerunner of the ECB together with European System of Central Banks (ESCB), being replaced in the 1998. The stability and growth pact proclaimed in Amsterdam in 1997, introduced further budgetary policy coordination and constraints. In the same year Eurogroup was created to coordinate economic policy. In 1999 there were 11 countries to enter the eurozone: Germany, Austria, Belgium, Spain, Finland, France, Holland, Italy, Luxembourg and Portugal, in 2001 joined by Greece, in 2007 by Slovenia, 2008 by Cyprus and Malta, in 2011 by Estonia and 2014 by Latvia. In year 2002 European Central Bank (ECB) was consecrated, legally based on articles 127 and 282 of TFEU, and Euro entered into circulation, it is also a currency in small states like San Marino, Monaco, Vatican City, Kosovo, Montenegro and Andorra. The provisions regarding Euro placed in the failed European Constitution of 2006, entered into force in the Lisbon Treaty ⁴⁰² of 2009.

The introduction of Euro allowed for increasing competitiveness and investment in the EU thanks to prices stability and transparency, elimination of transaction costs and exchange rates fluctuations and associated risks, i.e. reinforcing the single market, however as a counterpart causing the National Central Banks transfer of powers (necessary especially in cases of asymmetric shocks) to the ECB and the EU. It was also responsible for the inflation and increase in the cost of life, especially in the poorer countries of the eurozone, due to the prices rounding and related to the exchange of old currencies, i.e. money laundering as well as reinforcing the real estate speculative bubble.

In 2008 the financial crisis hit the global economy, starting with the ‘subprime mortgages’ crisis. The ECB together with some National Central Banks coordinated to

³⁹⁹ Jacques Delors, *Report on Economic and Monetary Union in the European Community* (1989).

⁴⁰⁰ European Communities (n 289).

⁴⁰¹ EMI, ‘The European Monetary Institute’ (1997).

⁴⁰² EPC (n 291).

reduce the interest rate and also proceeded with financing injecting liquidity to the economy. The failure of the Lehman Brothers caused the menace of bankruptcy of several banks.

In 2009 the De Larosière Report⁴⁰³ was presented analysing the crisis and proposing several measures, especially on the new structure of financial supervision. In 2009 G20 decided to deepen the European cooperation in this area. In 2010 European Financial Stability Facility (EFSF) was created and the provision for stability in the eurozone was added to the article 136 of the TFEU. ‘Economic Governance’ terms were established in a new framework, due to the amendments of the aforementioned article 136 but also 126 of the TFEU. In 2013 The Treaty on Stability, Coordination and Governance⁴⁰⁴ (called also European Fiscal Pact) in the EMU was approved. Due to this underpinning, the eurozone countries through European Commission and ECB, together with International Monetary Fund (IMF)⁴⁰⁵, called altogether ‘troika’ offered rescue for several countries, starting with Greece, Portugal, Ireland, Spain and Cyprus. After Greece rescue, European Fund for Financial Stability (EFFS) was created, and after that, also the second temporary entity called European Mechanism for Financial Stability (EMFS). In parallel during the crisis the Euro Plus Pact⁴⁰⁶ was introduced in 2011 and it in turns gave way to the entry in 2012 of the European Mechanism for Stability which replaced both temporary institutions in 2013. In 2011 ECB bought for first time the public (and private) debt. At the same time the BCE also started with Long Term Refinancing Operations (LTRO) borrowing banks the funds for only 1% interest rate for 3 years and Quantitative Easing (QE), buying directly and massively public and private bonds at the secondary market.

⁴⁰³ Ágnes Nagy and others, ‘The de Larosière Report Regarding the New Structure of European System of Financial Supervision’ (2010) 11 *Theoretical and Applied Economics* 5.

⁴⁰⁴ European Commission, ‘Treaty on Stability, Coordination and Governance in the Economic and Monetary Union’ 25.

⁴⁰⁵ Sara González Fernández, *Organización Económica Internacional. Relaciones y Organismos Fundamentales* (Pirámide 2002).

⁴⁰⁶ European Commission, ‘The Euro Plus Pact’ [2015] EPSC Strategic Notes 1.

As a Pact for Euro measure European Council approved a ‘six pack’⁴⁰⁷, where three relevant institutions are created: European Banking Authority (EBA), European Securities and Markets Authority (ESMA) and European Insurance and Occupational Pensions Authority (EIOPA). Other measures were: European Systemic Risk Board (ESRB) constitution, together with the adoption of the directive 2011/85/UE⁴⁰⁸ on requirements for budgetary frameworks of the Member States.

The financial system can be considered stable if it functions normally and has the capacity to limit and resolve imbalances produced in any of its three components: infrastructure (legal, payment, settlement or accounting systems), institutions (banks and securities companies) and markets (stock exchanges, bonds, money and derivatives)⁴⁰⁹. This stability is controlled through the price (around 2% inflation) and public debt of MS.

The essential element of the European monetary policy is the Banking Union. In 2013 Single Supervisory Mechanism (SSM) is created with the ECB and National Competent Authorities (NCAs) or National Central Banks (NBCs) with the aim of prudential supervision of all credit institutions⁴¹⁰. Another important institution is the Single Resolution Board (SRB) that together with NCAs forms Single Resolution Mechanism (SRM). The general objective of SSM is that the future rescue needs of the banks could be covered thanks to their own contributions and stay out of the EU budgetary framework. In 2015 Deposits Guarantee System (DGS) is also introduced for its implementation till 2025.

In 2017 White Book on the Future of Europe⁴¹¹ was produced, where the completion of the Banking and Capital Markets Union is envisaged through the SRF and DGS together with the risk reduction in the financial sector, through the Single

⁴⁰⁷ European Commission, ‘EU Economic Governance "Six-Pack " Enters into Force’ (2011) 126 Press Release Database 1 <http://europa.eu/rapid/press-release_MEMO-11-898_en.pdf>.

⁴⁰⁸ Council Directive No 85/2011, ‘On Requirements for Budgetary Frameworks of the Member States’ (2011) 2011 Official Journal of the European Communities 41.

⁴⁰⁹ Muñoz and Santamaría (n 390).

⁴¹⁰ European Central Bank, *Guide to Banking Supervision* (2014).

⁴¹¹ European Commission, ‘White Paper on the Future of Europe’ (2015).

Supervision of the Capital Markets or the possibility of creating financial instruments backed by Euro.

New Strategy Europe 2020⁴¹² introduced the European Semester, which is the instrument where the EU is giving its recommendations to the Member States of the eurozone. The priority is the progress in the banking union. In this sense the European Commission created also a Structural Reform Support Program (SRSP)⁴¹³ which is coordinated by the Service (SRSS).

In 2014 Juncker Plan⁴¹⁴ for Investment in the EU was proposed where new measures for mobilising public and private capital to address investment gaps in Europe, mainly the creation of the Fund for Strategic Investment (EFSI) integrated in the European Investment Bank (EIB). In 2018 the EU Commission proposed to replace Juncker Plan with existing instruments into 'InvestEU' Fund⁴¹⁵ with more focus on benefitting poorer countries and regions⁴¹⁶.

Apart from the ECB and NCBs, there are also special, dedicated bodies in the main EU Institutions. In the European Parliament, it is the Committee on Economic and Monetary Affairs (ECON) which is in charge of the corresponding legislative part. In the European Council it is the Economic and Financial Affairs Council (ECOFIN), in charge of policies coordination. In this framework of action, European Court of Auditors elaborates the report on the correctness of budget spending.

⁴¹² European Commission, 'EUROPE 2020. A Strategy for Smart, Sustainable and Inclusive Growth' (2010) Brussels Com(2010) 2020 Commission of the European Communities <http://ec.europa.eu/europe2020/index_en.htm>.

⁴¹³ https://ec.europa.eu/info/funding-tenders/funding-opportunities/funding-programmes/overview-funding-programmes/structural-reform-support-programme-srsp_en (Consulted on December 10th, 2018)

⁴¹⁴ https://ec.europa.eu/commission/priorities/jobs-growth-and-investment/investment-plan-europe-juncker-plan_en (Consulted on December 10th, 2018)

⁴¹⁵ <https://www.euractiv.com/section/economy-jobs/news/goodbye-juncker-plan-hello-investeu-europes-new-investment-fund/> (Consulted on December 10th, 2018)

⁴¹⁶ <https://www.euractiv.com/section/euro-finance/news/juncker-plan-becomes-friendlier-to-poorer-eu-members/> (Consulted on December 10th, 2018)

The point with all this complex banking architecture is whether the institutions mandates have sufficiently agile and well-targeted decision bodies (not too large or with too many different interests involved), and their instruments are strong enough to effectively execute corrective actions when needed. ‘Comply or explain’ mechanism is the one functioning at the EU banking union. The ECB seems to be in this sense better equipped than the ESRB in the matter of macroprudential reaction, but it is ESRB that is set up as a body for the supervision in the banking sector⁴¹⁷. In the ECB, however there can be a risk of conflict between the monetary and supervision roles. Allocation of central power (with subsidiarity principle) for asymmetric interventions seems a reasonable option mainly due to lesser influence of particular political interests, however the errors which in principle will be amplified are going to be supported mainly by the national states.

Several Basel III principles were introduced inside the EU Banking Union toolkits. New capital instruments were introduced to limit the credit growth, leverage thus limit the procyclicality. Higher capital requirements were introduced also for important financial institutions in order to cover systemic risks and also to reduce procyclicality, and better risk assessment for the sectors like real estate. Integrated financial markets can absorb many local shocks, 70% in case of the US and only 25% in case of the EU because of the lower integration level⁴¹⁸.

6.3. EU BANKING SECTOR ON INNOVATION AND ITS CHALLENGES

⁴¹⁷ <https://www.weforum.org/agenda/2015/06/how-to-improve-europes-financial-supervision/> (Consulted on December 10th, 2018).

⁴¹⁸ <https://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp180919.en.html> (Consulted on December 10th, 2018).

This chapter is concentrated on the description of the challenges facing the banking sector, as perceived by the economic players, i.e. banks themselves. Their aim and thus point of view in this sense are different, in their case it is the profitability for shareholders and service provision for customers.

Due to the ongoing digitalization of the economy which is the main source of the innovation in the sector, we need to understand that there is an implication of the physicality and adjacent slowness and limitedness of the assumptions of the physical model and the speed, immediateness and virtually almost no limits of the virtual/digital world. Changes can become massive and instantaneous, thus in many cases bank leverage becomes even more dangerously procyclical and not countercyclical. Technically there are no limits to that others than regulatory rules. It is especially relevant during the boom periods of financial cycles, when banks lend too much and in the crises times it becomes the opposite.

In principle the banks follow their own assessment of the new credits for their profitability and solvency. The question there is to assume what is widely considered a reasonable risk and not the process or model of risk assessment as a such. The grey zone (or the zone for the manual decisioning, at least in the consumer credits) is almost always quite large and also depends on the managerial dispositions, predisposed to the ‘herd effect’. Furthermore, too conservative assessment of the loanability of the applicants is equalled at boom times with ‘wasting market opportunities’. Thus, this was probably the main issue in the subprime market crisis, it is not that banks were not doing a good assessment, the point is that the admission thresholds were installed too low.

EU Banking sector and its environment pressures

Banking in Europe is currently exposed to many pressures, some of them are particular to Europe, some are global. The short-term challenges for the banks include⁴¹⁹: political and economic outlook, interest rate or taxes evolution, the inherited unproductive assets or changes in regulatory requirements.

⁴¹⁹ Miguel Fernández Ordoñez, ‘El Futuro de La Banca: Dinero Seguro y Desregulación Del Sistema Financiero’, *Seminario sobre el Futuro de la Banca (6 de febrero)*. (Fundación Ramón Areces 2018) 1.

At the political level, many recent developments (also due to digitalization of the society) suggest that moderation is replaced with polarization, because of the social media tendency of exacerbating the information to reach the audiences, none instant (physical) personal feedback, especially of the opponents. Moreover, realism/truth is replaced with ideology of pertaining to a tribe. These tendencies are followed by irrational model of decision making on the political arena and related high political risk which needs to be taken into account.

Risk management is evolving from mainly considering ‘value at risk’ and careful evaluation of risk scenario to the incorporation of more variables and preparation for a wider range of situations (scenario analysis and stress tests). Especially the risk of retreat from the globalization causes the need of changing the operational models of companies. In case of banking sector, it is embodied by subsidiarization, which require independently capitalized and governed subsidiaries and thus it is making international operations increasingly difficult and costly. It is mirrored by the branch approach in the international arena, which point toward more dependence but also implication in support from the parent company, especially in the crisis situation. The subsidiarity requirements were supposed to ensure that foreign (international) banks were not going to bring the crisis to the host country, providing their subsidiary with sufficient capital, liquidity, and accompanying governance ⁴²⁰.

As for the urgent issues, at the EU level, Brexit is one of the uncertainties that are being faced. London was traditionally a main financial centre due to its history, infrastructure and know-how. Even for the ECB it is probably not going to be easy to handle the influx of new bank applications and revision of internal capital models. UK was playing a key role especially in what regards the United States-EU financial worlds relations. Many banks from the United States being a first order global players have established their branches in London, to passport their operations on the EU markets. Depending on the outcomes of Brexit negotiations and agreements, this situation can change, the point is if the EU will be willing to maintain its financial centre offshore. New

⁴²⁰ Dennis Andrade and others, ‘The Changing Shape of International Banking and the Future of Europe’ 19 10.

operational centre could be established in principle in willing France or Germany ⁴²¹, which however seems rather hesitant in its confidence towards the banking sector in general (speculation, instability, etc.). Another indirect consequence can be found in the changing approach of the European policy without the UK opinion being considered (as the main opponent mainly) to progress in the integration and other welfare state measures, i.e. financial transaction tax, convergence of labour laws and social justice and welfare.

GDPR – General Data Protection Rules, PSD2 – Second Payment Services Directive which liberalize the access to banking data are being implemented at the EU level, however there are also MIFID II or Basel III or IV requirements at the world level.

Regulations seems to be highly fragmented (some even place them under risk of ‘balkanization’) ⁴²², also due to the regulatory arbitrage, i.e. the implementations of regulations and supervisory standards have always differed across the EU. These and other EU and global regulations (for example, European Comprehensive Assessment, bank stress tests; the market discipline triggered particularly by the need for capital raising ⁴²³) require the banks to concentrate on the changes that are not directly related to advance the customer base and services. Banks much more than many economic actors need to run in order to stay afloat. Low interest rates imposed by the ECB had also the consequence of making the net interest margins very low, thus returns have been suppressed and banks concentrated on their base costs. As consequence, many banks struggle to cover their cost of capital.

Bank as a service is threatening with the disintermediation with the customer, implying also the commoditization of the financial services, banks become ‘utilities’⁴²⁴. Banking products in turn become commodified mainly due to their standardization partly imposed by the legislative framework, and the commodity business require scale in order to survive. As probably foreseen by the legislators, standardization make the sector

⁴²¹ Andrade and others (n 420) 7.

⁴²² Andrade and others (n 420) 8.

⁴²³ PwC, ‘The Future Shape of Banking Regulation. Time for Reformation of Banking and Banks?’ (2014).

⁴²⁴ Andrade and others (n 420).

simpler and more prone to aggregated comparisons. Defensive mergers⁴²⁵ to acquire scale are however not an easy response, especially bearing in mind that the legislator wanted to make big banks smaller.

In the meantime, American wholesale banks are becoming bigger, as their EU counterparts concentrate more on wealth management and local retail banking instead of investments. European Banks however maintain their comparative advantages, i.e. ‘proximity to EU clients, strong asset management and wealth businesses, strength in credit cards and the application of fintech in retail banking’⁴²⁶.

Inside view on banking sector innovation

This view is a perspective presented mainly on the Innovation Forums. There can be distinguished several pillars of digital transformation⁴²⁷ in banking. Some of them are persistent during the times of digitalisation, others have rather a short-term life, being a hype only for shorter periods of time.

Omnichannel, also called multichannel banking implies the access of the consumer to banking services through digital media i.e. web, phone or branches, each of them has different customer experience expectations and should be adopted to their particular requirements, however in principle they should be developed once and then distributed through a central hub to orchestrate customer interactions, also between them. The issue around them is also called ‘customer journey’⁴²⁸.

The operational efficiency can also be gained through the use of software on the cloud with its more efficient use of processing power (on demand).

Modular architecture is also one of the characteristics proudly stated by many that is however truly difficult to achieve. The truth behind is that most of the banks hold a

⁴²⁵ Juan Mascareñas Pérez-Iñigo and Sara González Fernández, ‘Las Oleadas de Las Fusiones y Adquisiciones de Empresas: Análisis Retrospectivo Comparado’ [2013] RUE: Revista Universitaria Europea 87 <<https://dialnet.unirioja.es/servlet/articulo?codigo=4682814>>.

⁴²⁶ Andrade and others (n 420) 13.

⁴²⁷ Capgemini Consulting Group, ‘Trends in the Global Banking Industry 2013. Key Business Trends and Their Implications for the Global Banking Sector.’ (2013).

⁴²⁸ <https://internationalbanker.com/banking/key-banking-trends-watch-2018/>

central big core system which is an amalgam of computing mainframes, built decades ago, stitched together along mergers and acquisitions, additionally with some minor modules, which can be more parametrized and, in some configurations, not used, at least apparently, i.e. performing with some pre-set data. This is one of the main reasons of the so called, technological debt of the banks and the poor cost effectiveness of their IT systems based on the programming languages (Cobol, for instance) on the brink of extinction, at least as the outsourcing is ongoing and the functional knowledge is naturally dying with the natural professional replacement of work forces. Intricated complex systems of different ‘modules’ are not prone for the diving in what refers neither to their relations with the business activities of the banks and regulatory requirements either. In short, they are heavy and difficult to replace, also due to the long-term life of some outdated and complex products (mortgages), still in legacy. Nowadays it is also associated with the agile as opposed to waterfall projects running. However, agile is here rather wilfully applied to subject matters that are in no sense easy to move, light or flexible.

Big data and advanced analytics⁴²⁹ processes can however offer the chance to orchestrate the exchange of the information between modules and the world. Smart banking as another trend is related to big data and data science, with origins in KYC – Know Your Customer. This allows for the offer personalization based on the customer knowledge with the data from and outside the bank (i.e. from Facebook or other platforms readily selling the customer data, which however – due to the customer protection regulations - requires the depersonalization reverse procedures, only accessible to big entities).

Internet of Things is, especially in banking, on the stage of cloud of ideas, not saying anything about the Artificial Intelligence use, which, apart from being a hype also in the EU, is currently and mainly used for self-learning algorithms spreading associated with Machine and Deep Learning. As every tool used for knowing the future by the supposition that it will be like the past, its tendency is to maintain and reinforce the current and even past status quo without proper counterfeiting of the past tendencies, i.e. gender inequality, wealth inequality, making them however less transparent and more obscure

⁴²⁹ <https://thefinancialbrand.com/69180/2018-top-banking-trends-predictions-outlook-digital-fintech-data-ai-cx-payments-tech/all/>

and difficult to detect or to manage. So far, there are no proposals of their auditing by the regulators (for their construction assumptions but also for the outcomes they produce).

Open banking is another trend setter in the sector. APIs or Application Programming Interfaces are being introduced by many banks as mainly the answer to the requirements for payments (PSD2) and customer portfolio management across banks, especially when these are external ones. When properly set they should open the gate to the disintermediation and financial innovation, i.e. access to data by third parties, like fintech companies. Sometimes put as remedy to all, this architecture is also not a remedy for everything, especially in a complex and high-risk involving environment, having difficulties to run well inside the banks, a time will be required to make them work effectively.

Cyber risk mitigation is new on the list, together with the collateral question of banking system integrity.

Previously it included also the gamification or wearable technologies⁴³⁰, which are currently retired from the visible and presented stake. Personal financial management seems to be overtaken by the fintechs already. However, the reluctance of customers to switch, the regulatory barriers and the scale of operations are supporting the maintenance of the existing status quo of the banking sector landscape.

Fintechs and the EU Banking Sector

There is a new ‘Fintech Action Plan’⁴³¹ published on March 2018. Fintechs (Finance & Technology) are understood as ‘technology-enabled innovation in financial services’. As stated in the document, this action plan has synergies with other EU initiatives such as Digital Single Market⁴³² and cybersecurity⁴³³ strategies, eIDAS

⁴³⁰ Efma; Infosys, ‘Innovation in Retail Banking. Delivering Superior Customer Value.’ (2014) <<http://ideas.repec.org/p/wop/pennin/97-48.html>>.

⁴³¹ European Commission, ‘FinTech Action Plan: For a More Competitive and Innovative European Financial Sector EN’ 51.

⁴³² European Commission, ‘A Digital Single Market Strategy for Europe’ 20.

⁴³³ JOIN, ‘Resilience, Deterrence and Defense: Building Strong Cybersecurity for the EU’ 21.

regulation for the electronic identification⁴³⁴, but also to Consumer Financial Services Action Plan⁴³⁵ or Capital Markets Union mid-term review⁴³⁶. However, there it is still difficult to see a clear legal framework, more than for crowdfunding services⁴³⁷. The thoroughly applied mantra of ‘run fast and break things’ is not particularly well suited for the banking sector, where a serious breach brings together a high risk of undermining the overall confidence in the banking sector. The safe interconnectivity already mentioned in the point about ‘Open Banking’ and APIs is a key. In principle traditional banks should be able to allow outside developers to access the data from banking platforms under controlled conditions, especially in what refers to payments due to the PSD2 directive.

It is a good example of the way that traditional and newly establishing sector of technical and quasi-financial start-ups can work together in a no zero cost game (in principle benefitting both sides but especially the customers). Of course, banks can provide their own APIs for the outsiders’ reach. However, as the field develops due mainly to the legal pressure, we can observe the emergence agreements with ‘data aggregators’ which are specialised middlemen companies. They collect the data from banks and other data sources (like big tech companies), organise them and offer their own suite of open APIs to other developers from outside. In this way, banks and fintech can enter into individual agreements with specific technology providers and data aggregators, developers in order to fulfil their business and legal needs. Banks can of course always limit type of data, how (some specific third-party’s suite of products) and with whom it is shared.

⁴³⁴ Euro-Lex, ‘Regulation (EU) No 910/2014 on Electronic Identification and Trust Services for Electronic Transactions in the Internal Market and Repealing Directive 1999/93/EC’ (2014) 58 Official Journal of the European Union 42 <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.257.01.0073.01.ENG>.

⁴³⁵ European Commission, ‘Consumer Financial Services Action Plan: Better Products, More Choice’ 15 <https://ec.europa.eu/info/publications/consumer-financial-services-action-plan_en>.

⁴³⁶ European Commission, ‘Mid-Term Review of the Capital Markets Union Action Plan’ 22 <https://ec.europa.eu/info/publications/mid-term-review-capital-markets-union-action-plan_en>.

⁴³⁷ <https://es.fundspeople.com/news/innovation-hubs-y-sandboxes-como-facilitadores-de-la-innovacion-en-el-sector-financiero?sf184730537=1>

On the other hand, especially in the customer portfolio aggregation and management business, data aggregators and fintech developers can directly ask consumers to give them their online banking logins and passwords, then through the process commonly called “screen scraping”, data aggregators log onto banks’ online consumer websites, as if they were the actual consumers, and extract information. Banks have difficulties distinguishing them from actual consumer logging or cyberattacks⁴³⁸. The European Payment Directive or PS2 in a broader meaning can also bring the ‘unbundling’ between deposits and payments. It makes visible that the deposit activity does not provide any appreciable added value. The valuable services are the payments services. This is one of the tendencies that put current banking system in question and prone to ‘commoditization’. Instead of having customer ‘unsafe’ deposits, private companies can use insurances. On the other hand, these services could improve thanks to increased competition, shrinking current concentration which makes the system very fragile.

Another dimension, in the boarder with the society is crowdfunding, which implies looking for the financing in the crowd instead of traditional banks. Both forms of financing can coexist (even in the same crediting).

Cryptocurrencies, Blockchain and Smart Contracts

Concepts of Blockchain and cryptocurrencies are currently correlated in the public imaginary due to their history. As the original and best-known cryptocurrency, i.e. BitCoin is built on the blockchain architecture. Blockchain technology can be seen as a distributed, encrypted and anonymous ledger operation, when thinking about buying and selling. Nonetheless, another plausible use of the blockchain is to make a public, unalterable, undeletable signed statement, that can be ‘published’ to the block chain— instead of the distributed ledger applying more a diary notion. In theory, these could be used this for recording vote tallies, verifying the origin of diamonds or brand-name gear, verifying people’s identity, resolving the ownership of domain names, keeping items in escrow, disclosing provisional patents under seal, notarizing documents, and so on. In brief, it is seen as suited for the use in different kinds of transactions which previously

⁴³⁸ Lael Brainard, ‘Where Do Banks Fit in the Fintech Stack?’, *New Developments in Consumer Finance: Research & Practice* (2017).

were in need of an official intermediary body (middle men) and now could be replaced by direct and thus (in principle almost) costless and instantaneous peer to peer transaction. The point here is that every operation is reflected on the computers of all the system users and, in this way, they cannot be manipulated. Encrypting information, storing it forever, and replicating it across the entire network can however be also seen as a big overhead relative to what is actually trying to be accomplished.

Currently this middlemen function is covered by some government-backed entities, for instance, clearing houses in case of payments. It seems that they do however provide many other value-added services, especially in what relates to such a delicate issue as money. In general, the question with building the system is not in the so called 'positive path' when everything goes as foreseen but in case of 'negative paths' when something goes wrong, and it can be interrupted at some point, needs to be reversed and especially needs to fulfil audit standards and allows for investigation when required so. For instance, anti-money laundering in place in current banking systems entities, are designed to prevent and disrupt terrorist financing and (organized) crime. Cryptocurrencies being of a recent use and faithful to the reigning minimum value proposal, are instant and irreversible, furthermore private-key authentication is far from being perfect as it relies on a single-point encryption and not a more sophisticated and secure system involving for instance a two-factors authorization, intrusion detection, volume limits, firewalls, remote IP tracking and the ability to disconnect system in case of an emergency such as cyberattack, for instance. Customer and investor protection thus seem at risk. The cryptocurrencies in principle are a digital currency (as the 95% of currently used currencies), with the same aim of exchanging and also storing the value. In case of BitCoin it is being created with a use of an algorithm which with time is in need of more processing power, time and energy to produce each currency unit (called mining), and one day this possibility is foreseen to be exhausted. However, this is an interesting characteristic, differing from fiat money, with its impact not really studied so far.

As for the payment system, it seems that current payments systems such as Visa and Mastercard are providing several already pointed out value-added services, related to fraud (tracking) and the identity verification on both sides of the operation (buyer and seller). The problems of speed and energy consumption are important here as with the

processing power of today some estimate⁴³⁹ that if the current Visa transactions were replaced by BitCoin, it would need so much energy as the rest of the world altogether. What's more Visa can handle 60 thousand transactions per second, while the BitCoin historically taps out at 7, consuming for that 35 times more energy than Visa. Similar is the question with micropayments and bank-to-bank transfer, with BitCoin they are neither free nor instant. Nowadays, they take about 8 minutes to clear and 4 cents to process⁴⁴⁰. New companies have also begun creating other blockchain-based 'coins' convertible into company stock and selling them to the public in Initial Coin Offerings, or ICOs, as a cheaper and more flexible way to raise money than a traditional Initial Public Offering, or IPOs, of stocks on an exchange. 'Smart contracts' are contracts written as software, rather than written as legal text. Because you can encode them directly on the blockchain, they can involve the "self-executing." transfer of value based directly on the cryptographic consent of the parties involved. And in theory, contracts written in software are cheaper to interpret—because their operation is literally mathematical and automatic, there are no two ways to interpret them, which means there's no need for expensive legal battles. Here, the question is also with the previously described 'negative path' or 'grey zone' of meanings where human intervention is required.

Regulatory Sanboxes and RegTechs

This part is relevant as an interconnection between the institutional and business sphere (traditional sector innovations and technology start-ups) in banking but also other sectors of the economy. As already stated, the question of the legal burden of the traditional financial companies is being constantly raised by them in the opposition to the new fintech entries in the legal vacuum. This burden is also providing the protection for the traditional companies and banks, however the process of the commoditization of especially traditional banking services is also bringing strong costs pressure for the banks and as previously stated the benefits are mainly envisaged through the scale advantage. New, innovative activities in change, involve more value added and less cost dependent

⁴³⁹ <https://hackernoon.com/ten-years-in-nobody-has-come-up-with-a-use-case-for-blockchain-ee98c180100>

⁴⁴⁰ <https://hackernoon.com/ten-years-in-nobody-has-come-up-with-a-use-case-for-blockchain-ee98c180100>

services, providing for more benefits for the fintechs. However, the software stacks of almost all fintech apps point to a bank at one layer or another ⁴⁴¹. In this sense, there is an important role for the facilitators of new innovation business models, such as innovation hubs and regulatory sandboxes.

Innovations hubs are understood as forums and way of communication enabled among entities (regulated or not) and the authorities. As one of their missions they can guide the interpretation of the legislative framework and licensing requirements to serve also the fintech sector.

Sandboxes understood as frameworks for regulatory tests are deregulated models where the innovation and fintech solutions can be tested with the authority support and under its supervision, without the necessity of licence or all the regulatory obligations during a limited period of time. In the countries like UK the idea of sandboxes is already implemented since 2015, the results are encouraging, the time and cost of new innovations reaching the market have been lowered mainly due to an easier access to financing because of the improved regulative certainty for potential investors.

6.4. SCIENTIFIC THEORIES ON BANKING INNOVATION

Due to the proposed overarching framework, in this work we need also to concentrate on the innovations proposed by the science. We start with the theories which are more adjacent to the current banking sector model, passing then to others which question the very essence of current understanding of the way banking sector works and could work.

Sovereign Nexus and diabolic circle

One of aims of the theories of the financial banking crisis is explaining the self-reinforcing nexus between the banking sector crisis and sovereign debt problems. It advocates the existence of some sentiments that can lead to “sudden stops” in the funding of the government debt, setting in motion a ‘devilish interaction between liquidity and

⁴⁴¹ Brainard (n 438).

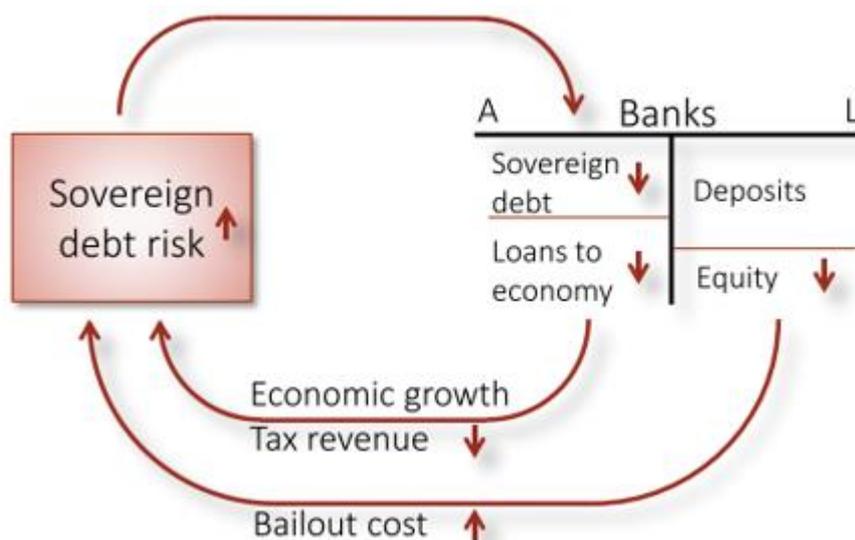
solvency crises’⁴⁴². Other scholars depict them as two diabolic loops⁴⁴³. In the countries of the periphery of Euro area, ‘the deterioration of sovereign creditworthiness reduced the market value of banks’ holdings of domestic sovereign debt. This reduced the perceived solvency of domestic banks and curtailed their lending activity. The resulting bank distress increased the chances that banks would have to be bailed out by their (domestic) government, which increased sovereign distress even further, engendering a “bailout loop”. Moreover, the recessionary impact of the credit crunch led to a reduction in tax revenue, which also contributed to weakening government solvency in these countries, triggering a ‘real-economy loop’⁴⁴⁴.

Figure 6-2: Two diabolic loops in the banking

⁴⁴² Paul De Grauwe, ‘The Governance of a Fragile Eurozone’ (2011) 20.

⁴⁴³ Markus K Brunnermeier and others, ‘The Sovereign-Bank Diabolic Loop and Esbies’ (2016) 106 American Economic Review 508.

⁴⁴⁴ Brunnermeier and others (n 443).



Source: Brunnermeier et al.⁴⁴⁵.

The solutions proposed by the scholars is to introduce the collective issue of government bonds ⁴⁴⁶, which should provide a defence against the ‘vagaries of euphoria and fears’ which seem to be common on financial markets. Studies about the TARGET2 (Trans-European Automated Real-Time Gross settlement Express Transfer System) which is interbank system in place in the EU, for transborder transfers interlinking the EU banking system seem to further corroborate the asymmetric effects of the functioning of the EMU, also on the short-term commercial debt and ‘speculative stress’⁴⁴⁷. Definitely the main problem is that lack of understanding of functioning of the monetary union has led to the irrational fears and these ones were turn into the political force, which makes even more difficult the work of the governing bodies to arrange the issue⁴⁴⁸. A suggested way to overcome the future short-term shocks is going toward the budgetary Union ⁴⁴⁹.

⁴⁴⁵ Brunnermeier and others (n 443).

⁴⁴⁶ De Grauwe (n 442); Markus K Brunnermeier and others, ‘ESBies: Safety in the Tranches’ [2016] Ssrn.

⁴⁴⁷ Paola Sánchez, ‘Política Monetaria Del BCE y Consecuencias En La Unión Monetaria Europea’ (2015) 27 Papeles de Europa 42.

⁴⁴⁸ Paul De Grauwe, ‘Design Failures in the Eurozone: Can They Be Fixed?’ [2013] LSE ‘Europe in Question’ Discussion Paper Series <[https://www.lse.ac.uk/europeanInstitute/LEQS Discussion Paper Series/LEQSPaper57.pdf](https://www.lse.ac.uk/europeanInstitute/LEQS%20Discussion%20Paper%20Series/LEQSPaper57.pdf)>.

⁴⁴⁹ Paul De Grauwe and Yuemei Ji, *Flexibility versus Stability. A Difficult Trade-off in the Eurozone*, vol 11372 (2016).

Modern Monetary Theory

As there is a strong concern regarding what happened and how to tackle the financial crisis, together with the concept of ‘digital’ or ‘virtual’ currency’, there are some theories arising insisting that they describe the ‘operational realities’. As always when related with the economic reality they can also be ad ascribed to an ideology or propose a specific economic policy, one of them is Modern Monetary Theory (MMT) proposed by Wray ⁴⁵⁰ in 1998. This theory refers to a fiat currency regime with a free-floating exchange rate. In part it is derived from (neo) chartalism ⁴⁵¹ which is giving the currency its value due to its ability to be a mean for tax liabilities. In a sense and due to the unpopularity of austerity measures it has gained a lot of traction proposing a counter-intuitive backlash to emphasis on deficits and national debt. The MMT main assumption is that the States budgets are not to be managed in the same way as the ones of households, where balance is required. According to MMT, the state could issue fiat currency at its will, as the government deficit adds to savings. Of course, it would require adapting the constitution and laws, especially in what refers to the separation of powers and others ⁴⁵². Furthermore, it claims that the sum of those deficit equals the money in the private sector possession. So that, without debt and deficit, there would be no more money. It recognises however that it is dangerous for the government to print money without limits, which of course would lead to hyperinflation, defaults, economy collapse and associated poverty. One of the reasons is related to the risk of debt in foreign currency ⁴⁵³ which cannot be printed by the indebted state, and the debt couldn’t be repaid due to the exchange rate collapse.

The main question is that the government or central bank can print the currency but not real wealth. Its real spending power (especially in a longer term) is related to the

⁴⁵⁰ Scott Fullwiler and L Randall Wray, ‘Modern Monetary Theory: A Debate’ (2014).

⁴⁵¹ Louis-Philippe Rochon and Matias Vernengo, ‘State Money and the Real World: Or Chartalism and Its Discontents’ (2003) 26 *Journal of Post Keynesian Economics* 57; L Randall Wray, ‘From the State Theory of Money to Modern Money Theory: An Alternative to Economic Orthodoxy’ (2014).

⁴⁵² Phil Armstrong, ‘Heterodox Views of Money and Modern Monetary Theory (MMT)’ (2015).

⁴⁵³ Warren Mosler, *The Seven Deadly Innocent Frauds of Economic Policy* (2010).

its ability to tax and borrow real wealth⁴⁵⁴. This multiplicity of theories explaining what is understood as well known is causing confusion in the public. In the first place, because it seems that even economists do not agree on such basic notions as money, its origins and role in the economy and in the second place because at the end this new invention with more understanding and means of these days scientists is at the end debunked⁴⁵⁵, even if still not recognised as a such by many⁴⁵⁶. It is however interesting to observe that almost all of the quoted documents are produced in the Working Papers and a book, outside of the mainstream scientific publications in the field, subdue to the so called ‘scientific excellency’ requirements. It also brought and brings more caution into the (neoliberal) austerity policies application⁴⁵⁷. Probably this is the only way to move forward, in the collective intelligence play there must as well be a space to explore the errors.

Innovative views on money issuance

We currently also have three competing theories of banking⁴⁵⁸: financial intermediation, fractional reserve and the credit creation, called financing through money creation (FMC)⁴⁵⁹.

In the first one, also called intermediation of loanable funds (IFL)⁴⁶⁰ which is widely assumed and present in the public imaginary, banks lend out the money from the previously gathered deposits of their customers. Here, there is an interesting and not a

⁴⁵⁴ <http://www.the-lighthouse.net/debunking-modern-monetary-theory-mmt-understanding-it-first/>

⁴⁵⁵ Thomas Palley, ‘Money, Fiscal Policy, and Interest Rates: A Critique of Modern Monetary Theory’ (2013) 109.

⁴⁵⁶ Eric Tymoigne and L Randall Wray, ‘Modern Money Theory: A Reply to Palley’ (2014) 27 *Review of Political Economy* 24.

⁴⁵⁷ Palley (n 455).

⁴⁵⁸ Werner (n 388) 71.

⁴⁵⁹ Zoltan Jakab and Michael Kumhof, ‘Banks Are Not Intermediaries of Loanable Funds – And Why This Matters’ [2015] Ssrn.

⁴⁶⁰ Jakab and Kumhof (n 459).

minor question of ‘market discipline’ because the depositor money is lent without his or her consent and control over the receptor of the credit.

In the second one, the bank lends the money received from the central bank reserves. However, recent inductive approach studies (reminding the sources of previously described MMT) based on empirical facts would rather support the credit creation theory, where the banks create the money ‘out of nothing’ while extending the credit. As explained by Werner ⁴⁶¹, the first step of lending seems the same for the banks and other non-financial institutions, but in the moment when the money is made available to the customer, it is when the money is created, because it becomes stated twice, reclassifying ‘accounts payable’ into a ‘fictitious customer deposits’, as if the bank has passed the money to the borrower. This is being allowed due to the banks exemption from ‘Client Money Rules’, which require all firms that hold client money to segregate such money in accounts that keep them separate from the assets or liabilities of the firm itself. Werner ⁴⁶² also points out, one of the reasons to neglect this dynamic of money creation is that there is no explicit law, statute or regulation that would grant this privilege to the banks, usually considered a sovereign prerogative to create and allocate the money supply for productive, consumptive or speculative purposes. This ‘creative accounting’, i.e. money creation and channelling it to some use is possible because the banks have also the function of the settlement of all non-cash transactions of the money in the economy ⁴⁶³. This way of banking system functioning based on the issuance of money by private banks, implies that it is necessary to increase the debt every time there is a need to increase the amount of money. Thus, the recent crisis, led to a colossal credit expansion, especially by the European Central Bank, hardly criticized as it finally resulted limitedly effective and supposed the negative distributive effects (from the population to banks and from the periphery banks to the central ones in the EU).

⁴⁶¹ Werner (n 388).

⁴⁶² Werner (n 388).

⁴⁶³ Werner (n 388).

There is a proposal to break this power into small, non-for-profit community banks⁴⁶⁴. In a different approach, trespassing the power of money creation to a central public bank/s in principle could solve many issues. The money created in such a way have several denominations with differences in their full definition, being called ‘secure money’, positive money, sovereign money, Full Reserve Banking, Limited Purpose Banking, etc. The adoption of the secure money would have disruptive effects for the system, because credit activity could be fully subject to competition, without protection or privileges granted by the State. Today only private commercial banks are allowed to have an account at the central bank. This measure is compared to the XIX century regulation (1844 in England, Peel Law) that stopped private banks from paper money creation⁴⁶⁵. It appeared however to be hardly insufficient, especially in the digital era when paper money is only a minor fraction of the total. There were many other approaches for the problem regulation, i.e. Chicago group⁴⁶⁶ proposal for transferring this money to Central Bank. The problem was in the accounting requirements that this kind of proceedings would require, i.e. dividing the banking activity into the normal one and on the other part the one of the deposit transfers to central banks, that is why this reform was called Full Reserve Banking (FRB). Even if considered by Roosevelt this measure was not implemented, as the ‘liberalisation is successful only when there is a technology in place that makes it possible’⁴⁶⁷.

The money in the central banks is considered real, not pseudo-currency, or the promise to return the money⁴⁶⁸. In order to assure this ‘promise’ central banks need to put in place extraordinary measures (mainly budgetary and regulatory effort) such as the assurance of deposits, the provision of liquidity by the State when they fail to obtain it in the market, injections of public capital, exemptions from the competition legislation and

⁴⁶⁴ Werner (n 388).

⁴⁶⁵ Fernández Ordoñez (n 419) 2.

⁴⁶⁶ Michael Kumhof and Jaromir Benes, ‘The Chicago Plan Revisited’ (2012) 12 IMF Working Papers i <<http://elibrary.imf.org/view/IMF001/13037-9781475505528/13037-9781475505528/13037-9781475505528.xml>>.

⁴⁶⁷ Fernández Ordoñez (n 419) 6.

⁴⁶⁸ Fernández Ordoñez (n 419).

many others. Anyway, this sovereign money will not prevent all the financial crisis, like the ones of stock exchange, pension or hedge funds, but the meaningful difference is that the costs of such crisis will be directed and restricted to the agents that take part in money borrowing or investment for such financial activities (and not the citizens as it is now). This will also imply what is called 'putting the skin in the game'. Currently, the banks where the assets to capital ratio is generally at the level of 5-10%⁴⁶⁹, are playing mainly with the money that are not owned by their shareholders (the rest).

Quite interestingly, at the EU level there is no information about total money supply (M4) as in the UK (in 2010 notes and coins in circulation supposed only 2,1% of actual money supply).

There are still many questions that need to be answered in the respect of the 'secure money' proposal. One, which is crucial is the way to make the transition from old to new way the system would work. What is generally working in case of liberalizations is the application of a slow calendar of reduction of protective shields, allowing a gradual opening to the competition. This is however not a very viable way, as once the possibility for deposits and credits would have been opened, a social demand could become "viral" and urgently require the removal of privileges to the private banks.

The point with this reform is that even if it has some recognized scholars, like a Nobel Prize in Economics, Prescott, working on the subject. There are also efforts to introduce the ideas into the political debate, like Monetative⁴⁷⁰ in Germany. There was even a referendum in Switzerland in 2018 in order to introduce the reform, with quite a fuzzy explanation and delivery, it gained 26% of votes, even if Association of Banking and the Central Bank are defending the current system of creation of money by private banks. The Bank of England has a research program, and in Sweden there is one also, correlated.

⁴⁶⁹ Fernández Ordoñez (n 419) 12.

⁴⁷⁰ <https://www.monetative.de>

There are also some association or non-lucrative citizens organizations like Positive Money⁴⁷¹ in the UK but also ‘Dinero Positivo’⁴⁷² in Spain. A documentary⁴⁷³ on the subject, is however presenting a catastrophic vision in a highly emotional tone⁴⁷⁴. In some sense, it reminds the climate change question, where according to some studies, the knowledge of the subject is penalizing the action of the subject in the real world, due to its highly depressive content. Anyway, this question is not easy to explain and to be understood by the citizens, considered too complex and bored as opposed to other more simple and ‘sexy’ subjects.

It seems that this innovation proposal is trying to spread from the niche level, not reaching the traction and probably critical weight. Probably we are also observing a sub-optimal lock in as it is taking out a lot of power and profitability from current economic agents in the sector. Even if in the long term their life could in this way be easier, not being so for profits. The shock of the financial crisis has passed and there is no such a strong willingness to change things when they seem to work even if they could work better in another configuration.

Local/Regional Currency

In almost all the theories of money, only one kind is described, i.e. central currency, generally issued by the Central Bank. However, during the history together with this centralized money, used for long-distance transactions with long term value holding due to the precious metals it was made of, there was also a local currency⁴⁷⁵ in place used for daily transactions.

Local currency, first (described) in use in ancient Egypt where a shard of pottery – an ostrakon was paid for the agricultural products storage. This money was losing quickly its value, as well as the stored products, in this sense having a negative interest

⁴⁷¹ <https://positivemoney.org/videos/introduction/>

⁴⁷² <https://dineropositivo.es>

⁴⁷³ <https://positivemoney.org/videos/97-owned-monetary-reform-documentary/>

⁴⁷⁴ Talking about the monetary reform and meanwhile presenting bleeding people from manifestations.

⁴⁷⁵ Rushkoff (n 14) 106–112.

rate due to recoinage (with other date in exchange of less units of the older edition) and in this way biased toward spending or collective investment and not saving or private hoarding. By investing into productive assets instead of bank accounts, strong businesses can be built, workers rewarded well, integrity of the equipment and quality of land maintained, investment can be done in the research and development, in general improvement.

Central currency built on scarcity, however promotes the centre in comparison to periphery as everybody needs to repay the debt to the lender, also promoting the interests of already wealthy (aristocracy first) and reducing the ability of smaller groups or regions to create the wealth for itself. Furthermore, in central currency there is a bias towards competition, the repayment requires economy expansion and increases the overall indebtedness to the central bank of this positive interest-bearing money. The business activity is subdued to its debt structure.

There are some organizations dealing with the return to this kind of money, like RAMICS⁴⁷⁶ - Research Association on Monetary Innovation and Community and Complementary Currency Systems, it deals also with time banks. These theories and research are however only on the niche level, not broadly known. There are only some small experiments with the local money.

There is an effort also in establishing the 'lost' connection between money and values, when value changes money instead of money changing values. In some cases⁴⁷⁷ even, regional money are not really understood based on the beforementioned assumption, trying to enter the market value play from the central currency assumptions just replacing their place of creation. Such is probably also the case of cryptocurrencies or digital money, with its hype and exacerbated speculation.

⁴⁷⁶ <https://ramics.org>

⁴⁷⁷ <https://michaelsevans.com/zelizers-theory-of-money-and-the-case-of-local-currencies/>

6.5. BANKING AND SOCIETY AND (NATURAL) ENVIRONMENT

The general public perception is that the benefits of the banking system activity are privatised, but the lost is made to be paid by the public, i.e. citizens. This is so not only because of the citizens money employed in the banks rescuing but also due to the macroeconomic costs as GDP losses, unemployment growth, companies' destruction, etc. The direct costs can be estimated in the 40 billion euros, but the indirect are estimated in 600 billion euros ⁴⁷⁸.

There are several voices, especially Thomas Picketty raising the question of the capital and labour split that is causing the exacerbation of the inequality or peripherization of the society related to wealth and income distribution. '*Once constituted, capital reproduces itself faster than output increases. The past devours the future*'.⁴⁷⁹ He proposes the progressive annual tax on capital, advocating for supranational and also European Union level as appropriate for its implementation.

Political economy, dealing with the policy proposals is having also its normative and moral sense. There is the question of participation of society and other agents, like social scientists, if they are active in the public debate and political confrontation and are not only the commentators or demolishers of the views and data of others. 'Everyone is political in his or her own ways'⁴⁸⁰. The conflict of our time is the division between those with and without the knowledge ⁴⁸¹.

The currently observed used of mathematical methods in the study of subjects makes it difficult to be accessed by the citizens, topics studied in the models are minutiae mainly based on stating the correlation between variables that are already intuitively known, in this way the vacuity of the content is rather obvious. The same is known for

⁴⁷⁸ Fernández Ordoñez (n 419) 3.

⁴⁷⁹ Picketty (n 377) 398.

⁴⁸⁰ Picketty (n 377) 400.

⁴⁸¹ Fischer (n 230).

the pyramid schemes of the financial crisis covered in sophisticated mathematical and supposedly logical explanations. Statistics by itself are also social construct. In the innovation field there is so much concentration on the STEM (science, technology, engineering and mathematics). It gives the impression that the economic thought is lost and especially its ways of shaping the management of the society and economy. They appear to exist in separated realms. Economy seems to be an infrastructure to the political structure, but this view is probably too simplistic and abstract. Quoting Picketty ⁴⁸²: ‘all social scientists, all journalists and commentators, all activists in the unions and in politics of whatever stripe, and especially all citizens should take a serious interest in money, its measurement, the facts surrounding it, and its history’.

Even if apparently not really treating the same questions, Society and (Natural) Environment are very closely related in its indirect dimensions of impact of especially services sectors as they are the dimensions which are more likely to be included in the long-term strategies only, apart from gimmicky marketing strategies.

Probably the question of the (natural) environment directly understood are less relevant here as the banking products are services. Money is the mean of storing and exchanging value, even if taking into account cash this is not considered a high burden on the environment. Banking systems are also not high energy consumers (in principle).

Though, bearing in mind the indirect effects the banks are having some argue that their impact is understated. There are two major causes of banking negative impacts. One of them is their endemic weakness and crisis dynamics they impulse. When the crisis struck and there is a recession, short-term thinking prevails, meaning that the government regulations are caring less about the natural environment and lesser long-run oriented investments are done, companies are rather concentrated on the cost cuts in order to return to their profitability as sale expansion is rather difficult in that times. Another cause of the banking sector negative impact on the natural environment is due to the fact that current monetary and economy system requires growth in order to be sustainable. It is already stated by Keynes and Schumpeter, talking respectively about the ‘real or pure

⁴⁸² Picketty (n 377) 402.

exchange economies' and 'monetary or capitalist economies' which employ the money supply expansion through credit creation mechanisms.

There can be many reasons distinguished⁴⁸³, however the main is that as the credits need to be repaid with the interest rate there needs to be a growth in order to support these charges. Another part of the question is related to the procyclical behaviour of banking sector in relation to the overall economy (caused by the design of the current system), during the hypes more money is created, and it is being reverted in creating speculative bubbles, as for the real estate market, which require in turn earning (and borrowing) more money by the citizens in order to sustain their lives. From the perspective of natural environment, economic growth has a high correlation with consumption of resources and pollution. We need a monetary system that will help fighting against the challenges of growing population, climate change and scarcity of natural resources in all its forms as the natural is being changed to industrial and urban if not wastelands.

6.6. CONCLUSIONS

As it was presented in the document, several dimensions of the innovation ecosystems in the banking sector were studied. Here we highlight the most important global questions, such as the last economic/financial crisis, digitalization and social and climate change.

As for the last crisis, there is a lot of criticism expressed on the policies run by the European Central Bank with its introduction of unconventional monetary policies in the high income countries, in order to avoid secular stagnation⁴⁸⁴, such as the purchases of large-scale assets to stimulate economic growth by keeping credit market functioning and interest rates low. Central Bank cheap liquidity has in turn incentivized the investment in equities fueling the hyper-activities in the stock market. Thus, further reinforcing the

⁴⁸³ <http://positivemoney.org/issues/environment/>

⁴⁸⁴ Lawrence H Summers, 'U.S. Economic Prospects: Secular Stagnation, Hysteresis, and the Zero Lower Bound' (2014) 49 Business Economics 65.

rate of return on capital over income learned in the real economy and economic and social inequality.

As expressed by Goodheart: ‘financial regulation is normally imposed in reaction to some prior crisis, rather than founded on theoretical principle’⁴⁸⁵. Indeed, there was a strong push for the regulation of the banking sector, in order to avoid the future financial crises. Even if justified in the current configuration of the banking sector, it was having however mostly pervasive effects, obliging more investment of the Banks but in this way increasing the concentration and reducing competition, by protecting them as new entries are strongly handicapped due to the fact of high spending and efforts required for these regulations. The presentation of these far-reaching supervisions can however be counterproductive as proposing the panacea for all, which can be only an indirect consequence when properly articulated with other relevant and broad changes.

In the short term, the ‘diabolic circle’⁴⁸⁶ of Supervisors and Central Banks trapped in their relationship with private banking could make the system work out, however in the long-term it increases the leverage and reduces the need for innovations in the traditional banks, which in turn makes banking system more fragile and increase the risk of crisis.

As for the banking sector views on the innovation, the changes concentrate there on the response to changing political climate in general. As explained due to the digitalization the moderation is replaced with polarization and realism with ideology. This leads to the populism, protectionism and also a spread of anti-European politicians, with Brexit as an evidence. Fortunately, social networks provide also for the promotion of progressive movements, such as the emergence of a pan-European party Volt⁴⁸⁷. In what refers to digitalization, these changes even if widely spread seem so far not really affecting the essence of the banking business.

⁴⁸⁵ Charles Goodhart, ‘How Should We Regulate Bank Capital and Financial Products? What Role for ‘living Wills?’ [2010] The Future of Finance: The LSE Report 165.

⁴⁸⁶ Fernández Ordoñez (n 419) 6,8.

⁴⁸⁷ <https://www.volteuropa.org>

Current core banking systems are very expensive and more and more complex, as compared with agile fintech companies, even if the main fear of the banks is perceived from the big technology companies like Amazon, Apple or Facebook ⁴⁸⁸. The legacy is not so easy to overcome as compared to starting from scratch.

APIs allow the start-ups to enjoy the access and aggregation of the customer information from banking systems without the high regulatory burden of being a bank. Information asymmetry is supposedly being overcome. Especially the PSD2 is opening the opportunity for the fintechs, Financial Technology innovation companies. It is potentially affecting more the retail than the wholesale banking. This last one involves so far too much entry barriers and too much money ⁴⁸⁹.

There are also other changes discussed even if only promising in their nature, such as blockchain, cryptocurrency, so far having too much in common with lottery bubbles and in need of check for the implementation of probably many future legal requirements that allow for supervision. Cybersecurity is also become a high concern in the newly introduced and old systems. The regulatory sandboxes should be eagerly implemented in order to protect the consumers and also allow for a balanced growth in innovations.

In a sense, in the current banking architecture, there is a question that governmental institutions, need to worry about assuring banks liquidity, they need to tell the economic agents (banks) what are the decisions that they must adopt when taking risks, with what capital, or liquidity requirements and furthermore they are offering as money an asset whose security they cannot guarantee. In principle, these governmental institutions should deal with banks through market regulations, protection of the consumer, defense of competition and supervision of markets and infrastructure, in order to assure that market works correctly and do not defraud the citizens.

The issuance of money should probably be separated from the objectives, from private entities but also from politicians and governments. Nowadays Central Banks have

⁴⁸⁸ Kasper Peters, 'The Future of Retail Banking in Europe' [2013] Roland Berger Report 33.

⁴⁸⁹ Andrade and others (n 420).

the power to decide to whom they deliver the money they create: to private banks, to holders of public or private debt and can even buy shares of private companies.

In addition, the public initiatives in form of public subsidies or investment, reduction of taxes, reduction of public debt should be going to the state and/or citizens and not to private companies with the stress on correcting the inequalities generated by globalization and climate change long-term initiatives. The destination of the (public) money should be decided by citizens through the democratic institutions ⁴⁹⁰.

There are several proposals of solutions to this problem exposed, in what refers to scholars' views on the banking, however it seems that only the narrowest ones have currently the possibility to permeate rather slowly into the reality. In theories like Positive Money or Local Currencies apart from not having a wider public reach, there is a need of further inquiry into the possibilities they can offer. They are only on a niche level and the banking system represents rather suboptimal lock-ins the current status quo. The question is that it is a complex and confusing landscape which cannot be easily explained to the public, furtherly associated with the subject matter being boring or presented in tremendous terms. There should be much more willingness on part of the society to actively enter this area as it is having profound implications on the lives of citizens and on the natural environment, the subsequent crisis strengthens the short-term measures with pervasive consequences on both of them.

⁴⁹⁰ Fernández Ordoñez (n 419) 6.

7. CHAPTER 4: INNOVATION ECOSYSTEMS IN BANKING AND MONETARY SECTOR: COMPETITIVENESS VERSUS SUSTAINABILITY⁴⁹¹

7.1. INTRODUCTION

The present document is a further stage of the research presented in the documents establishing the framework for structural maturity advancement assessment of innovation ecosystems in the EU ⁴⁹² and based on that the banking sector case study ⁴⁹³, it touches also the document about the Horizon Europe, actors' perspective in the innovation ecosystem ⁴⁹⁴. It takes the outcome of the previous researches, notably the one of the banking sector, developing the monetary and different currencies aspect to apply there the competitiveness and sustainability frames of reference, as the innovation is pivotal for both processes. It also amplifies the innovations area, for instance, on the banking sector 'green transition' readiness.

The purpose of this research is the analysis of the collective intelligence conditions through a comprehensive depiction of recent trends in the banking innovation, especially in terms of different currencies options, seen from different angles. The postmodern prospect brought the tunnel vision to academic studies. This work aims to overcome this

⁴⁹¹ This chapter was published as an article co-authored with Sara González Fernández and in the scientific review *Mercados y Negocios*, vol I, N41 [2020].

⁴⁹² González Fernández, Kubus and Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment' (n 270).

⁴⁹³ Kubus (n 275).

⁴⁹⁴ Sara González Fernández, Renata Kubus and Juan Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the EU : Policy Evolution and Horizon Europe Proposal Case Study (the Actors ' Perspective)' (2019) 11 *Sustainability* 25 <<https://www.mdpi.com/2071-1050/11/17/4735>>.

division, joining different contexts and in this way providing for collective intelligence learning loops application ⁴⁹⁵. From the innovation ecosystems context, it takes a biological framework of an ecosystem as opposed to usually applied reductionist physical and mathematical mirroring composition of economic and socioecological reality. Only when there is a first loop collective intelligence learning and understanding of the underlying model of the reality and its configuration, this model can be challenged, in the second loop defining variables that can be modified and in the third loop, the thorough way of thinking about the subject can be re-approached differently. In this qualitative systemic framework analysis of the banking sector, the refraction through the innovation ecosystem actors' perspective allows for a new and structured understanding, also channelling a balanced metamodern super-hybridity ⁴⁹⁶ applied to economic and socioecological practice. Super-hybridity is understood here as 'a method of responding to, or exploiting, the technological accelerated possibility of converging sources and influences'⁴⁹⁷.

Specifically, from the theoretical framework context, the model of the ecosystem is based on the actors' approach, but it implies also the innovation process outlook. Actors' perspective is founded on the reframed triple helix ^{498 499 500}, grounded on the Sabato triangle of knowledge ⁵⁰¹. In the previously mentioned background study of the innovation ecosystem framework, i.e. innovation helix ⁵⁰², two additional dimensions were added to this picture: society and natural environment. These actors interplay defines

⁴⁹⁵ Mulgan (n 26).

⁴⁹⁶ However, first mainly applied to the artistic (and cultural) practice: <https://frieze.com/article/pick-mix>

⁴⁹⁷ Robin Van den Akker, Alison Gibbons and Timotheus (ed. Vermeulen, *Metamodernism; Historicity, Affect and Depth after Postmodernism* (Rowman & Littlefield International 2017).

⁴⁹⁸ Etzkowitz, *The Triple Helix: University–Industry–Government Innovation in Action* (n 17).

⁴⁹⁹ Lowe (n 18).

⁵⁰⁰ Leydesdorff (n 87).

⁵⁰¹ Sábato and Botana (n 7).

⁵⁰² González Fernández, Kubus and Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment' (n 270).

the ground for the innovation, in this sense, they are required to interact, compete and collaborate together⁵⁰³. In this way, the collective intelligence can emerge, but orchestration is a key. It can allow a proper and comprehensive response to threats and organisation of tactic and strategic priorities, regarding attention, action and resources allocation.

The innovation process context apart from the implied actors' evolution^{504 505} out of the scope of this document, brings on the multilevel perspective with its innovation phases and levels⁵⁰⁶, before all else when it comes to window of opportunity for the innovation break-through.

This research of the banking sector is not exclusively concerned with the EU level governance. On the one hand, the EU is only one of the players on the international scene and here the global picture is studied; on the other hand the future EU main Research and Innovation (R&I) framework program – Horizon Europe, does not take innovation in the banking sector as an area of relevance for innovation emergence⁵⁰⁷.

In the conceptual part, in order to build the understanding background, the overview of the global banking and monetary architecture will be presented, the money, credit and their characteristics are briefly revisited, followed by the traditional fiat money geopolitics introduction.

The actors' revision starts with the banking authorities, where the liquidity trap and unconventional monetary policies, the diabolic loops in the sovereign nexus issue and

⁵⁰³ Tania Elena González Alvarado and María Antonieta Martin Granados, 'La Innovación En Entornos Económicos Poco Favorables: El Sector Auto Partes Mexicano' (2013) 29 Estudios Gerenciales 167.

⁵⁰⁴ Cai (n 99).

⁵⁰⁵ Elias G Carayannis, David FJ Campbell and Scheherazade S Rehman, 'Mode 3 Knowledge Production: Systems and Systems Theory, Clusters and Networks' (2016) 5 Journal of Innovation and Entrepreneurship 17 <<http://innovation-entrepreneurship.springeropen.com/articles/10.1186/s13731-016-0045-9>>.

⁵⁰⁶ Geels, 'Ontologies, Socio-Technical Transitions (to Sustainability), and the Multi-Level Perspective' (n 185).

⁵⁰⁷ González Fernández, Kubus and Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the EU : Policy Evolution and Horizon Europe Proposal Case Study (the Actors ' Perspective)' (n 494).

the central banks digital currency innovations are reviewed. Traditional banking sector innovation standpoint provides with general approach, after that Fintech characterisation, and digital currencies, blockchain and smart contracts problematics introduction, with the the private banks currencies issuance proposals to complement the picture. Academia's views include 'operational realities' studies such as Modern Monetary Theory proposal or the money issuance question with the positive money innovation status check. Society is characterised by three perspectives, the one of the inequalities associated to the capital dynamics, the alternative, bottom-up currencies and finally the metamodern prospect at the level of sociotechnical landscape. The natural environment is seen from the angle of green transition of the banks and natural environment related currency proposals.

Developing countries context is even more out of the scope of the present document, their specificity would require a separate study, for instance in terms of financial inclusion and/or microcredits, even if they could also apply to some sectors of the developed countries, in sense of 'Ungleichzeitigkeit' defined in 1932⁵⁰⁸ or different, asynchronous progress levels inside the same civilization or country.

The metamodern definition of challenges faced by our societies⁵⁰⁹ can provide also an inspiring lens for examination. Hereby the concepts are going to be applied when they are eminently relevant and can bring a structural understanding to the subject, in other conditions seen with a phenomena fragmentary understanding.

In principle, the density and emergence of intermediary institutions are important indicators for the structural advancement of an innovation ecosystem., also their multilateral nature when it comes to innovation actors' implication. This could be an interesting line of future studies. Hereby only basic architecture configuration is presented.

⁵⁰⁸ Ernst Bloch, *Heritage of Our Times* (Martin Jay and Anton Kaes eds, Polity Pre, University of California Press 1992).

⁵⁰⁹ <https://medium.com/the-abs-tract-organization/the-metamodern-condition-1e1d04a13c4> (Consulted on October 27th, 2019).

Banking sector is considered the infrastructure for other activities, especially economic ones. In this sense, it is probably seen as a part of operating system, so pervasive, that it is difficult to be questioned, corresponding to the metamodern ‘structure of feelings’⁵¹⁰. This is why it is crucial to approach globally the sector and ‘dare to know’.

7.2. METHODOLOGICAL AND CONCEPTUAL FRAMEWORK

With the aim of providing the methodological background, the innovation ecosystems conceptual framework is to be explained more extensively, as well as the introduction into the understanding of banking and monetary infrastructure, and the money or currency as a constitutive tool allowing the flow of value exchange in the economy and society.

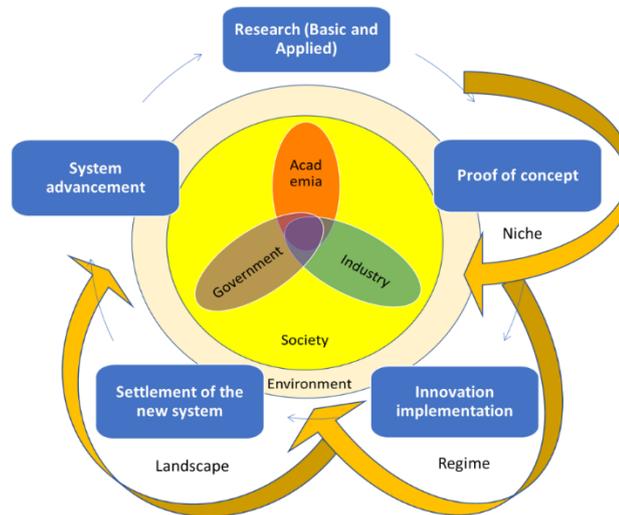
Innovation ecosystems methodological framework

In order to reach to check the competitiveness versus sustainability approach, the reframed innovation helix is applied. It can be seen in the Figure 1 below. The actors such as Government, Academia and Industry, correspond to the regulatory, knowledge and productive functions of society. Additional dimensions are included due to a new and more active role of the society, in the technological and digital environment, and more markedly natural environment as a relevant and all-embracing aspect of the global challenges we face these days. This is also related to the notion of ‘Anthropocene’⁵¹¹, not only in sense of a geologically defined human epoch but specifically understood as an era when the humanity impact on the Planet Earth ecology (anthropogenic climate change) is not only acknowledged but also there is a sense of urgency in addressing it, at least at the society level.

⁵¹⁰ Van den Akker, Gibbons and Vermeulen (n 497).

⁵¹¹ See for instance: <http://www.anthropocene.info> (Consulted on October 27th, 2019).

Figure 7-1. Reframed Innovation Helix: Process loop with the actors involved.



Source: ⁵¹².

The multilevel perspective ⁵¹³ gives the vision of three levels, starting from a divergent niche where new ideas are born and incubated, going through the sociotechnical regimes, where they can be scaled-up and finally impacting the sociotechnical landscape, i.e. mindset. This outlook is especially important from the socioeconomically and ecologically disruptive innovation emergence and breakthrough context, living the window of opportunity for challenging the established status quo generally galvanized at the sociotechnical regime level, when the landscape urgency is not transmitted correctly.

From the actors' perspective, however, the grid-group culture theory ⁵¹⁴ can bring interesting insides. It provides with four angles regarding the search of solutions and innovations that would be required to address them:

⁵¹² González Fernández, Kubus and Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in the European Union – toward a Theoretical Framework for Their Structural Advancement Assessment' (n 270).

⁵¹³ Geels, 'Ontologies, Socio-Technical Transitions (to Sustainability), and the Multi-Level Perspective' (n 185).

⁵¹⁴ Weber (n 62).

- The individualist outlook interprets the world through the lens of interests and incentives - this could be a main but not only focal point for Industry and Academia.
- The hierarchical context implies conflicting powers, principally for government, hereby represented by banking and monetary authorities and also on the international stage, between different countries.
- The egalitarian panorama is seen through the self-organization of people, and it is especially relevant in case of society. The biological ecosystems and the market can also be seen through this frame of reference.
- Fatalist group can probably be seen in different dissident points of view, if prevailing this can lead to the countries with authoritarian system.

General banking and monetary structure

In order to characterize international financial architecture, three groups of organizations ⁵¹⁵ can be distinguished, according to the regulation and supervision dimensions. The first one, are the organizations that exercise these functions. In the second, we have those that are regulated and supervised by the former (as private and commercial banks and other supervised financial institutions), and in the third one, we find the organizations that do not follow such rules or supervision, forming the so-called shadow banking system.

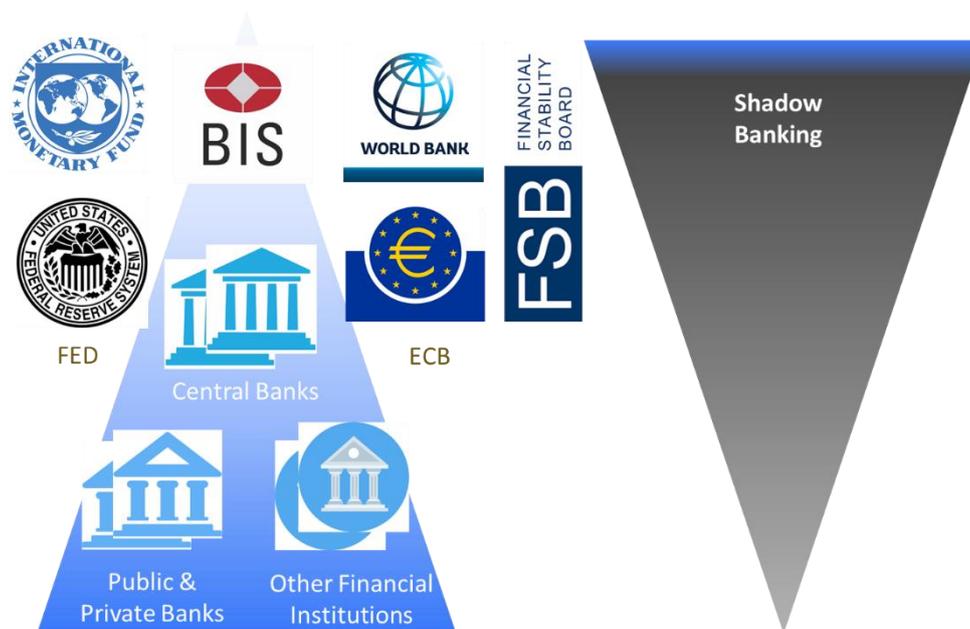
The general banking and monetary structure is depicted in the Figure 2 below. It includes at the international level the Bretton Woods organizations as World Bank and International Monetary Fund thought to help the development of the countries. Bank for International Settlements (BIS) is an independent international entity which can be considered the central bank of central banks (generally national ones), it is based in Switzerland where also the Basel I, II and III regulations were originated. Financial

⁵¹⁵ MF Previdelli and LE Souza, 'Is There a Need for Reforms in IMF ? IMF , BIS , and World Bank : On the Intra-Institutional Articulation of the International Financial System.' (2018) 4 Management and Economics Research Journal 48.

Stability Board is a G-20 organization, descending from Financial Stability Forum, with the aim of helping to address the vulnerabilities of global financial system.

Also European Central Bank and Federal Reserve System are presented: ECB due to the importance of the subject of the European Union to the study of the innovation ecosystems in the EU, that this document is part of; FED because of its significance for the global architecture and the role of USD in the global economy. In the level below, there are central banks of different countries, understood as the ‘lenders of last resort’ and ‘guarantors of value’ with inflation tackling as objective. Afterwards, we have public and private banks and other financial institutions, many of which are transnational but are subordinated to the rules of the levels above.

Figure 7-2. Banking and monetary structure



Source: Own elaboration.

Shadow banking, a concept coined by Paul McCulley, refers to the companies running financing and credit business activities but that are not in the field of traditional regulations. After the 2008 crisis they are seen as a long-term systemic challenge to the stability of the banking system. At the EU or FSB level a monitoring reports and studies are being produced for this sector, in recent years related as non-bank financial

intermediation⁵¹⁶. The shadow banking includes different types of companies⁵¹⁷: investment funds, hedge funds, venture capital funds, monetary market funds (FFM), structural investment funds, borrowing between big corporations, asset-backed commercial papers, collateralized debt obligations, loans securitizations (two last known due to the subprime crisis) or real estate investment trusts (related to real estate bubbles). As in the case of M4 worrying is their scale, some estimations (FSB) say they suppose 120% of world GDP⁵¹⁸⁵¹⁹.

Money and credit understanding

Banking sector is the one holding the money which are the principal mean of exchange⁵²⁰, but also the common denominator of value and its storage⁵²¹. Acceptability is another key characteristic of money.

There are also different kinds of money: commodity money has its intrinsic value, for example, gold; fiat currency value is based on some authority backing it, in general state. Cryptocurrency or different kind of currencies raised in the digital environment are in principle based on their ‘general’ acceptability, backed by some algorithms, also companies value, for instance in case of ICO – Initial Coins Offerings.

A significant subject in terms of money is the money supply, or the ‘total quantity of money in the economy at any time’, the M1 being the narrower definition linked strictly to ‘real economy’ and M4 the widest one, including financial markets and their diverse

⁵¹⁶ <https://www.fsb.org/work-of-the-fsb/policy-development/enhancing-resilience-of-non-bank-financial-intermediation/> (Consulted on December 4th, 2019).

⁵¹⁷ <https://www.elsaltodiario.com/banca/todo-hay-que-saber-sobre-banca-sombra-shadow-banking#> (Consulted on November 4th, 2019).

⁵¹⁸ Check for the broad money at the World Bank page: <https://data.worldbank.org/indicator/FM.LBL.BMNY.GD.ZS> (Consulted on April 27th, 2020).

⁵¹⁹ Financial Stability Board (FSB), ‘Global Monitoring Report on Non-Bank Financial Intermediation 2019’ (2020).

⁵²⁰ Smith (n 13).

⁵²¹ Fetter (n 379).

instruments based on the expectations and related market-fluctuation. Currently it is estimated that the 'real economy' money (M1-M3) supposes only 2-5% of general money supply.

An important concept in the banking sector is the question of credit, which should mobilise capital and make from banking sector a bookkeeping centre of economy and thus society accountant⁵²². However, from some way of looking, this can be also a problem, when causing the money creation along the crediting process⁵²³.

Fiat currencies geopolitics

From the geopolitical perspective, the leading and truly global fiat currency is the US dollar (USD or \$), used in Foreign Exchange (FX), known also as greenback, accompanied by the Japanese Yen (JPY or ¥) and quite recently by the European Union Euro (EUR or €) with its position rooted in the replaced Deutsche Mark (DM). Altogether they are called Big Three. Also, the Chinese Renminbi (RMB or Chinese Yuan CN¥, CNY or redback) enters in 2015 the international stage and the FMI currency basket, i.e. special drawing rights (SDR or XDR), in theory used for minimising the risk of currency fluctuations. For SDR, created in 1969 the challenge is its definition as money or credit, i.e. form of debt. Even if aiming at aiding USD its current role is considered irrelevant.

USD prevalence⁵²⁴ materialises mainly through seigniorage (difference between the real cost of money vehicles and their value) or in some sense interest-free loan from abroad. Flexibility of macroeconomic policy unrelating the balance of payments consideration in domestic policy formulation is another gain, together with the 'soft power' of status and prestige with their reflection on market predominance. It goes hand in hand with 'hard power' of monetary dependence and potential for economic coercion.

⁵²² Laughlin (n 379).

⁵²³ Werner (n 388).

⁵²⁴ Benjamin J Cohen, 'The Geopolitics of Currencies and the Future of the International System' (2003).

7.3. DISCUSSION AND RESULTS

Hereby different dimensions of the banking sector are being reviewed, following the proposed framework of actors' perspective: banking and monetary authorities (government), banking sector, scholars view (academia), and societal and natural environments outlooks and impacts.

Banking and monetary authorities' policies innovation

Last financial crisis of 2008 obliged many to rethink the banking system functioning. Monetary policy, however, was centred on relatively traditional methods, the maintenance of low interest rates, through lowering the interest rates by the central banks. In theory, it should stimulate the borrowers to borrow more (because the credit is cheap) and savers to spend (because they are not gaining money on the deposits and what is more must pay for their maintenance), at the end leading to the investment and stimulation of the economy. Nonetheless, the real effects result to be somewhat contrary to the expected ones. Banks' profits meagre and they are struggling to cover their cost of capital, firstly because banks main source of profit apart from commissions is the interest rate differential, secondly banks are also obliged to pay for the maintenance of increased mandatory reserves. Furthermore, the investment seems to 'keep dying companies on life support and fuel a potentially unsustainable surge in asset prices'⁵²⁵.

Currently entering world stage regulations such as MIFID II or Basel III or IV, are in principle helping the stability. However, regulatory landscape is rather 'balkanised', in part due to arbitrage, i.e. different progress of regulations implementation.

⁵²⁵ <https://www.truthdig.com/articles/bankers-will-stop-at-nothing-to-keep-their-grip-on-the-global-economy/> (Consulted on November 4th, 2019).

Disintermediation, standardization (partly due to regulation and related commodification of banking services), require scale for survival, thus implying defensive mergers which at the end concentrates banking sector even more.

Current political situation in the world arena is worrying, authoritarianism is expanding. In part this can be caused by digitalization of the society and social networks influence where the moderation is replaced with the polarization, sensationalism and tribalism, leading in many cases to a post-truth era of irrational political decisions. The evaluations of risks thus, need the enlargement, above all for cases of protectionism return or retreat from globalization. The operational model of international banks requires adjustments such as subsidiarization, which demands much more investment aiming at the establishment of independently capitalised and governed subsidiaries, instead of branches ⁵²⁶. Thought for not ‘bringing the crisis’ to a host country, it has the inconvenience of the languishing parent company implication. Consequently, it is rather reinforcing the local, country competitiveness instead of taking into account collaboration and sustainability.

Liquidity trap and unconventional monetary policies

Liquidity trap is where the interest rate is near zero and the economy is near recession. These are also the conditions where unconventional monetary policies are applied. Once subsequently lowered the interest rates, the policy adopted by the central banks are centred in the quantitative easing, i.e. when central banks buy the government bonds and other financial assets in order to directly insert liquidity in the economy.

An alternative sometimes proposed to that is the ‘helicopter money’ - notion coined by Milton Friedman ⁵²⁷ to illustrate the effects of money expansion policies centred on the banks giving the money to the individuals, or private sector financed with base money, without directly involving fiscal authorities. Theoretically, it would in principle help avoiding deflation. This is related to alternative policies such as citizen’s

⁵²⁶ Andrade and others (n 420).

⁵²⁷ Milton Friedman, *The Optimum Quantity of Money and Other Essays*. (MacMillan ed, 1969).

dividend⁵²⁸ (in Georgist economics terms it is a form of regular basic income from leasing or taxing the monopoly of land and natural resources, in original also wealth transfer) or future seigniorage (inflation tax).

Sovereign nexus issue

Sovereign nexus question understood as a nexus between the banking sector crisis and sovereign debt funding problem was raised and studied after the 2008 crisis. It was before all else relevant for the periphery of Euro area, explained by two diabolic loops⁵²⁹. The creditworthiness of the sovereign debt reduced the market value of the banks which in turn are holders of sovereign debt. This affected the perceived solvency of the bank and influenced their credit activity, furthermore, causing the bailout pressure on the government, reinforcing the sovereign distress even further (bailout loop). The credit crunch in the longer term brings lower tax revenue, and perturbed government solvency (real economy loop).

More integrated functioning of the EU in this case, consequently, should prevent irrational vagaries of euphoria and tears, i.e. budgetary and fiscal union. Collective bones are rather a short-term solution.

Central Bank Digital Currency

The use of cash is diminishing. It implies that in digital environment, the means of payments are issued and controlled by private agents. Apart from increasing competition by introducing new actors to strongly concentrated payment services, it would provide more stability and trust in monetary system, notably in times of crisis, thus it would mean more sustainability. In case of Swedish e-krona⁵³⁰ project there are separated however related options of account-based e-krona, by allowing the public to have the accounts directly in central bank or value-based e-krona on a card or an app.

⁵²⁸ Similar concept already known from Classical Athens' history, proposed by Aristides.

⁵²⁹ Markus K Brunnermeier, 'Deciphering the Liquidity and Credit Crunch 2007-08' (2008) 23 Ssrn 77.

⁵³⁰ <https://www.riksbank.se/en-gb/payments--cash/e-krona/e-krona-reports/e-krona-project-report-2/> (Consulted on November 4th, 2019).

China's National Bank is also stating the plans for introduction of its own digital currency as well as Switzerland.

There are also proposals for the issuance of an international digital currency backed by multiple national currencies. It raises the doubts about the issuer agency and the rules for obtaining the reserves, also of how much the central banks are really 'public' and if the technocrats leading these institutions are a good option for democratic governance.

Banking sector innovation standpoint

The perspective of the innovation in the banking sector includes in the first place the view on the innovation of the traditional banking and financial institutions. Afterwards, the emerging fintech sector is briefly presented. In the third place, the digital currency, together with blockchain and associated smart contracts emerging technologies are introduced.

Traditional banking and financial institutions innovation

Banks are very much concentrated on their approach to customer, offering omnichannel, more seamless 'customer journey' for the products they offer. From the implying technology hardware background, cloud services can be seen as a reason for sustainability as the processing power can be used more efficiently (on demand, according to needs). However, (cyber) security issues can be raised, together with the availability problems. Edge computing is also a complementing countertendency of this approach.

Modular IT architecture is another way of struggle for efficiency in this sector, highly difficult to be achieved, bearing in mind the current banking systems legacy problems. Big data and advanced analytics, including Artificial Intelligence, with Machine or Deep Learning if not properly assessed bring the tendency of reinforcing the past negative tendencies, such as gender or wealth inequality, etc. They should be

prepared for auditing, so that their proper functioning could be properly monitored by regulators⁵³¹.

Open Banking is being introduced allowed by PSD2 through APIs (Application Programming Interfaces) and in this way paving the way for the Fintech companies.

Already mentioned, cybercrime risk mitigation is another important question which in principle requires collaboration of several actors.

Fintechs

The start-ups mantra of ‘run fast and break things’ is at odds with the banking sector operational modes. Furthermore, many Fintechs or financial technology companies, with their innovative services enter a legal vacuum, which raises many concerns, especially in opposition to strongly regulated, conservative and traditional banking sector. The regulation can also be perceived as an entry barrier, protecting the traditional banking business, which needs to turn to scale advance in face of commoditization. What is more, Fintechs rely on traditional banking system at one layer or another.

In order to mitigate the risks of legal vacuum, innovation hubs can join together companies and authorities for interpretation of legislative framework and licensing requirements. Regulatory sandboxes are frameworks for regulatory tests with the authority support and supervision. Regulative certainty provision, principally to potential investors, makes innovation less costly and time-to-market can be shortened. RegTech and LegTech, correspondingly regulatory and legal innovation start-ups can also be helpful in this sense.

Crowdfunding as a trend in the Fintech area, at the end is more suitable for the lenders or investors (minor quantities being the case), not so much for the actual clients, or companies in need of financing as their costs and workloads are rather high (contacts

⁵³¹ Kubus (n 275).

management, marketing), compared to standard credit, for instance. What can be lowered, is their risk requirements, of course pertinent in case of start-ups.

PSD2 in case of Europe, brings together the APIs giving the option for collaboration (even if forced) between banks and start-ups, specifically the ones in the data aggregation business. There are ways to avoid the obstacles on the interface between banks and Fintechs in this sense, i.e. through practices of ‘screen scraping’ where the data aggregation application can log into the bank one as if they were customers and extract the information⁵³². Another challenge for PSD2 is ‘unbundling’ of deposits and payments, the last one being the only attractive segment so far, as deposits can be replaced by insurances.

There are also some efforts in the Fintechs area in the field related to the Know-Your-Customer (KYC) field, especially for financing of segments such as self-employed or freelance and micro-companies, if not small and medium ones with booming presence on the market, due to the Future of Work impact. Their financial and risk assessment is currently comparatively outdated and incomplete and building their financial prestige is of vital importance⁵³³.

Digital currencies, blockchain and smart contracts

Cryptocurrencies are mainly digital (95% of them) with the aim of exchanging and storing values. Bitcoin is the most widely known and spread of them, however its disruptive potential is so far more present in the public eye due to its value fluctuation related to the market expectations. Other digital currencies, more pertinent from the social economy disruption potential are going to be presented in the society innovation part of this document. Many companies decide for ‘coins’ expressing the company stock through Initial Coins Offerings, i.e. ICOs as a cheaper alternative to the Public version (IPOs).

Blockchain comes as an architecture, originally underpinning the bitcoin cryptocurrency. It is based on distributed and encrypted ledger processes, which can be

⁵³² Brainard (n 438).

⁵³³ For instance, incipient Crederit project.

anonymous but also public, having unalterable and undeletable signed statements, that are reflected in all machines. In principle, the promise of blockchain is to make unnecessary the official middlemen or intermediary body. Nonetheless, they use to provide as well some valuable services such as anti-money laundering or fraud issues addressing. Options for correction of the mistakes and tackling other negative-path issues of the users' journey are another positive sides of traditional systems. The encryption of the information, its (endless) storage and replication over the entire network, brings forth an increased energy consumption, processing speed is thus lowered and finally also costs of transactions are not so minor ⁵³⁴.

Smart contracts are self-executing digital contracts written as a service, where transfer of value is based on the previously reached agreement and cryptographic consent of the parties involved. Some of more standardised (also banking) contracts can probably be a good option for smart contracts. However, the 'grey zone' requiring human intervention here is in practice probably even more important and could be better addressed by freeing the time spent on standard contracts.

All these technologies, as argued by some ⁵³⁵ allow for reconfiguration of the current financial market due to the alternativization in the currency subject matter (Facebook Libra crypto initiative), value transfer and financing (ICOs), bringing more power and opportunity to small and medium-size actors.

Private banks currency issuance

The private banks and other private institutions were able to issue currencies at some points in the past centuries. In the United States the Free Banking era lasted from 1837 to 1866. However, over time they were forbidden, due to the variety of fraud, money laundering, counterfeiting, etc. practices they were bringing in. Currently private banks currency last only in Scotland, Northern Ireland and Hong Kong. With the raise of digital and virtual currencies this topic is being timidly reopened. From the neoliberal outlook,

⁵³⁴ As it can be seen by recent implementations, blockchain together with other technologies can also instrumentalise massive surveillance and control of citizens (China).

⁵³⁵ Melanie Swan, *Blockchain. Blueprint for a New Economy*. (O'Reilly Media Inc 2015).

the government monopoly also in this subject is seen pejoratively, as private domain would increase competition and quality control through the supposedly stronger accountability of private companies. This perspective is rather insufficient in context of transnational private banks and for instance their associated tax responsiveness.

Academia views on banking innovation

Academic studies in the subject matter of the monetary, banking and financing sectors of the economy accompany mainly the institutional developments at the international level, explained previously. Additionally, due to the unpopularity of (neoliberal) austerity measures which were predisposed to tackle the recent crisis, there are proposal of other ways of action, described by themselves as ‘operational realities’. Hereby, the Modern Monetary Theory and alternatives to the traditional fiat money issuance are presented; first one due to its relevance at the sociotechnical landscape level, the second one because of its potential impact on the general banking and monetary architecture.

Modern Monetary Theory

Modern Monetary Theory (MMT) was first proposed by Wray in 1994⁵³⁶. It applies to fiat currency economy with floating interest rates. The main point of this theory is that state and household budget cannot be understand the same way; i.e. state budget does not require balance. MMT proposes an additional issuing of the currency by state in case of need, arguing that the government deficit adds to savings. However, it must be noted that the money should be related to real wealth, that can be taxed. Even if debunked, this theory proved its usefulness in bringing more caution into the austerity measures applied after the recent crisis.

Fiat money issuance innovation

There are currently three competing theories on money issuance and banking: financial intermediation, fractional reserve and financing through money creation.

⁵³⁶ Wray (n 451).

Financial intermediation, also called intermediation of loanable funds is currently the implicitly popular one. It says that banks lend out money from previously gathered deposits of their clients. It is related to ‘market discipline’ issue, as the money of the clients are lent without their knowledge and consent. In case of fractional reserve approach, banks lend money received from central bank reserves.

Recent inductive theories would however lead to the third theory: while extending credit, banks would generate the money by reclassifying ‘accounts payable’ into fictional customer deposits. This is allowed through the exemption of banks to ‘Client Money Rules’, which requires entities to separate customer money from assets and liabilities of a company. As there is no specific regulation for this case, this dynamic of ‘creative accounting’ is neglected⁵³⁷. This is also possible because banks provide for the settlement of all non-cash transactions in the economy. This theory explains the credit expansion associated with the last crisis, especially by ECB causing the negative distribution effects, from population to banks and from periphery to centre. It could also be a reason for M4 money supply big numbers.

The theory of financing through money creation leads to different proposal of current problems solution, taking away the power of money creation from private banks. This could be trespassed to small not-for-profit community banks but also to the central public bank. This kind of monetary policy is being called ‘secure money’, positive money, sovereign money, Full Reserve Banking, Limited Purpose Banking, etc., depending on the associated specificities. Peel law from XIX century, taking away paper money creation (highly insufficient in a digital era) from the commercial banks, is meant as a precedent for this policy⁵³⁸.

Even if the solutions proposed would not erase all the financial crisis in the secondary money markets, i.e. stock exchange, pension, hedge funds, etc., this would oblige the players ‘to put the skin in the game’ and not play with the money that are not

⁵³⁷ Werner (n 388).

⁵³⁸ Fernández Ordoñez (n 419).

own by their shareholders. There is still a huge challenge regarding the transition from old to the new system in the context of positive money concept.

Another issue is the sociotechnical landscape or mindset. Even if studied by Nobel Prize scholars like Prescott, it is almost not worked on a scientific and political scene, besides some intents like Monetative in Germany, 2018 referendum in Switzerland, Positive Money initiative in UK or Dinero Positivo in Spain ⁵³⁹.

Society is almost entirely out of the discussion, the subject seems to be too complex and not prioritized enough to enter the Overton window of social debate, once the 2008 crisis has passed. We probably also assist a sub-optimal lock-up of all the innovation ecosystem, not allowing the innovation to overpass the niche level.

Banking and society

Hereby the relation between the capital and its impact on the inequality in the society is revised, with special reference to the periods of crisis accompanied by the procyclical nature of the banking sector. The innovative solutions of the alternative bottom-up currencies are introduced. Also, the global prospect of the metamodern perception is presented. It relates the individual position in the world in general and banking sector in particular.

Capital and inequality

There is a raising concern about the privileged capital positioning among the other means of production such as labour and land. Thomas Picketty raised the topic of labour and capital dissonance, causing the peripherization of the society, exacerbating the inequality in income and wealth distribution. His concern is related to faster capital reproduction as compared with the outcome increase. 'The past devours the future' ⁵⁴⁰, by bringing the future value to present and consuming it. The proposed way of tackling this issue is a progressive annual tax on capital. As our current economy is based on multinational corporations, the level of the tax application should be able to reach them,

⁵³⁹ Kubus (n 275).

⁵⁴⁰ Picketty (n 377) 398.

applying it on supranational base. Here probably the pertinent question would be more on any (apart from symbolic) tax payment (not requiring it to be progressive) by addressing the tax avoiding schemes, based on tax jumping and fiscal paradises. This issue is even more relevant for big banking corporations, which weight is only raising with current commodification or regulations increase requiring scale to bear them.

The 2008 crisis brought to the public consciousness the issue of banking sector procyclical nature, exacerbating the ups and downs of the economy. During the hype, monetary supply expansion leads to speculative bubbles creation and reverts into making less affordable the livinghood of citizens, especially in case of real estates costs. Furthermore, the critical public idea is that private banks seem to be fully private when it comes to gains distribution, loses in turn are to be paid by the society in more or less direct ways. Some call even the process of ‘reverse class struggle’ or ‘class struggle from above’⁵⁴¹ as opposed to the one from below. Direct costs of the last banking crisis are estimated at 40 billion euros, but indirect macroeconomic costs like GDP loss, unemployment, companies’ destruction, etc. are supposed to be as high as 600 billion euros ⁵⁴².

The 2008 crisis subject matter has an important area of relevance and it relates to the crisis tackling short term focus. During the crisis time urgent issues are being addressed and long term, strategic ones are ‘postponed’, education or even science and research can be one example, climate change or natural environment issues are relegated in the same way. Real activity is replaced with the declarations of good will but with little or waning financial support, see for instance the innovation field.

Alternative or complementary bottom-up currencies

Alternative or complementary (local) currency is an additional player to be considered apart from the fiat currency, generally produced by Central Bank in current

⁵⁴¹ <https://petras.lahaine.org/the-two-faces-of-class-struggle-the-motor-force-for-historical-regression-or-advance/> (Consulted on November 4th, 2019).

⁵⁴² Fernández Ordoñez (n 419) 3.

economies. As studied on the society side, raised by Douglas Rushkoff⁵⁴³ or P2P Foundation⁵⁴⁴, it is presented in this part.

It is called alternative or local currency, because it is to be used for daily transactions on local (or specific) markets. When used in combination with fiat currency, it is called Complementary Currency. Local, complementary currency is not a new idea, as it was already used in ancient cultures as Egypt. An ostrakon, a shard of pottery provides us with the idea of local currency. The main point is that it quickly loses its value due to recoinage (new date version with lesser value). The value of such currency is not based on the precious metal it is being done from.

Current monetary architecture, almost fully centred on fiat currency ‘leads to scarcity, centralization, concentration, secrecy and proprietarization’⁵⁴⁵. Local currency, in change, as advocated by its promoters, due to previously mentioned quick waning of value is biased towards spending, collective investment and not saving or private hoarding.

Fiat currency due to seigniorage, i.e. difference between the cost of producing currency and its nominative value; and the need for repayment with a positive interest rate, implies the extraction of value from periphery to (capital) centre and also promotes the competition as it requires expansion allowing for the debt repayment. It also makes the business activity subdued to its debt structure.

There is an open money project starting in order to ‘develop a software and architecture to enable peer-based multiple local currencies’⁵⁴⁶, also RAMICS⁵⁴⁷ - Research Association on Monetary Innovation and Community and Complementary

⁵⁴³ Rushkoff (n 229).

⁵⁴⁴ <https://p2pfoundation.net>; https://wiki.p2pfoundation.net/Alternative_Currencies; https://wiki.p2pfoundation.net/Complementary_Currencies (Consulted on November 4th, 2019).

⁵⁴⁵ https://wiki.p2pfoundation.net/Open_Money (Consulted on November 4th, 2019).

⁵⁴⁶ <https://openmoney.org/top/omanifesto.html> (Consulted on November 4th, 2019).

⁵⁴⁷ <https://ramics.org> (Consulted on November 4th, 2019).

Currency Systems promotes regional currency and time banks. Open Money project introduces an interesting way for acquisition of practical knowledge and familiarity with community money system functioning, it is a LETSplay game⁵⁴⁸. As in the case of positive money, these initiatives are currently only on the niche level stage.

Resource Based Economy could be seen a further, so far rather futuristic step in the context of monetary policies, erasing the need of money as a regulatory tool or value system. There, the ownership and trade could also be abandoned and replaced with usership and sharing or giving on microlevel and proper management at macrolevel⁵⁴⁹.

Metamodern standpoint of the society

Physical and mathematic modelling related to the economic reality made possible the pyramid schemes gaming, which in turn brought (criminal) benefits to few and the impoverishment of the rest. The terms of the debate seem to be rational facing the irrational, both confused and system determined, in metamodern, oscillating sense.

Metamodernism brings also its associated notion of the ‘structure of feelings’⁵⁵⁰, or the perception of ‘matrix’ or structure of control imposed by society projections on our ways of perception. It is related to the Colbert’s truthiness, where truth is more a product of emotional contagion and not empiricism coming from information or data (overflow) or critical thinking.

Furthermore, systemic-conspiracy responds to the conception of a conspiracy as a structural and systemic process rather than exclusively related to the conspiracy agents. In this view, ruthless economic (exclusively centred on benefits) and geo-strategic calculation (power-struggle) which are in itself an ‘ideological pathology’, becomes ‘sucked into political and military process it ceases to control, leading to devastation that

⁵⁴⁸ <https://openmoney.org/letsplay/index.html> (Consulted on November 4th, 2019). Even if difficult to check its real functioning.

⁵⁴⁹ https://wiki.p2pfoundation.net/Resource-Based_Economy (Consulted on November 4th, 2019).

⁵⁵⁰ Van den Akker, Gibbons and Vermeulen (n 497).

ends all calculation'. The point is that along the process both victim and executioner responsibility vanquish, especially in what refers to its collective and systemic nature.

From the metamodern standpoint, however, even if the collective political progress is not available many times, at least the advancement is available by learning as individuals. We can do this by choosing as a stumbling block the assumption that the understanding is possible, that it is important to 'dare to know'. As it is easier said than done, ethical action is even harder, and faith is required. In this sense, the existence of anti-intellectual forces that intentionally spread and traffic in misinformation and/or people who try to defund, discredit or deny education and learning should be acknowledged and they ought to be actively opposed as it goes against the collective intelligence.

Banking and natural environment

As previously stated, some voices state that endemic weakness of the capitalism caused by the way the banking and monetary system works, relates to the growth requirement. That growth in turn, is in general highly correlated with natural resources consumption and exhaustion. The required growth orientation of the companies causes their short-term focus and competition orientation, both with negative impact on the environment protection questions. Additional issue is the banking sector procyclical nature, with similar consequences when it comes to the natural environment impact.

Banking sector financing in developing countries sums up to over 90% and two thirds worldwide. The investment needed till 2050 in order to reach the Paris Agreement are estimated at the level of at least USD 60 trillion⁵⁵¹. Thus, banks are crucial for sustainable economy transition. It is not only because they can finance the future, but even more, they are also the ones currently financing the fossil fuels-based economy⁵⁵².

⁵⁵¹ <https://www.unepfi.org/news/industries/banking/130-banks-holding-usd-47-trillion-in-assets-commit-to-climate-action-and-sustainability/> (Consulted on November 4th, 2019).

⁵⁵² Tim Buckley, 'Over 100 Global Financial Institutions Are Exiting Coal, with More to Come.' [2019] Institute for Energy Economics and Financial Analysis-IEEFA.org 1 <http://ieefa.org/wp-content/uploads/2019/02/IEEFA-Report_100-and-counting_Coal-Exit_Feb-2019.pdf>.

Green transition commitment of the banks

There are several drawbacks in what refers to banking sector commitment to ‘green transition’⁵⁵³: It is only a half of the banks that explicitly commit to sustainability. More than that, these commitments in their terms and definition vary greatly across different banks, consequently and not surprisingly the methodology to measure the commitments is also full of shortcomings, previously mentioned fossil-fuels suppose a bigger chunk of the financing of majority of the banks.

There are several ways of climate-friendly actions of the banks⁵⁵⁴: recent Principles for Responsible Financing⁵⁵⁵, Task Force on Climate-related Financial Disclosure (TCFD)⁵⁵⁶ report, Science Based Target Initiative (SBTi)⁵⁵⁷, Re100⁵⁵⁸ electricity sourcing, restricting coal financing⁵⁵⁹.

Natural environment related currency proposals

There are some interesting proposals of currencies which would back the natural environment cycles and recovery. Emission Reduction Currency system⁵⁶⁰ tries to create a behavioural change or carbon-based currency⁵⁶¹. So called ‘stable coin’ would be backed by solidified and safely-sequestered carbon that has been “mined” by a global

⁵⁵³ <https://www.wri.org/blog/2019/10/how-are-banks-doing-sustainable-finance-commitments-not-good-enough> (Consulted on November 4th, 2019).

⁵⁵⁴ Idem

⁵⁵⁵ <https://www.unepfi.org/banking/bankingprinciples/> (Consulted on November 4th, 2019).

⁵⁵⁶ <https://www.unepfi.org/banking/tcfd/> (Consulted on November 4th, 2019).

⁵⁵⁷ <https://sciencebasedtargets.org/financial-institutions/> (Consulted on November 4th, 2019).

⁵⁵⁸ <http://there100.org> (Consulted on November 4th, 2019).

⁵⁵⁹ <https://www.bloomberg.com/news/articles/2018-12-04/five-of-europe-s-biggest-banks-join-low-carbon-lending-effort> (Consulted on November 4th, 2019).

⁵⁶⁰ https://wiki.p2pfoundation.net/Emissions_Reduction_Currency_System (Consulted on November 4th, 2019).

⁵⁶¹ Buckminster Fuller (n 19).

army of prospectors'⁵⁶², in this way bringing value as a useful resource to what is currently considered waste and pollution.

This digital currency would use the local banks for chits, i.e. rewards for carbon sequestration and in this way, it would promote the exchange. Thus, every citizen around the world could use the available technologies and it would not require high investments in the big-scale technologies. Biochars made of solidified carbon could be an alternative to gold, being portable, non-decaying, easily divisible, and quantifiable, its availability (and scarcity) would depend on the nature. The functioning is related to the dispersed fractional reserve system.

7.4. CONCLUSIONS

The general view is highly affected by the 2008 crisis which in some way can also provide for a reason to review the role of banking in the economy and society, even if probably the momentum for deep changes has already passed. Brexit in the medium term could however allow for more EU integration due to the generally perceived EU-scepticism of the UK, balanced by the raise of populist anti-European parties.

Innovation is currently understood as the main force of progress in the global economy and socioecology. However, at the international authorities' level, the issue addressed by the traditional banking and monetary sector is the system and prices stability, understood in terms of laying a proper background structure for the activities of economic and other agents. Systemic banking sector innovation concerns are left apart. In an ideal world, this stability should lead to the sustainability of the economic and socioecological system itself. However, from what we can realize along the study is that the dynamics of the banking and above all financial sector display high fluctuations, destabilizing in this way not only the economy, but also society and natural environment management. The digitalization only acerbates this tendency, because in comparison to the 'physical' world the changes can be massive, instantaneous, and procyclical instead

⁵⁶² <http://www.publicseminar.org/essays/more-precious-than-gold/> (Consulted on November 4th, 2019).

of countercyclical, especially due to boosted ‘herd effect’, i.e. following what others are doing, an example can be subprime credit expansion all over the world.

The kind of weak approach to innovation reinforces the current status quo, in short term it can allow the system continuity but in the long run it does not really improve competitiveness as the (over)protected current banking institutions when not obliged to compete and innovate, become in this way more fragile and prone to crisis adversities.

When carefully checked, emerging banking and monetary innovation ecosystem’ depiction brings forward its rather fragmented nature. Every dimension has the appearance of working on the issue of endemic weakness of the banking and monetary system, but their efforts go in sort of different directions. Nonetheless, at some points they could also become complementary, for instance, when different, alternative currencies can be used in the same economy⁵⁶³.

Banking authorities are concentrated on the liquidity and regulation questions related frequently to risk minutiae of banks and specifically credit functioning. According to some voices, secular stagnation fear with low interest rates, furtherly drained the benefits from current banking business, taking away the time value. Many financial markets instruments apply the mechanisms of bringing future value to present, which over time can cause what some address as ‘black hole of debt’⁵⁶⁴ (and spaghettification of economy). Purchase of large-scale assets brought the investment in equities and incentivised the activity of stock market, reinforcing the capital predominance over other dimensions of economy and socioecology of the ecosystem.

Regulations are increasing the dependence on scale, boosting concentration (mergers and acquisitions), and developing stronger entry barriers. These activities are not helping competition, many times are even weaken it.

⁵⁶³ Please see also (in Spanish): <https://www.iebschool.com/blog/innovacion-banca-finanzas/> (Consulted on May 2nd, 2020).

⁵⁶⁴ <https://www.youtube.com/watch?v=u3ojPk8CQns> (Consulted on November 4th, 2019).

There are however some cases, where the regulation would bring also the collaboration reinforcement as the PSD2 directive, with its open APIs policies, it tries to deregulate the traditional banking monopoly in favour of fintechs. It implies cooperation, especially in what relates to customer data.

Nonetheless, the impression is that that the FinTechs in many cases are only pilots, once tested the effectiveness of their solutions they become incorporated in FAANG (Facebook, Amazon, Apple, Netflix, Google) and other related Big Tech companies. They are more and more able to quite quickly engulf the traditional markets. In short term they are innovative but the concern is their emerging architecture in long-term. They become de facto supranational monopolies or oligopolies without the power to control and regulate them effectively. The lack of transparency and fiscal creativeness seem to be their implicit characteristic, furtherly increased by Artificial Intelligence, apparently without the option to audit it. Apart from that, fintechs are taking away the more interesting segments of the business, especially from the benefits point of view, reinforcing the difficult situation of the traditional banking.

Out of the traditional banking regulation there is a shadow banking sector renamed and closely monitored by FSB as non-bank financial intermediation. Together with M4 or broad money supply they are both causes to concerns, especially due to their size as compared to the real economy.

Disruptive innovative solutions as digital cryptocurrencies, which could in principle repair the broken link between money and value⁵⁶⁵. i.e. bitcoin is reducing its innovation scope, by changing ‘only’ the currency production body, perhaps erasing some middle-men in the process due to blockchain, are at the end highly volatile in value. Probably it is related to the unicorns’ search dynamic in the innovation field, where the risk is so high that the companies that function must compensate for all the losses.

New approaches arising from the Academia, based on ‘operational realities’ even if not solvent from the theoretical outlook as the MMT, can prove their utility in moderating the austerity measures. The new solutions to money issuance, such as positive

⁵⁶⁵ Rushkoff (n 14).

money, seem inspiring, notably as they promote the central bank accounts for individuals and companies, that due to the technological advances are being currently under revision for implementation by some banks around the globe. Anyway, they are so far stuck at the niche level, enabled once by the opportunity window of 2008 financial and economic crisis, progressing very slowly nowadays. Perhaps the climate emergence can open a new opportunity window, when it transcends from the sociotechnical landscape to other levels.

The currency innovations show every sign of being up and coming, it is a field that can be found almost at each level. Some even advocate for a supranational entity for the issuance of truly international, the point is the accountability of such an institution. This concern is also raised for the case of central banks digital currency issuance. Complementary, alternative or local currencies have the conditions of attractive study field for the researches, particularly inspiring from the community point of view. Especially local currencies could bring along more cooperation and sustainability due their implicit way of functioning, explained previously. Also, the natural environment related currencies proposals demonstrate their usefulness (so far in terms of intellectual exercise) as they would allow the orchestration of the efforts of the economic agents toward the environmental goals. What is more, the alternative also digital currencies at the global level can be considered as a leverage to the USD and its associated economic and political power.

Society seems to be sceptical and scared by the complexity of the banking and monetary system functioning, not allowing the related subject to enter the Overton window of public debate. Commodification of culture and financialization of the economy are the undergoing processes which furtherly make the understanding of the banking innovation more pertinent. Indeed, there are some innovative ways of making society familiar with more complex questions, this could be the gamification as in the case of LETSplay game⁵⁶⁶, which with minor time investment promises to help understand the way of open community money system functioning.

⁵⁶⁶ <https://openmoney.org/letsplay/index.html> (Consulted on November 4th, 2019).

Banking and financial sectors are uniquely constitutive to the economy and society in the modern world where capitalist system is prevailing. Capital seem to be the prevailing factor of production when compared to labour and land ⁵⁶⁷. Increasing inequality and natural environment challenges can be considered some of the most worrying outcomes of such configuration. If not properly addressed, according to some voices, this could lead to the socioeconomic neo-feudalism ⁵⁶⁸.

From the collective intelligence perspective, the supranational structure of the banking and monetary sector, in the digital world more than ever transcends the borders and has its global impact. This would also apply to natural environment. Climate change is global and what is more, it cannot be addressed by one region or location only, more collaboration than competition would be required in order to reach sustainability. Especially, in case of banking and natural environment dimensions with their transactional nature, the actors become relevant not so much because of their agency but much more because of the relations their bring. The context of liquid reality ⁵⁶⁹ and relational sociology ⁵⁷⁰ could bring a deeper inside to the subject.

The further quest regarding value refers also to value creation versus value extraction⁵⁷¹ and the functioning socioeconomic system should definitely privilege and harness the first one, which is not always the case for banking and financial sector. This could also be an interesting aspect for further research.

⁵⁶⁷ Picketty (n 377).

⁵⁶⁸ John Kenneth Galbraith, *Money: Whence It Came, Where It Went*. (1977).

⁵⁶⁹ Zygmunt Bauman, *Dentro La Globalizzazione. Le Conseguenze Sulle Persone*. (Editori Laterza 1999).

⁵⁷⁰ Pierpaolo Donati, *Birth and Development of the Relational Theory of Society: A Journey Looking for a Deep 'Relational Sociology'* (University of Bologna 1968).

⁵⁷¹ https://www.project-syndicate.org/commentary/platform-economy-digital-feudalism-by-mariana-mazzucato-2019-10?utm_source=Project+Syndicate+Newsletter&utm_campaign=d192f2bc47-sunday_newsletter_6_10_2019&utm_medium=email&utm_term=0_73bad5b7d8-d192f2bc47-105013549&mc_cid=d192f2bc47&mc_eid=a8cee90b20 (Consulted on November 4th, 2019).

8. CONCLUSIONS

8.1. CONCLUSIONS IN ENGLISH

In the present work, the framework for the assessment of the maturity of the innovation ecosystems was developed and after that applied for practical cases, for Horizon Europe policy proposal and also for the study of banking sector.

From the perspective of innovation ecosystems, socioecological perspective emerged as an especially relevant one, bringing the attention to such actors as society and natural environment. Even if natural environment has its difficulty to be seen as an active actor by itself⁵⁷², it should be indeed an important *leit motive* while undertaking any human activity, once assumed we live in the ‘Anthropocene’ era. It is corroborated by addressing the subject from sociotechnical landscape stance of the Multilevel Perspective.

The grid-group cultural theory allows to organize the ways of structuring social relations according to four different perceptions of reality of culture and policy, four ways of ‘organizing, perceiving and justifying social relations’, also in what refers to innovation ecosystems devising and promotion.

Cultural theory assumes fractal nature of social life, i.e. where the four ways of life are interacting very strongly, splitting, merging and recombining. It allows to address in a constructive way the main challenge of our times which is the crisis of perception, assuming that different standpoints come with different premises. Each ways of life need each other to attain the long-term sustainability.

⁵⁷² There are proposals, like Terra0: <https://terra0.org> (Consulted on December 8th, 2019), where the forest can become an actor, gaining virtually given technological and legal agency and having its own accountability.

These are the main takes of the present document, because there is still a lot of research which limit themselves to more ‘operational’ point of view of sociotechnical level of sector functioning or a ‘philosophically’ oriented socioecological perspective. There are, however, approaches which try to operationalise the socioecological dimensions, like Elinor Ostrom⁵⁷³ and the P2P Foundation with the ‘commons’⁵⁷⁴ concept as a complementary governance model, for applying the government or market ‘invisible hand’ management, always when it suits the situation and its context. ‘A commons’ *modus operandi* is seen as an interesting line of future studies regarding the innovation ecosystems, especially when it comes to knowledge⁵⁷⁵ and socioecological management.

The conceptual framework elaborated in the present research is giving the overall structure for the studies, providing a more comprehensive and dynamic model of innovation ecosystems. A more static approach is already quite well grounded in contemporary literature of the innovation, i.e. the government, academia and industry dimensions were already studied in the 60s in Sabato’s triangle of knowledge. Their meta innovation constituency and interactions, through their own interfaces as well as intermediary entities become particularly important. In this sense, the relational sociology⁵⁷⁶ approach would be an interesting line of future investigations.

However, already the intermediary entities appear extremely difficult to an individual study, probably due to their recent proliferations, regarding their number but also their definition, a hybrid one, in every term, especially in ownership terms. In the present document, due to the case studies chosen, prevailed the limitations of subject matter, time and data availability and consistency. It should be yet consistent to develop them in the future lines of research. For instance, the questions of bilateral agreements

⁵⁷³ Charlotte Hess and Elinor Ostrom (n 24).

⁵⁷⁴ Michel; Bauwens and Alex Kostakis, *P2P Accounting for Planetary Survival. Towards a P2P Infrastructure for a Socially-Just Circular Society*. (2019); Charlotte Hess and Elinor Ostrom, ‘Ideas, Artifacts and Facilities: Information as a Common-Pool Resource’ (2003) 66 *Law and Contemporary Problems* 111 <<http://www.law.duke.edu/journals/66LCPHess>>.

⁵⁷⁵ Commons perspective can also be interesting for its application in the citizen science philosophical approach. A chapter of an internationally written citizen science book is currently being co-authored.

⁵⁷⁶ Donati (n 570).

between actors⁵⁷⁷ are already quite well developed, but it is not the case for the multilateral agreements.

From the process perspective, the ‘valley of death’ or the associated ‘window of opportunity’ seem to be fundamental. At the preliminary stages, the totally new ideas incubation is pertinent, and it is where the government and university seem to play a crucial role, in particular, due to their long-term approaches of several decades time laps till their can materialize into an economically viable implementation. Basic research is eminently suitable for this role, even though paradoxically it is not easily explicable in the short-term.

At further stages, the proof of concept can be done together with the industry, as it would be fundamental for market introduction and acceleration or scaling-up. The regulatory sandboxes allow for a smoother legislation adaptation, which is risk mitigating for all of the implied actors and dimensions.

The three-fold relationships between the innovation helixes, i.e. the vertical ones inside each of the helixes (actors’ fields), the horizontal ones between the different helixes, but also the extra-relations understood as the interaction of an innovation ecosystem with its environment and other innovation ecosystems is of a vital importance. This can be seen especially for the global questions, such as climate change, or the geopolitics of the currency system, which convey only a partial view on the dynamics when not considered. In the last case, it required the enlargement of the studied field beyond the European Union. For the innovation, dependency on foreign technology, brain or even innovation start-ups drain can be the unwanted consequences in this respect.

The actors’ perspective of the innovation helix applied to the European Union explicit R&I Policy, i.e. Horizon Europe proposal, gives an insightful picture of the denotative consideration of the three blades of the innovation helix, however there is only rather tacit move toward the socioecological dimensions which are considered pivotal to the sustainability and proper innovation ecosystem articulation. More ‘we’ and collective intelligence orientation is required to mitigate and overcome the systemic risks. The

⁵⁷⁷ For instance, university-industry relations or the policies of the government related to these actors (separately).

model application brings an actionable in-depth understanding. It is especially relevant in the complex picture of the EU policy strategy, where striving for simplicity is continuously stressed. The endeavours toward coherence along time and space, are also recommended, as the FPs (and related grant mechanisms) are only some years long and the general Member States and furthermore regional specificities are an outstanding challenge to deal with. Progresses are being made regarding the operability and manageability of the actors' way through the EU support process, for instance, lowering the administrative burden.

Some of the more omnipresent mantras seem to be however the areas when more sub-optimal lock-ins are present, with a willingness of already strong actors to maintain their status quo. This can be the case of the scientific excellence with its bibliometrics orientation or the bottom-up requirements for the processes which need to be grounded in already strong civil society, furthermore the efficiency and flexibility of its institutional framings. The inclusion principles seem to be centred on the more polemic and also statistically less pertinent cases, like outermost regions or LGBT+ rights, while huge areas like the South and Eastern Europe participation in funding (with the exception of SMEs sector in Spain) or the women equality are progressing rather slowly⁵⁷⁸.

The missions' orientation of the EU program is presented as the main innovation approach improvement, allowing closer citizens understanding of the policies. Scientific advice offices for policy institution should also allow for more alignment of different actors as well as a more thorough understanding. Innovation funding is still a concern, two ways of improvement seem especially relevant: public procurement where big sums are at stake and private (venture) funding which is the Achilles heel of the EU innovation.

Regulatory sandboxes and Reg- or Legtech companies can be of great help in the legislation and regulations adaptation for the disruptive 'greenfield' innovation, especially from the risk lowering outlook for all the innovation actors involved.

⁵⁷⁸ The examples can be the participation of the Eastern European countries in the EU FP Horizon 2020 or the inclusion of the 'maternity leave' case in the grants policy of the EU.

From the Academia point of view the EU strategy is also very important to provide a long term plan of action, however, the scientific excellence criteria⁵⁷⁹ are having somehow wayward effects on the scientific activity and publishing market evolution, especially when they happen to collude with the more declared than really considered openness declarations⁵⁸⁰.

Newly constituted European Innovation Council should be of help in stimulating the start-ups overcoming the valley of death and scaling-up. For that purpose, the collaboration between start-ups and big corporations can be of vital importance to the process. Venture Capital inclusion in the EU schemes is also a declared effort. Blended finance seems to be a foreseen way of dealing with the private financing deficit in the EU innovation.

None of the current technology giants are from the EU, which from some perspective can also be advantageous mainly due to their immoderate profit orientation. The rules such as GDPR – General Data Protection Rules, can help avoid future problems, however it does not include the collective, relational data. Probably the EU could follow China's example in developing its own social networking platforms and avoid the dependence on Facebook and similar giants. The data considered the petrol of the XXI century, are a base for the machine learning and AI development.

The EU after the fall of its constitution and Brexit issue is having reinforced intents to improve its engagement with society. Not only diffusion but also more society empowering initiatives like citizen science⁵⁸¹ or social innovation processes are stated as

⁵⁷⁹ Please check also the co-authored blog entry: <https://aeac.science/la-agencia-estatal-de-investigacion-frente-al-espejo-de-la-comparacion-internacional-pesimismo-de-la-inteligencia-versus-optimismo-de-la-voluntad/> (Consultation on January 18th, 2020).

⁵⁸⁰ For instance, the reliance on the JCR Journals publications seem to be at odds with open access publications (not only open from the readers perspective).

⁵⁸¹ Please check the blog entry: <https://aeac.science/citizen-science-do-it-together/> (Consulted on December 8th, 2019), also the I International Citizen Science Forum 2019: <https://ciencia-ciudadana.es/i-foro-internacional-ciencia-ciudadana-en-espana/> (Consulted on December 8th, 2019), where the Citizen Science groups activities were presented by the author. Also: <https://aeac.science/civilab-comunidad-de-ciencia-ciudadana-2/> (Consulted on December 8th, 2019).

the lines of action. Nonetheless, there is no declared impulse for collaborative economy or ‘commons’ approach.

There is an implicit commitment of 25% of R&I EU budget assignment for the natural environment. The circular economy orientation needs to be a global trend implemented starting from education to general products and production design.

The innovation policy landscape is everchanging and more and more complex, apart from its already stated geographical fragmentation from the member states and regional centres.

The criteria of scientific, social and economic impacts in the Horizon Europe would probably require a more actionable approach, taking into account actors’ perspective. They should also be the basis for the evaluation and budget assignments. Close and real time monitoring can flood everybody with the irrelevant information, there is already a question of so-called GIGO (garbe-in, garbage-out) for Big Data. Cross-cut analysis, especially in the metamodern context is of great relevance. This study hope is to provide with such a simple tool for complex reality structures understanding.

Collective intelligence orchestration should be seen as an important field of innovation development. In this sense, the question of Future of Work⁵⁸² would be an interesting and relevant field of study which by the way is missing in the Horizon Europe proposal so far. The Future of Work question is also pertinent to SDGs and competitiveness sustainability^{583 584}.

The concentration on the measurements, especially for the purpose of management and improvements is relevant, however, as Albert Einstein said: “Not

⁵⁸² During the duration of this PhD studies, several experimental workshops regarding the Future of Work subject were held by the AEAC Futuroscopio community. The outcomes of some of them were published in the AEAC blog: <https://aeac.science/futuroscopio/> (Consulted on December 8th, 2019). This line of work and experimentation finds is continued in CID - Collective Intelligence Development Network: <https://www.linkedin.com/in/network-lion-collective-intelligence-development-2a5248197/> (Consulted on January, 8th, 2020),

⁵⁸³ José Sánchez Gutiérrez and Tania González Alvarado, *Competitiveness against Sustainable Development Goals* (2019) 7–32.

⁵⁸⁴ Please check also the associated blog entry: <https://aeac.science/capitulo-libro-cambio-climatico/> (Consulted on January 18th, 2020).

everything that can be counted counts, and not everything that counts can be counted.” Similar is the question of value and its monetary expression, as expressed by Adam Smith⁵⁸⁵.

The 2008 crisis brought a need of revision of the role of the banking sector in the economy and society. However, the way of dealing with the question is far from reaching a satisfactory public approval, especially when it refers to popularization of austerity measures defined by many as counterproductive. It rather led to a wide disenchantment of the society towards the government and the sector (or industry) as a such.

What is more, the stability undermining relationship between banking sector and government was exposed in the diabolic loops’ dynamics. This interdependence seems to oblige the government to worry about the banks’ liquidity and whereabouts more than about the general interest of the society. European Central Bank tried new methods like unconventional monetary policies, which fulfilled their main role of maintaining system stability, but with the not so welcome asymmetric effects of strengthening the ones with already advantageous position in terms of capital. Hyper-activity in the financial market was additionally fuelled in this way and reinforced even more the role of capital and inequality when compared with other means of production. These effects increased even more the fragility of the system, lowering the competitiveness and long-term robustness, resilience and sustainability of the sector.

The digitalization is so far not strongly affecting the core of the banking activities, as banking systems still mainly rely on the legacy frameworks which are not easy to be dealt with, partially because of the popularized human resources outsourcing and in consequence loss of knowledge about their own functioning. Fintechs seem to be centred on big data and payments (see PSD2), all areas where big tech giants as Facebook or Amazon reign. Some innovations related to money issuance, as the Bitcoin seem at the end more about the value fluctuation due to expectations’ change than real value creation. The expansion of legal regulation on one hand increases costs but also the entry barriers for new competitors.

⁵⁸⁵ Smith (n 13).

The real innovation of the banking sector seems to be still a pending lesson to learn, the most radical proposals are currently at the niche level, society in general seems to lack the understanding and also interest, especially when the related questions are presented in the complex and tremendous terms. The knowledge of the metamodern attitudes can provide insightful ways for dealing with these issues and furtherly allows for the suboptimal lock-ups' overcoming related to the rigidity tramp.

From a closer look, it is clear that the international level banking authorities, including the EU ones, are centred on the questions of stability of the system, and as previously pointed out, it can have, already in medium term, rather pejorative effects on the competitiveness and furthermore long term sustainability. The digitalization only aggravates current tendencies as the changes can now be more massive, instantaneous and besides more procyclical due to the networks boosted herd effect.

The expansion of the legislation, risk and monitoring requirements for the sector furtherly heightens the entry barriers for newcomers and smaller entities as only the scale can help covering the increasing costs. Secular stagnation fear with the correspondent countermeasures, such as low interest rates erase the benefit base which for the banking sector rests on the interest differential and commissions. Already the notions of credit and inflation associated with fiat currencies, which require the economy growth in order to repay the interests is brought into question, when it comes to the exploitation of natural resources.

Some collaboration initiatives like PSD2 directive, lay the playing field for the entry of the new fintech companies. The big data and customer information can be better managed in this way. Fintechs enter especially into more interesting fields, from the profit view, of the banking activity, deepening the commodification of the traditional banking. Once proven to be successful many of the fintechs are acquired by the FAANG tech giants, which become the most pondered competitors of traditional banks. The current international architecture rather lacks effective power to control their monopolies or oligopolies at most. The question is also how much their valuations rely on the really functioning business models and added value creation, and not on the expectations' hypes, in search of unicorns to compensate the losses of the investment in a risky innovation business.

Innovative academia approaches bring some counterweight to the austerity measures or emphasis on the private sector and the invisible hand of the market forces management abilities. They are promising, however once passed the momentum of 2008 economic crisis, they seem to get dissipated. Climate emergency if taken seriously could bring together a window of opportunity in this question.

The currency issuance emerges from this research⁵⁸⁶ as the most promising and disruptive innovation field. Some advocate for the supranational entity, the question would be its accountability. National banks digital currency issuance is also under studies by some countries, with the same precautions. Complementary, local or alternative currencies, also the ones based on natural environment seem to be especially interesting solutions to the issues of fiat currency. In particular, these innovative currencies due to their ways of functioning, i.e. quick need of reinvestment in local environments, would be more oriented towards cooperation reinforcement, and could help facing the competitiveness exigencies, bringing along the resilience and sustainability.

There are many interesting proposals and ways of boosting the collective intelligence found during the research, especially when recognizing the actors' role and perspective as well as their accountability. The overemphasized focus on power and benefits, can be at odds with the welfare of population in general, when the matter comes to natural environment and climate change. The accountability and responsibility should be encountered in the process.

The innovation brings, as well, an interesting debate of trust vs hyperformalisation⁵⁸⁷ in legal and social transactions, assigning the technology a privileged place and depreciating the human factor. Associated comes here also the question if this is technology to serve humans or the reversal is the case, relating itself

⁵⁸⁶ Sara González Fernández, Renata Kubus and Juan Mascareñas Pérez-Iñigo, 'Innovation Ecosystems in Banking and Monetary Sector: Competitiveness versus Sustainability' (2020) 1 *Mercados y Negocios* 19 <<http://www.revistascientificas.udg.mx/index.php/MYN/article/view/7512>>.

⁵⁸⁷ <https://medium.com/cryptolawreview/blockchain-governance-redistributing-societal-interactions-and-institutions-a-research-agenda-f644da4af0ab> (Consulted on November 4th, 2019).

very well to the ‘matrix’ model of society and economy. So far, there is no perfect system, all of them, required human intervention and attention⁵⁸⁸.

In this sense, the notion of Social Shaping of Technology (SST)⁵⁸⁹ can be of help, when the technology is understood as evolving together with society in a two-ways manner, as a spiralling process, opposed to technological determinism. What is more, so far, there is no perfect system, all of them require human attention⁵⁹⁰. The SST would reinforce the motion for the Society inclusion into the innovation ecosystem actors.

Only human teams are so far able to generate the third loop learning. We should learn as individuals and also as collectives, we should enter the metamodern space of ‘daring to know’. From this point of view, the dimension of general interest of the study is relevant, as it allows to fulfil its premise of collective intelligence fostering.

⁵⁸⁸ And especially the blockchain technology which can be corrupted since the very beginning of its core conception process, with rather a scarce opportunity for scrutiny/correction in the more advanced stages.

⁵⁸⁹ Robin Williams and David Edge, ‘The Social Shaping of Technology’ (1996) 25 Research Policy 865.

⁵⁹⁰ And especially blockchain technology can be corrupted from the very beginning of its core conception with rather meagre opportunity of scrutiny/correction in further stages.

8.2. CONCLUSIONES EN ESPAÑOL

En el presente trabajo, se compone el marco para la evaluación de la madurez de los ecosistemas de innovación que luego se aplica en casos prácticos, para la propuesta de Horizonte Europe y también para el estudio del sector bancario.

Desde el enfoque centrado en los ecosistemas de innovación, la perspectiva socioecológica surge como especialmente relevante, implicando a los actores como la sociedad y el medio ambiente. Incluso si éste último no resulta fácil verlo como un actor activo por sí mismo⁵⁹¹, debería ser un *leit motiv* importante al emprender cualquier actividad humana, y más viviendo en la era del "Antropoceno". Lo corrobora la aproximación mediante el nivel del paisaje sociotécnico desde la perspectiva multinivel (MLP). Estos son los principales resultados del presente estudio.

La teoría cultural de grupo/estructura permite organizar las formas de articular las relaciones sociales de acuerdo con cuatro percepciones diferentes de la realidad de la cultura y la política, cuatro formas de "organizar, percibir y justificar las relaciones sociales", también en lo que se refiere a la creación y promoción de ecosistemas de innovación. .

Esta teoría cultural asume la naturaleza fractal de la vida social, es decir, las cuatro formas de percibir la vida están interactuando muy fuertemente, dividiéndose, fusionándose y recombinándose. A través de la misma, se hace posible abordar de manera constructiva el principal desafío de nuestro tiempo, que es la crisis de percepción, suponiendo que diferentes puntos de vista vienen con diferentes premisas. Cada uno de los cuatro estilos de vida se necesita mutuamente para alcanzar la sostenibilidad a largo plazo.

En principio, prevalecen actualmente dos tipos de proyecciones diferentes, se podría decir opuestas: numerosos estudios que se limitan a un punto de vista más

⁵⁹¹ Hay propuestas, como Terra0: <https://terra0.org> donde el bosque puede convertirse en un actor activo, adquiriendo virtualmente la agencia tecnológica y legal y teniendo su propia responsabilidad.

"operativo" del nivel de funcionamiento del sector sociotécnico o una perspectiva 'filosófica' socioecológica. Existen también enfoques que intentan operacionalizar las dimensiones socioecológicas, como Elinor Ostrom⁵⁹² y la Fundación P2P con el concepto del "bien común o compartido, o lo común"⁵⁹³ a modo de un modelo complementario de gobernanza, junto con la gestión del gobierno o la mano invisible del mercado, siempre que se adapte a la situación y su contexto. . El *modus operandi* de "lo común" se ve como una línea interesante de futuros estudios sobre los ecosistemas de innovación, especialmente en lo que respecta al conocimiento⁵⁹⁴ y la gestión socioecológica.

El marco conceptual elaborado en la presente investigación aporta la estructura general para los estudios, proporcionando un modelo más completo y dinámico de ecosistemas de innovación. Un enfoque más estático ya está bien desarrollado en la literatura contemporánea sobre la innovación, i.e. las dimensiones del gobierno, la academia y la industria se estudiaron ya desde los años 60 y el triángulo del conocimiento de Sabato. Cobran especial importancia sus componentes e interacciones en el proceso de metainnovación, a través de sus propias interfaces y entidades intermedias. En este sentido sería interesante la aplicación de sociología relacional⁵⁹⁵, como una futura línea de estudio para profundizar el enfoque. Sin embargo, las organizaciones intermedias de innovación resultan difíciles de examinar, en parte debido a su gran proliferación reciente, en lo que concierne a su número, pero también en cuanto a la definición, al ser híbridos, en todos los términos, especialmente en el de la propiedad. En el presente documento, debido a los estudios de caso elegidos, prevalecieron las limitaciones de temática, tiempo y disponibilidad de datos y su consistencia. No obstante, reviste su importancia poder desarrollarlos en las futuras líneas de investigación. En tal cuestión, por ejemplo, un

⁵⁹² Charlotte Hess and Elinor Ostrom (n 24).

⁵⁹³ Hess and Ostrom (n 574); Bauwens and Kostakis (n 574).

⁵⁹⁴ La perspectiva de lo común también puede ser interesante por su aplicación en el enfoque filosófico de la ciencia ciudadana. Actualmente se está redactando, con la participación de la autora, un capítulo de un libro de ciencia ciudadana escrito internacionalmente.

⁵⁹⁵ Donati (n 570).

aspecto como los acuerdos bilaterales entre actores ya están bastante bien desarrollados⁵⁹⁶, pero no es así para el caso de los acuerdos multilaterales.

Desde la perspectiva del proceso, el "valle de la muerte" y la "ventana de oportunidad" asociada parecen ser especialmente relevantes. En las etapas 'preliminares', la incubación de ideas totalmente nuevas es fundamental, y es donde el gobierno y la universidad parecen jugar un papel crucial, primordialmente debido a sus enfoques a largo plazo, de varias décadas, hasta llegar a la posibilidad de su implementación económicamente viable. En particular, la investigación básica se adecua para este papel, aunque, paradójicamente, se considere difícilmente justificable a corto plazo.

En las etapas posteriores, las pruebas de concepto se pueden desarrollar junto con la industria, ya que son esenciales para la introducción de la innovación en el mercado y la aceleración o escalado de la empresa. Los sandboxes entendidos como entornos de prueba regulatorios permiten una adaptación más fluida de la legislación, lo que mitiga el riesgo para todos los actores y dimensiones implicados.

Tres tipos de relaciones entre las hélices de innovación son de vital importancia, i.e. las verticales (intra) dentro de cada una de las hélices, las horizontales entre las diferentes hélices, pero también las extra-relaciones entendidas como la interacción de un ecosistema de innovación con su entorno y otros ecosistemas de innovación. Esto es esencial en cuestiones globales, como el cambio climático o la geopolítica del sistema monetario, que cuando no se consideran, surten solamente una visión parcial de la dinámica. En el último caso, se requirió la ampliación del ámbito más allá de la Unión Europea. Para la innovación, las consecuencias no deseadas a este respecto serían la dependencia de la tecnología extranjera, la fuga de cerebros o también start-ups.

La perspectiva de los actores de la hélice de la innovación aplicada a la Política de I +D+i explícita de la Unión Europea, i.e. la propuesta de Horizonte Europe, ofrece una imagen global de la consideración explícita de los tres 'filamentos' básicos de la hélice de la innovación, sin embargo, solo hay un implicación bastante tácita hacia las

⁵⁹⁶ Por ejemplo, las relaciones universidad-industria o las políticas del gobierno relacionadas con estos actores (por separado).

dimensiones socioecológicas que se consideran fundamentales para la sostenibilidad y la adecuada articulación de ecosistemas de innovación resilientes.

Se requiere más orientación estilo "nosotros" que acarree la inteligencia colectiva para mitigar y superar los riesgos sistémicos. La aplicación del modelo ofrece una comprensión profunda y accionable. Es especialmente trascendental debido a la imagen compleja de la estrategia política de la UE, donde, no obstante, se enfatiza continuamente la lucha por la simplicidad. Los esfuerzos dirigidos hacia la coherencia a lo largo en el tiempo pero también en lo que se refiere al espacio son igualmente importantes. Los programas marco (y los mecanismos de subvención (grants) relacionados) duran solo unos años y los Estados Miembros en general, pero, además, sus especificidades regionales, conllevan a un desafío importante a enfrentar. Se están haciendo progresos con respecto a la operatividad y la capacidad de gestión de los actores a través del proceso de apoyo de la UE, por ejemplo, reduciendo la carga administrativa.

Con todo, algunos de los mantras más omnipresentes parecen ser las áreas donde hay más bloqueos subóptimos en cuanto a su permeabilidad hacia la innovación, con el apalancamiento de actores ya fuertes para mantener su *status quo*. Así podría ser el caso de la excelencia científica con su orientación bibliométrica o los requisitos de procesos abajo-arriba (bottom-up) que deben basarse en una sociedad civil ya sólida y la eficiencia y flexibilidad de sus marcos institucionales, difícilmente alcanzables en los países con un grado de desarrollo menor. Los principios de inclusión parecen centrarse en los casos más polémicos y estadísticamente menos pertinentes, como las regiones ultraperiféricas o los derechos LGBT +, mientras que grandes áreas como la participación de Europa del Sur y Este en la financiación (con la excepción del sector de las PYMES en España) o la igualdad de las mujeres⁵⁹⁷ están progresando muy lentamente.

La orientación por misiones del programa marco de la UE se presenta como la principal mejora en el enfoque de innovación, permitiendo así a los ciudadanos comprender mejor las políticas. Las oficinas de asesoramiento científico para las instituciones políticas también deberían conllevar una mayor alineación de los diferentes actores, así como una comprensión más profunda y objetiva de temas tratados. La

⁵⁹⁷ Los ejemplos pueden ser la participación de los países de Europa del Este en el FP Horizonte 2020 de la UE o la inclusión del caso de "licencia de maternidad" en la política de subvenciones de la UE.

financiación de la innovación sigue siendo motivo de preocupación, dos formas de mejora revisten especial relevancia: la contratación pública en la que están en juego grandes cantidades de fondos y la financiación privada, que es el talón de Aquiles de la innovación de la UE.

Los sandboxes regulatorios y las compañías Reg- o Legtech pueden ser de gran ayuda en la adaptación de la legislación y las regulaciones para la innovación disruptiva estilo "greenfield" i.e. abriendo un campo totalmente novedoso o virgen, especialmente desde la perspectiva de mitigación de riesgos para todos los actores de innovación involucrados.

Desde el punto de vista de la Academia, la estrategia de la UE es muy importante para proporcionar una estrategia a largo plazo, sin embargo, los criterios de excelencia científica⁵⁹⁸ están teniendo efectos perversivos en la actividad científica y la evolución del mercado editorial, especialmente cuando coinciden con las mantras de apertura más de moda en cuanto a declaraciones de intenciones que en la aplicación real⁵⁹⁹.

El Consejo Europeo de Innovación recientemente constituido y actualmente pilotado debería ser de gran ayuda para estimular las nuevas empresas (start-ups) que superan el valle de la muerte y llegan a su escalado en el mercado (scaling-up). La colaboración entre las nuevas empresas y las grandes corporaciones se considera de vital importancia para su progreso. La inclusión de capital riesgo en los esquemas de la UE también es un esfuerzo declarado. La financiación combinada (blended finance) subyace como una forma prevista de abordar el déficit de financiación privada en la innovación de la UE.

Ninguno de los gigantes tecnológicos actuales proceden de la UE, lo que desde cierta perspectiva también puede ser ventajoso principalmente debido a su vertiente de comportamientos monopolísticos. Las reglas como LGPD – Ley General de Protección

⁵⁹⁸ Véase la entrada al blog en coautoría: <https://aeac.science/la-agencia-estatal-de-investigacion-frente-al-espejo-de-la-comparacion-internacional-pesimismo-de-la-inteligencia-versus-optimismo-de-la-voluntad/> (Consultado el 18 de enero de 2020).

⁵⁹⁹ Por ejemplo, la dependencia de excelencia, llevada a las publicaciones de JCR parece estar en desacuerdo con las publicaciones de acceso abierto (y no solo abierto desde la perspectiva de los lectores).

de Datos, pueden ayudar a evitar problemas futuros aunque pueden resultar insuficientes al no cubrir los datos colectivos, de relaciones.

Probablemente, la UE podría seguir el ejemplo de China en el desarrollo de sus plataformas propias de redes sociales y evitar la dependencia de Facebook y gigantes similares. Los datos, considerados el petróleo del siglo XXI, se precisan además para entrenar a las máquinas y desarrollar la inteligencia artificial.

La UE después del fallo de votaciones de su constitución y el tema del Brexit ha reforzado sus intentos de mejorar su compromiso con la sociedad. Se establecen como líneas de acción no solo la difusión sino también más iniciativas de empoderamiento de la sociedad como la ciencia ciudadana⁶⁰⁰ o los procesos de innovación social. Con todo, no existe un impulso declarado para impulsar la economía colaborativa o el enfoque del "bien común" o "lo común".

Hay un compromiso implícito del 25% de la asignación presupuestaria de I+D+i de la UE para el medio ambiente. La orientación hacia la economía circular debe ser una tendencia global implementada comenzando por la educación, la salud y llegando hasta los productos en general y el diseño de la cadena de producción.

El panorama de la política de innovación es siempre cambiante y cada vez más complejo, aparte de su ya mencionada fragmentación geográfica de los Estados miembros y sus regiones.

Los criterios de impacto científico, social y económico en el Horizonte Europa probablemente requerirían un enfoque más práctico, teniendo en cuenta la perspectiva de los actores. También deberían constituir la base para la evaluación y la distribución de asignaciones presupuestarias. El monitoreo cercano y en tiempo real puede inundar con la información irrelevante, estilo la llamada cuestión de GIGO (garbe-in, garbage-out o basura dentro, basura fuera) para Big Data (también llamado macrodata, o inteligencia de datos). El análisis transversal, especialmente en el contexto metamoderno, es de gran relevancia. Se espera proporcionar con este estudio una herramienta relativamente simple para la comprensión de estructuras de realidad complejas.

⁶⁰⁰ Véase la entrada al blog (en inglés): <https://aeac.science/citizen-science-do-it-together/> (Consultado el 18 de enero de 2020)

La orquestación de inteligencia colectiva debe verse como un campo importante en y para el desarrollo de innovación. En este sentido, la cuestión del Futuro del Trabajo⁶⁰¹ sería un campo de estudio interesante y relevante que, por cierto, no se encuentra en la propuesta del Horizonte Europa hasta el momento. La cuestión del futuro del trabajo también es pertinente para los ODS y la sostenibilidad de la competitividad^{602 603}.

Sin embargo, la concentración en las mediciones, especialmente con fines de gestión y introducción de mejoras es relevante, como dijo Albert Einstein: "No todo lo que se puede contar cuenta, y no todo lo que cuenta se puede contar". Similar es la cuestión del valor y su expresión monetaria, como lo expresó Adam Smith⁶⁰⁴.

La crisis de 2008 puso en evidencia la necesidad de revisar el papel del sector bancario en la economía y la sociedad. No obstante, la forma de abordar la cuestión está lejos de alcanzar una aprobación pública satisfactoria, especialmente cuando se refiere a la popularización de las medidas de austeridad. Todo ello, produjo más bien un aumento del desencanto de la sociedad hacia el gobierno y el sector (o industria) como tal.

Además, su relación con la estabilidad del sistema quedó expuesta en la dinámica de los bucles (loops) diabólicos. Esta interdependencia parece obligar al gobierno a preocuparse más por la liquidez y los quehaceres operativos de los bancos que por el interés general de la sociedad. El Banco Central Europeo está probando nuevos métodos, como las políticas monetarias no convencionales, que cumplieron su función principal de mantener la estabilidad del sistema, pero trayendo los malvenidos efectos asimétricos de fortalecer a los que ya estaban más aventajados en términos de capital. Se incentiva además de esta manera la hiperactividad en los mercados financieros y refuerza el papel

⁶⁰¹ Durante la duración de estos estudios de doctorado, dentro del marco de la comunidad de Futuroscopio de la AEAC se realizaron varios talleres experimentales sobre el tema Futuro del trabajo. Los resultados de algunos de ellos fueron publicados en el blog de AEAC: <https://aeac.science/futuroscopio/> (Consultado el 18 de enero de 2020). Esta línea de trabajo y experimentación tiene su continuidad dentro de la Red de Desarrollo de Inteligencia Colectiva – CID, por sus siglas en inglés: Collective Intelligence Development Network: <https://www.linkedin.com/in/network-lion-collective-intelligence-development-2a5248197/> (Consultado el 18 de enero de 2020).

⁶⁰² Sánchez Gutiérrez and González Alvarado (n 583).

⁶⁰³ Véase también la entrada de blog asociada: <https://aeac.science/capitulo-libro-cambio-climatico/> (Consultado el 18 de enero de 2020).

⁶⁰⁴ Smith (n 13).

del capital y, por ende, la desigualdad frente a los otros medios de producción. Estos efectos aumentan la fragilidad del sistema, disminuyendo la competitividad y la robustez, resistencia y sostenibilidad del sector a largo plazo.

Hasta ahora, la digitalización no está afectando fuertemente el núcleo de las actividades bancarias, ya que los sistemas bancarios aún dependen principalmente del marco tecnológico heredado de las décadas pasadas que no es fácil de tratar, en parte debido a la popularización de la contratación externa de recursos humanos y en consecuencia pérdida de conocimiento sobre su propio funcionamiento. Las fintech parecen estar centradas en macrodatos y pagos (véase PSD2), ambas son áreas donde reinan los grandes gigantes tecnológicos como Facebook o Amazon. Algunas innovaciones relacionadas con la emisión de dinero, i.e. el Bitcoin y otras criptomonedas, en última instancia, más que aumentar su uso en las operaciones diarias, son noticia por las fluctuaciones especulativas de su valoración. La expansión de regulaciones y marco legal, por un lado, aumentan los costes, por otro las barreras de entrada para los nuevos competidores.

La verdadera innovación del sector bancario parece ser una lección pendiente, las propuestas más radicales están estancadas al nivel de nicho, la sociedad, en gran proporción, carece de la comprensión y el interés, especialmente cuando los temas relacionados se presentan en términos complejos y tremendistas. El conocimiento puede proporcionar formas apropiadas para lidiar con estos desafíos, permitiendo además la superación de bloqueos subóptimos (lock-ins) relacionados con la trampa de la rigidez.

Analizando el tema en más detalle, está claro que las autoridades bancarias a nivel internacional, incluidas las de la UE, se centran en las cuestiones de estabilidad del sistema. Como se señaló anteriormente, estas políticas pueden demostrar debilitar, ya a medio plazo la competitividad y además la sostenibilidad a largo plazo. La digitalización puede reforzar de sobremanera las tendencias actuales, ya que los cambios ahora pueden ser más masivos, instantáneos y por ende más procíclicos debido al efecto de la manada (herd effect) potenciado a través de las redes.

La expansión de la legislación y marco regulatorio, junto con los requisitos de riesgo y monitoreo para el sector, además de los efectos ya comentados, aumentan aún más la concentración del sector, ya que solo la escala puede ayudar a cubrir la subida de

costes. El miedo al estancamiento secular con las contramedidas correspondientes, como las bajas tasas de interés, provocan la erosión de la base de los beneficios que para el sector bancario se fundamentan en el diferencial de intereses y las comisiones. Asimismo, se cuestionan las nociones de crédito e inflación asociados al funcionamiento de monedas fiat que requieren crecimiento de la economía para pagar los intereses, relacionada también con la explotación de los recursos naturales.

Algunas iniciativas de colaboración, como la directiva PSD2, sientan las bases para la entrada de las nuevas empresas fintech. Los macrodatos y la información del cliente se pueden gestionar y manejar mejor de esta manera. Fintechs entran especialmente en las áreas más interesantes, desde el punto de vista de beneficio para de la actividad bancaria, profundizando la comodificación de la banca tradicional. Una vez demostrado su éxito, muchas de las fintechs son adquiridas por los gigantes tecnológicos de FAANG, que se convierten de hecho en los competidores más ponderados por los bancos tradicionales. La articulación internacional actual carece prácticamente de poder efectivo para controlar sus monopolios, u oligopolios a lo sumo. La pregunta clave es hasta qué punto sus valoraciones se basan en los modelos de negocio realmente eficientes, en la creación del valor añadido relacionado, sino más bien en las expectativas de compradores o mercados de valores, en busca de unicornios para compensar la inversión en un negocio de innovación que por su naturaleza misma es altamente arriesgado.

Los enfoques académicos innovadores aportan cierto contrapeso a las medidas de austeridad y el hincapié sobre el sector privado y la mano invisible del mercado. Sin embargo, una vez pasado el momento de oportunidad histórica de la crisis económica, el interés por ellos parece disiparse. La emergencia climática podría aportar una ventana de oportunidad en este contexto.

La emisión y conceptualización de la moneda surge de esta investigación como el campo de innovación más prometedor y disruptivo. Algunos abogan por la entidad supranacional, dónde la cuestión crítica sería su rendición de cuentas. La emisión de moneda digital por los bancos nacionales también está siendo estudiada por algunos países, con las mismas precauciones. Las monedas complementarias, locales o alternativas, o las basadas en el entorno natural parecen ser soluciones especialmente interesantes para los problemas de la moneda fiat. En particular, estas monedas innovadoras, debido a su manera de funcionar, i.e. rápida necesidad de reinversión en

entornos locales, se orientarían más hacia la cooperación y ayudarían a contrarrestar las exigencias de competitividad, aportando resiliencia y sostenibilidad.

Durante la investigación, se han descrito muchas de las propuestas y formas inspiradoras de impulsar la inteligencia colectiva, especialmente al reconocer el papel y la perspectiva de los actores. El foco exclusivo en el poder y los beneficios, puede estar reñido con el bienestar de la población en general, en tanto en cuanto se trata del medio ambiente y el cambio climático. El sentido de responsabilidad debe reencontrarse en el proceso.

Asimismo, la innovación trae consigo un interesante debate de confianza versus hiperformalización⁶⁰⁵ en transacciones legales y sociales, asignando el lugar privilegiado a la tecnología y mermando la importancia del factor humano. Asociada viene también la pregunta si la tecnología está para servir a los humanos o si es a la inversa, relacionándose muy bien con el modelo de "Matrix" de la sociedad y la economía. Hasta ahora, no existe un sistema perfecto, todos requieren atención humana⁶⁰⁶.

En este sentido, la noción de la determinación social de la tecnología (SST)⁶⁰⁷ puede ser de ayuda, cuando se entiende que la tecnología evoluciona junto con la sociedad, con el impacto bidireccional, como un proceso en espiral, opuesto al determinismo tecnológico. El SST reforzaría la moción para la inclusión de la Sociedad en los actores del ecosistema de innovación.

Hasta el día de hoy, solo los equipos humanos son capaces de generar el tercer ciclo/bucle (loop) de aprendizaje. Deberíamos aprender como individuos y también como colectivos, a ahondar en el espacio metamoderno de "atreverse a saber". Por ello, también es importante la dimensión de interés general en el estudio, a través de procesos experimentales, que permite cumplir sus promesas de impulso a la inteligencia colectiva.

⁶⁰⁵ <https://medium.com/cryptolawreview/blockchain-governance-redistributing-societal-interactions-and-institutions-a-research-agenda-f644da4af0ab> (Consultado el 4 de Noviembre de 2019).

⁶⁰⁶ Y especialmente la tecnología blockchain puede corromperse desde el comienzo de la concepción de su núcleo con una oportunidad bastante escasa de escrutinio / corrección en etapas posteriores.

⁶⁰⁷ Williams and Edge (n 589).

9. SUMMARY

9.1. SUMMARY IN ENGLISH

The subject of this PhD thesis is the qualitative analysis of the evolution of structural dynamics providing for advancement of innovation ecosystems in the European Union.

For this purpose, four chapters/articles considering this subject matter were elaborated. The first one is centred on the elaboration of a tentative conceptual framework. This framework is afterwards applied for the study of the innovation policies evolution in the European Union in general, and Horizon Europe proposal in particular. The case study of the banking sector consists in the application of the elaborated framework, it is further on enlarged in the last article, introducing monetary issuance innovation and its context against the competitiveness vs innovation orientation.

The theoretical framework is based on the process and actors view of the innovation ecosystems. Actors view follows the Sabato triangle and triple helix, however apart from Government, Industry and Academia, two additional dimensions were added, i.e. Society and (Natural) Environment which gives a distinctive and richer view on the studied fields. The process view is based on the Multilevel Perspective, establishing innovation phases from the levels of niche, sociotechnical regime and landscape.

The actors' perspective of the innovation helix seems especially valid and actionable when it is joined with the metamodern approach to the nowadays society standpoint and also the grid/group culture theory. It reinforces also the sociotechnical landscape level, for the window of opportunity creation for the disruptive, structural innovations. This is especially relevant when we approach the challenges of our times, such as economic growth, natural environment or the inequality. The transgression of a mere benefit centred business model, leads us to a more civic responsibility, also of the companies and circular economy orientation at each level, from education to design of full innovation life cycle.

It is also especially relevant for the banking and monetary sectors, as they provide the infrastructure for economic activity. Innovative money issuance at different levels seem to be the key.

The creation of a quite simple approach to evaluate dynamically the innovation ecosystems, brings an actionable answer to a metamodern ‘dare to know’ requirement for a more conscious approach toward economic processes and thus more collective intelligence in general.

9.1. RESUMEN EN ESPAÑOL

El objetivo de esta tesis doctoral es el estudio de la evolución de la dinámica estructural que permite definir el grado de avance de los ecosistemas de innovación en la Unión Europea.

Con este propósito se elaboraron cuatro capítulos / artículos. El primero se centra en la elaboración de un marco conceptual tentativo. Posteriormente, este marco se aplica para el análisis cualitativo de la evolución de las políticas de innovación en la Unión Europea en general, y la propuesta de Horizonte Europa en particular. El estudio de caso del sector bancario consiste en la utilización del marco elaborado, se amplía más en el último artículo, presentando la innovación en emisión de moneda y su contexto frente a la orientación de competitividad vs innovación.

El marco teórico se basa en el proceso y la visión de los actores de los ecosistemas de innovación. La caracterización de los actores sigue el triángulo de Sabato y la triple hélice, sin embargo, aparte del Gobierno, la Industria y la Academia, se agregaron dos dimensiones adicionales, es decir, la Sociedad y el Medio Ambiente, brindando así una visión distintiva y enriquecedora dentro de las áreas estudiadas. La vista del proceso se basa en la Perspectiva Multinivel, estableciendo fases de innovación desde los niveles de nicho, régimen y paisaje sociotécnicos.

La perspectiva de los actores en la hélice de innovación parece especialmente válida y accionable cuando se combina con el enfoque metamoderno y con la teoría cultural grupo/estructura desde el punto de vista de la sociedad actual. Se refuerza también el nivel del paisaje sociotécnico, en cuanto a la creación de la ventana de oportunidad para las innovaciones estructurales disruptivas. Esto es especialmente relevante cuando nos acercamos a los desafíos de nuestros tiempos, como es el crecimiento económico, la crisis medioambiental o la desigualdad. La transgresión de un modelo de negocio centrado solamente en beneficios nos lleva en dirección a más responsabilidad cívica, también de las empresas y la orientación hacia la economía circular en cada uno de los niveles, desde la educación hasta el diseño del ciclo de vida completo de la innovación.

También resulta ser especialmente relevante para los sectores bancario y monetario, ya que proporcionan la infraestructura para la actividad económica. La emisión innovadora de moneda a diferentes niveles parece ser la clave.

La creación de un marco relativamente simple para evaluar dinámicamente los ecosistemas de innovación brinda una respuesta práctica a un requisito metamoderno de "atreverse a saber" para una aproximación más consciente hacia los procesos económicos y, por lo tanto, más inteligencia colectiva en general.

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