Multi-Vortex Tornado Blueprint for Disruptive Global Co-Creation (Inspired by EUvsVirus)

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Hackathons vs Grand Challenges

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TYPES OF CO-AUTHORING AND CONTRIBUTING in OPEN COLLABORATION AND OPEN INNOVATION IN SCIENCE: each of the co-authors, contributors, and reviewers in these two chapters has been involved in the actual EUvsVirus and/or Academia Diffusion Experiment research and/or in the process of making these chapters. From 'occasional brainstorms', to texts here and there in our vast repository of activities, interviews, statements, discussions, inspiring emerging notions, as well as building making bridges with others needed for the research. Clearly, it is not necessary that 40 authors write 1 page each to consider them as count equally contributing. This group of authors consider contribution incompletely different way of validating participation, especially from people who have never met before! Among the many distinctive messages we are sending, we are trying to tell the world that it is not just the one who writes about science but who creates it! It is unfair to keep the traditional short list of few 'writers', while the credit and ownership for the actual phenomena (EUvsVirus, Academia Diffusion Experiment, and others) being analysed should go elsewhere. Like this we represent humanity in small and capture all the co-creation emergent magic also via the co-author structure.

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Real-life analogy. We can hide behind different doors, and we are comfortable within them. However, there is a window of opportunity installed … Co-dreaming for co-creating and emerging with co-evolution, how amazing! And when a multi-vortex tornado with good DNA comes? … to be continued.

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Abstract Since its burst in early 2020, the Covid-19 pandemic has deeply affected every aspect of daily life, from international trade and travelling to restrictions on an individual level, becoming a complex multi-level and highly multi-faceted problem. Due to its overarching influence and deep impact, it can be seen as one of the most disruptive Grand Challenges of our time. Different from most other lasting Grand Challenges, such as Climate Change, the pandemic exerted its influence with little ramp-up, rapidly transforming health and health systems, human lives, goods and economic flows, decision-making mechanisms, research and innovation, and many other aspects of life in a very short span of time.

Grand Challenges require extraordinary efforts from society as a whole since they need holistic, effective, collaborative endeavours to solve them. One such unique orchestrated effort can be observed in the subsequent series of virtual massive EUvsVirus (https://www.euvsvirus.org/) events and committed collaborations ('hackathon', 'matchathon', 'launchathon', 'community', 'EIC Covid platform', and the unparalleled 'Academia Diffusion Experiment' [ADE], analysed in chapter "Academia Diffusion Experiment: Trailblazing the Emergence from Co-Creation" of this book).

While this chapter explains 'what' has been produced with the ADE, inspired by the EUvsVirus phenomenon, the ADE chapter describes 'how' it has been done. Both are extremely unique in terms of content, procedure, motivation, collaboration, effects—and they attempt to trailblaze at highest level co-creation, co-evolution, and co-dreaming. Hence, situated as the last chapters of this book.

This chapter will shed light on the EUvsVirus events, where over 30,000 individuals from 40 countries came together and addressed the complexity of this massive challenge in a pioneering and groundbreaking way. The chapter is focused on analysing the EUvsVirus hackathon (alongside its mentioned unique spillovers) as

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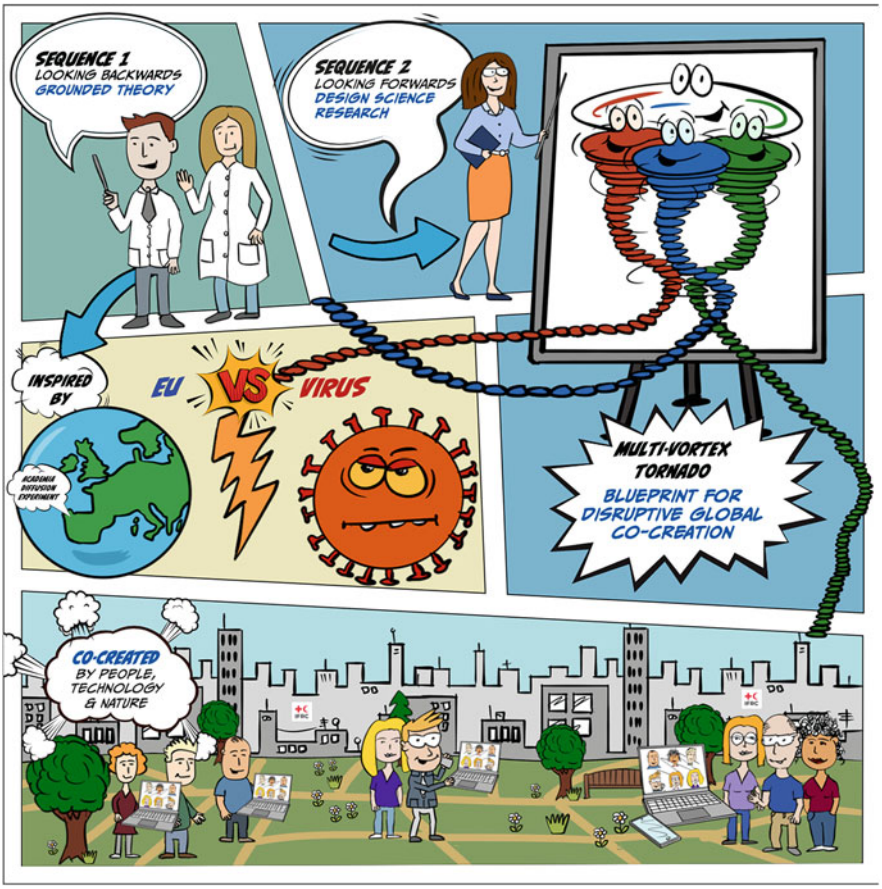
a tool, method, and process capable of channelling and activating individuals' and institutions' concerns, wills, and commitments into a unique orchestrated open, collaborative response to an urgent Grand Challenge, the pandemic. We are producing a multi-vortex tornado model, resembling the EUvsVirus phenomenon, its components, mechanisms, behaviour and how to replicate it to achieve such disruptive, global organisational effort of co-creation. Especially, the emergence of such collaboration in the face of such urgency leads to the assumption that there are crucial lessons to be learned from this endeavour, quite fittingly encapsulated by these words:

'We are learning
That though we weren't ready for this,
We have been readied by it'.

Amanda Gorman's New Year poem (https://amandagormanbooks.com/#the-hill-we-climb-and-other-poems or https://edition.cnn.com/videos/tv/2022/01/06/exp-amanda-gorman-nye-poem.cnn)

Graphical Abstract



1 Introduction

In the uncertain initial stages of rallying against Covid-19, minds, ideas, wills, commitments, needs, research projects, funding efforts,... were aligned under numerous responses at local, regional, national, and international levels to fight against what was perceived as a tragedy on a large scale. The mortality impact, the accumulated effects on the labour market, and the long-term impact on the economy of many EU and world countries harming the poor and vulnerable the most were unprecedented. In only a few weeks, the Covid-19 crisis became a global grand challenge that required unparalleled, innovative, and coordinated responses as every aspect of life was affected.

One of these responses was the EUvsVirus Hackathon, initiated and co-organised by the European Commission, to quickly develop ready-to-implement innovative solutions to overcome coronavirus-related challenges. Nonetheless, what started as a hackathon evolved rapidly, like a multi-vortex tornado, into a whole complex transformative phenomenon. It developed, grew, and matured into a Pan-European event with vast (global) participation and resonance.

This chapter will analyse the entire case of the EUvsVirus phenomenon (hackathon,[1] matchathon,[2] EIC Covid platform,[3] launchathon,[4] community,[5] academia diffusion experiment[6]) against the backdrop of the Covid-19 crisis since its burst at the beginning of 2020. The analysis period has been spread in the timeframe from 2020 till the end of 2021, covering the valid developments and some intermediary and aftereffects worth pursuing in such a scientific quest. It aims to analyse and unveil the main features and lessons learned from what evolved, not as a stand-alone initiative (a hackathon), but as a continued effort of many actors to create, boost, and sustain open, collaborative innovation, its components, mechanisms, and actors.

Grand challenges are formulations of global problems rock-hard to tackle as they demand a systemic vision and collaborative approach rather than linear, conventional, and siloed innovation paths (George et al., 2016). Increasingly, multidisciplinary approaches are becoming vital to frame, analyse, and handle these grand societal challenges and the ambitious sustainable development goals,

[1] https://www.euvsvirus.org, https://www.euvsvirus.org/press/, https://www.facebook.com/EUvsVirus, https://www.linkedin.com/company/35938295/.

[2] https://www.euvsvirus.org, https://ec.europa.eu/info/news/european-commission-euvsvirus-matchathon-boost-scaling-creative-solutions-covid-19-challenges-2020-may-20_en.

[3] https://ec.europa.eu/newsroom/eismea/newsletter-archives/22323, https://eic.eismea.eu/challenges/.

[4] https://euvsvirus.live/launchathon/, https://eic.eismea.eu/community/articles/euvsvirus-launchathon-innovation-comes-collaboration.

[5] https://www.linkedin.com/groups/8928483/.

[6] One of the main informal applied science voluntary 'spin-offs' that resulted from within the initial European Innovation Council Covid-19 initiative (not as contestants, but within the organisers) http://tactical-management-in-complexity.com/course/view.php?id=18.

both from academic and real-life standpoints.[7] Current world complexity demands more orchestrated trans−/cross−/interdisciplinary, intersectoral, inter-institutional, and multi-stakeholder collaboration. Synergetic approaches that comprise shared visions, common purposes for common good sustainable and inclusive development are becoming more relevant than ever before. Emergence of components, mechanisms, and networks deserves special attention too.

Because of the complexity of these grand challenges, the focus on societal transformation and co-creation is much broader (Yarime et al., 2012). Input from academia, government, industry, and civil society is a prerequisite (Mazzucato, 2018). As a result, a growing unpredictability, dynamic and change in focus is observed from 'making a profit by the commercialization of knowledge' towards 'solving a problem by co-creation of knowledge' (Sarewitz, 2016; Yarime et al., 2012), with the aim to promote more orchestrated, efficient, and common-purpose-driven efforts able to generate positive societal impacts.

The EUvsVirus has taken unconventional paths to meet grand challenges in times of crisis with united yet unexpected force and evolution. Inspired by EUvsVirus, conveyed by the Academia Diffusion Experiment (chapter "Academia Diffusion Experiment: Trailblazing the Emergence from Co-Creation") this chapter attempts to respond to the following research questions:

- How are Grand Challenges tackled using novel open innovation initiatives (from hackathons through matchathons[8] and launchathons) and are continued by the encompassing emergent and unprecedented endeavour of generating science—the 'academia diffusion experiment'?
- How can a global disruptive co-creative effort address the urgent and dramatic needs that emerged from the global coronavirus crisis?
- What can we learn from this for other grand challenges and the use of open innovation initiatives to address them?
- What drives open innovation initiatives virtually and voluntarily and how can they be replicated?

With the aim to traverse from understanding to modelling it, this chapter attempts to present a comprehensive study of the EUvsVirus phenomenon as a case study and raise it as a global best practice, taking into account the technological, managerial, and interactional aspects within the community, created and dynamically maintained by the EUvsVirus phenomenon, which subsequently (after the hackathon and

[7] https://sustainabledevelopment.un.org/partnership/?p=29493.

[8] Matchathon is a neologism used to name the subsequent effort deriving from the EUvsVirus hackathon. It took the form of an ongoing and continued sequence to push the innovations into real application by matching interests of different actors. The Matchathon's goal was to 'connect the needs of innovators with the opportunities made available by investors, corporates, public authorities (including hospitals and other contracting authorities), academia and research institutions'. More info: https://ec.europa.eu/info/news/european-commission-euvsvirus-matchathon-sets-world-record-2235-new-partnerships-scaling-120-innovative-projects-tackle-coronavirus-challenges-2020-jun-03_en.

matchathon) supported the development of an innovative self-sustained ecosystem for the communities, registering effects beyond today and tomorrow.

The EUvsVirus phenomenon has inspired, triggered, and co-created the Multi-vortex Tornado Blueprint for disruptive global co-creation explained in this chapter. The whirlwind symbol represents a central force of determination and disruption that, when focused rather than scattered, lends tremendous creative energy to the collective search for solutions to the complex challenges facing humanity today.

2 Research Setting: EUvsVirus and Academia Diffusion Experiment

To explore how to face the grand challenge (Ferraro et al., 2015; Grodal & O'Mahony, 2017) of the Covid-19 pandemic, the present study draws upon crowdsourcing as open innovation (Bogers et al., 2018; Chesbrough, 2003) measure launched by the European Union and partners (*EUvsVirus*; https://www.euvsvirus.org) as a *robust, fast, disruptive global voluntary effort* that took place during spring 2020 and progressed along with two main phases. In the first phase (April 24–26, 2020), 2164 transdisciplinary and internationally generated project ideas were formulated, out of which 117 'winners' were identified as promising candidates to tackle different problems of the Covid-19 situation. Ultimately, 120 have participated throughout the second phase (May 22–25, 2020), these winning project ideas were invited to collaborate and join forces with over 450 partners from industry, research institutions, venture capitalists, accelerators, and public authorities in a so-called matchathon; that is, a neologism indicating the attempt to match winners from the hackathon with the different collaboration partners.[9] This matchathon is also one big aspect setting apart the EUvsVirus event from other hackathons, because it posed a huge networking effort to accelerate the implementation of the projects. The endeavour continued with the European Innovation Council (EIC) Covid-19 platform where the winners had the opportunity to collaborate with advisors and experts by the EIC, as well as partake in various activities organised by a EUvsVirus community intended to sustain throughout the year the networking and the belonging to the distinctive clique of global collaborates. However, the scoping of this work is around the EUvsVirus hackathon and matchathon, as a rapid, dynamic, energetic, disruptive phenomenon, while the others are in more calm waters with regard to the tempo and potence.

Figure 1 shows statistics obtained as secondary data from the SLACK portfolio of supported events; they situated these events according to the number of users in their Slack workspace. EUvsVirus had 27 K+ and so far enlisted as the biggest.

The EUvsVirus crowdsourcing effort represents an extreme and, at the same time, politically important case (Patton, 1990). While crowdsourcing efforts (Afuah &

[9] https://www.euvsvirus.org/finalreport.pdf.

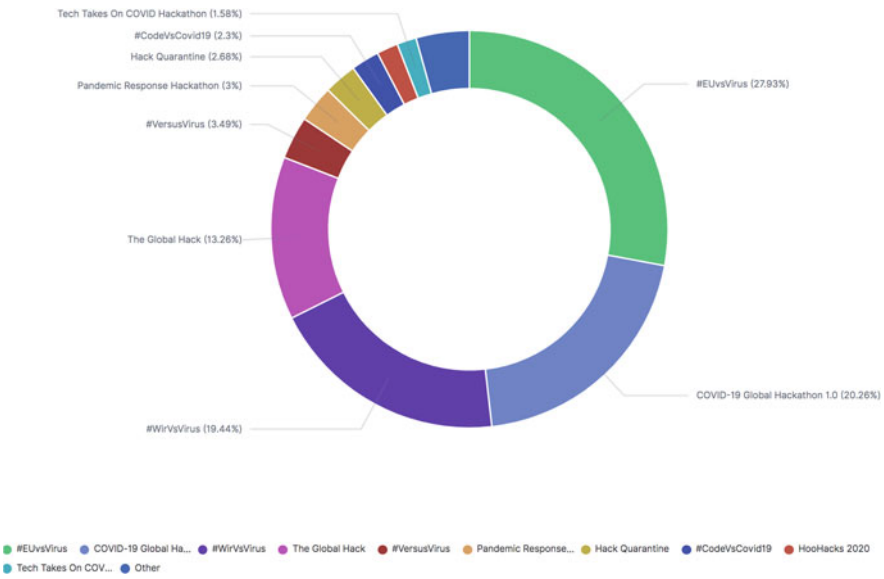


Fig. 1 Relevance of the EUvsVirus among the hackathons during the pandemic (https://slackcommunity.com/events/details/slack-berlin-presents-european-covid-19-special/)

Tucci, 2012) are of increasing interest in research on open innovation, we submit that the EUvsVirus crowdsourcing phenomenon represents a compelling case regarding its scale—the crowd contributing to the hackathon consisted of about 30,000 individuals over the course of 3 days. The political ambitions and singular nature of the Covid-19 pandemic underlying the crowdsourcing effort make it a striking and, at the same time, global, politically relevant case. Given the objective of identifying innovative solutions, it resonates with similar studies observing the intersection of open innovation and organisational theory (e.g., Bogers et al., 2018; Lifshitz-Assaf, 2018), legitimating and further supporting our chosen approach.

The main mechanism which enabled applied research and the underlying driving force was an *Academia Diffusion Experiment (abbr. ADE) as a sustained, disruptive in nature, global voluntary effort* which is elaborated in detail in Chapter for ADE (chapter "Academia Diffusion Experiment: Trailblazing the Emergence from Co-Creation") (De Wit et al., 2019; O'Shea et al., 2021) It allowed for voluntary facilitated co-creation endeavour of enthusiasts, calling themselves co-dreamers, self-organised around the purpose to produce applicable knowledge on how to co-create value together, emerging after the stellar academia partners team at EUvsVirus, facilitated by Renata Petrevska Nechkoska. The ADE gravity attracted people who have participated in the EUvsVirus in any of the roles, witnessed its effects, or have been completely external to the phenomenon—but wanted to dive into it and/or into the ADE. Complete explanation on the ADE and on its unique

existence helped produce these chapters and other emergent effects can be found in Chapter for ADE.

3 Theoretical Foundations for the IMPACT DOMAINS

3.1 Grand Challenges

We live in a world that is increasingly characterised by complex problems with far-reaching societal implications, conceptualised in the literature as 'wicked problems' (Dorado & Ventresca, 2013; Head, 2008) and, more recently, 'grand challenges' (George et al., 2016). Organisations are thus called to deal with a wide range of issues such as climate change, energy and water supply, digital workforce, labour exploitation, gender inequality, poverty, natural disaster, and pandemics (Grodal & O'Mahony, 2017; Venugopal & Viswanathan, 2019). Grand challenges transcend the interests or influence of individual organisations or local communities and require collective, coordinated, and sustained efforts from multiple different actors (George et al., 2016). Organisations are thus called to rethink their practises and to develop participatory and network-based models that enhance collaboration between consumers and producers, technicians and citizens, and public and private organisations (De Bernardi et al., 2020; Ferraro et al., 2015; Moggi et al., 2018; Schmidthuber et al., 2019).

While research on new organisational forms for tackling emerging societal challenges is burgeoning, much remains to be understood about the implications of organising for complex, uncertain, and evaluative challenges. Grand challenges may therefore be both great stimulants of innovation and opportunities for organisational learning (Bertello et al., 2021a; Bertello et al., 2022; Chesbrough, 2020). In this regard, the open innovation community has the huge opportunity to offer possible new solutions to grand challenges, on the one side, while taking lessons on how to move forward the concept of open innovation, on the other side. Taking COVID-19 as a grand challenge, we have noticed that several developments throughout the pandemic have already highlighted the crucial role of innovation, openness, and knowledge flows in dealing with the crisis (e.g., Chesbrough, 2020; Wenzel et al., 2020). Getting things done fast and well has brought organisations to remove boundaries and break down silos in ways no one thought was possible (De Smet et al., 2020). Scientists around the world have mobilised to collaborate on possible vaccines, building on the work of hundreds of scientists that had worked on mRNA vaccines for decades before the coronavirus pandemic brought a breakthrough (Dolgin, 2021), and to the extent that by the end of 2020, several vaccines had been approved (Ball, 2021). Researchers have shared more openly data for their publications to accelerate the management of the COVID-19 crisis (Noorden & Richard, 2021). Firms have been looking for new ways to innovate and collaborate by developing new products and business models to provide essential infrastructure and products, such as masks and ventilators. Clusters

and umbrella organisations have activated their networks to mitigate value chain disruptions in these fundamental goods.[10] Universities and other educational establishments had to develop a new paradigm of online teaching and remote working, while mitigating inequalities of remote education.[11] These examples provide new insights into our understanding of the value of open innovation in the face of grand challenges and call for further research to address the underlying processes of deploying open innovation for the common good.

3.2 Open Innovation

Defined as 'a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model' (Chesbrough & Bogers, 2014, p. 17), open innovation is nowadays a widespread innovation management paradigm (Chesbrough & Bogers, 2014; West & Bogers, 2017; Mignon et al., 2020). Although early forms of open innovation can be dated back centuries ago (Formica & Curley, 2018), the term 'open innovation' was only first used in 2003 in a book published by Henry Chesbrough to indicate a shift of paradigm from closed to open industrial innovation processes. The concept underpinning the term is that the generation of innovative outputs is facilitated by more openness towards external sources of knowledge (Ferreira & Teixeira, 2018).

As outlined in Chesbrough (2003), at the turn of the millennium, the distribution of knowledge has gradually shifted away from large, central, and vertically integrated R&D laboratory systems to more disintegrated networks of innovation that connect companies to more variegated pools of knowledge such as suppliers, customers, universities, research labs, consultants, and start-up firms (Chesbrough & Bogers, 2014; West & Bogers, 2017). As main erosion factors that led to the decline of a closed model of innovation and the rise of an open model, Chesbrough (2003) identified increasing mobility of trained engineers and scientists, increasing importance of venture capital, greater dissemination of knowledge throughout the world, increased quality of university research, and increased rivalry between companies in their product markets.

The open innovation model has spread over the years across a wide set of areas and domains beyond that of large and high-tech companies, such as small- and medium-sized enterprises (SMEs) (Santoro et al., 2020; Scuotto et al., 2017), low-tech firms (Bertello et al., 2021b; Dooley & O'Sullivan, 2018), and online communities and not-for-profit organisations (Forliano et al., 2020; Randhawa

[10] https://clustercollaboration.eu/sites/default/files/WYSIWYG_uploads/dp2_supply_chains_final.pdf.

[11] https://blogs.worldbank.org/education/silent-and-unequal-education-crisis-and-seeds-its-solution.

et al., 2019; Schmidthuber et al., 2019). After the coronavirus outbreak, open innovation has also revealed to be crucial in the face of the pandemic, highlighting how collaborative innovation efforts between public and private actors and between industry and science have been playing a fundamental role in dealing with the COVID-19 crisis (Bertello et al., 2021a; Chesbrough, 2020). This has stimulated growing interest among academics to investigate the characteristics, evolution, and implications.[12]

Open Innovation can be studied using a different approach. Open Innovation in Science (Beck et al., 2021b) proposes various theoretical and practical attitudes. Even if the thinking of scientists is different, it is possible to obtain interpretable results. Where we usually associate innovation with products or processes, we can also apply it to people as users (Bogers et al., 2010). It is possible as there are many sources of inspiration while creating modern things. It can also be explained using the technological paradigm (Sydow & Müller-Seitz, 2018).

The innovative method also has its downsides (Nunes & Abreu, 2020). They can be used for phishing attacks (Abroshan et al., 2021), and the efficiency of the attack is determined by demographic and sociological factors. However, what is not yet answered in the current literature is how open innovation can be co-created and replicated virtually and voluntarily on a global scale to tackle grand challenges.

4 Global Best Practises to Address Grand Challenges

The Covid-19 crisis has encountered a deep transformative change affecting every aspect of life, which has been profoundly touched upon with prolonged medium- and long-term effects. Widmer et al. (2018) argue that periods of transformative change require the adoption of 'a complex systems thinking mindset' (p. 630) that successfully accommodates interdependence, dynamism, and unpredictability (Marion & Uhl-Bien, 2001; Uhl-Bien et al., 2007).

Research typically investigates innovative processes from either a technology perspective or a managerial mindset perspective, and less in a systemic way.[13] In this section, we focus our attention on describing interesting global best practises, taking into consideration the technological organisation of the phenomenon and revealing its main components and drivers. The goal is to portray their essence, purpose, structures, and summarise what real-life state of the art is.

In many areas of development, innovation, humanitarian, and other fields of work, it is not the technologies for progress that are lacking, but the enabling institutional environment, related levels of political energy, and the mechanisms to

[12] https://www.nature.com/articles/d41586-021-01570-2.

[13] https://www.sciencedirect.com/science/article/pii/S0019850118304218.

encourage and foster adoption. Despite this, the largest part of the innovation effort has focused on generating more products and tools.[14]

Due to the complexity of solving grand challenges, it is crucial to identify powerful practises and methods that have already been put in place to tackle them. This is the case of hackathons and similar best practises worldwide. However, the need to open the scope of such efforts and outcomes is a compelling underlying challenge.

Solution of community problems by the efforts of one individual or even one agency is largely a thing of the past. Most problems affect all people of a community in one way or another and therefore require the involvement of many for their solution.[15] This is also a major lesson learnt from the pandemic. Traditional boundaries have become more porous or even blurred, creating opportunities for new business models and driving more effective collaborations between agents. It has never been so clear that close collaboration is the only valid strategy for tackling global challenges (OECD, 2021, Chap. 5). Thus, inviting constituencies to solve problems and exploit opportunities collectively is a better strategy, with authors calling this approach *co-creation.*[16] This represents a strategy with an integrated, interdisciplinary approach and a balance of innovation and experience, theory, practice, creativity, and practicality.

Grand initiatives, such as hackathons (ideathons), accessors, marketplaces, crowdsourcing, talent shows, networking, grant projects, etc., have been devised to trigger interactions for co-creating effective solutions, interacting with business, generating synergies, and finding talent.

Researching the global best practices in theory and practice is possible, provided their scope, areas of research and their main related characteristics are identified.[17] According to the OECD work,[18] there are four main areas to addressing these:

- *Community-power problem-solving* encompassing criteria for stimulating the potential of the collective mind to a complex solution of the problem.
- *Open science and open innovation* as collaborative platforms to co-create innovative solutions (in general and against Covid-19).

[14] http://www.oecd.org/coronavirus/policy-responses/innovation-development-and-covid-19-challenges-opportunities-and-ways-forward-0c976158/.

[15] https://roghiemstra.com/commch6.html.

[16] https://hbr.org/2013/04/community-powered-problem-solving.

[17] OECD Mission-Oriented Innovation policies online toolkit (https://stip.oecd.org/moip/), accessed 11 Dec 2021; and presentation on the lessons learned in other systems by Philippe Larrue, https://ec.europa.eu/info/sites/default/files/research_and_innovation/events/documents/ec_rtd_philippe-larrue-oecd.pdfm, accessed 11 Dec 2021.

[18] https://www.ucl.ac.uk/bartlett/public-purpose/sites/public-purpose/files/iipp_policy_brief_09_missions_a_beginners_guide.pdf and https://stip.oecd.org/moip/ and https://www.isi.fraunhofer.de/content/dam/isi/dokumente/policy-briefs/policy_brief_mission-oriented-innovation-policy.pdf, accessed 11 Feb 2022.

- *Mission-oriented innovation policies (MOIPs)* involve implementing a coordinated package of research and innovation policy and regulatory measures tailored to address specific objectives in a defined timeframe.
- *Talent (People, Ideas, Solutions) Finding Systems* crosswising from single talent to the innovative community.

4.1 Community-Power Problem-Solving[19]

Collective problem-solving is essentially an algorithmic strategy based on the individual perception of the problem. And consequently, the scale of the problem and its persistent understanding impact human needs according to Maslow's pyramid, where the physiological needs of life and health, safety, social needs, and so on are at the core. The more influential the problem is for each individual and, therefore, for a given society and community as a whole, the higher the potential of the community involvement and engagement for problem-solving will be.

However, for community-power problem-solving, beyond the importance of the strategy for tackling the problem, it is the encompassing criteria what stimulate the potential of the collective mind to a complex solution of the problem. The use of the 'collective mind'[20] is one of the best strategies to solve problems and unite individuals in ideological communities that have the energy of creativity, innovation, co-creation, and co-leadership. This is the case EUvsVirus community, as it will be analysed later in the chapter.

Devised by the Massachusetts Institute of Technology (MIT), the 'PARK' community problem-solving strategy for a changing world[21] offers already-tested strategy tools that advise those who participate in community planning by identifying:

– P-things we have and value and so want to protect
– A-things we value but do not have and so want to acquire
– R-things we have but do not like and so want to remove
– K-things we do not have and do not like and so want to keep out

Problem-solving is rarely a linear process of completing these tasks, and solving problems requires not only developing strategies but also getting them done, effectuating them.

[19] Good practice Community-power problem-solving for specific communities has been presented in Review of Neighborhood Revitalization Initiatives in February 2004, prepared for Calece Johnson Neighborhood Reinvestment Corporation, by Jennifer Turnham Jessica Bonjorni. The generalized matrix of initiatives gives us an idea of the goals, strategies, and types of the neighbourhood (community).

[20] The collective mind concept has been long time used.

[21] http://web.mit.edu/cpsproject/strategy_tools.html.

4.2 *Open Science and Open Innovations as Collaborative Platforms to co-Create Innovative Solutions (in General and against Covid-19)*

The urgency of tackling COVID-19 led governments, funding bodies, foundations. . .in many countries to launch a number of short-notice and fast-tracked initiatives (ex. calls for research and innovation proposals). However, without proper coordination amongst ministries, agencies, sectors, disciplines, and/or clusters, they risk duplicating efforts or missing opportunities, resulting in slower progress and socio-economic inefficiencies.[22]

The science and innovation response to COVID-19 has been a great international effort, reflecting the steady growth of international science, technology, and innovation (STI) collaboration in recent decades. Much STI collaboration on COVID-19 has been 'bottom-up' efforts and collaborations initiated by scientists themselves. But the challenges posed by a pandemic also called for more orchestrated responses at an international level to share data, identify and fill knowledge gaps, exploit complementarities, and pool resources. These increasingly involve not only governments but also businesses, philanthropies, and civil society actors. Ideally, such responses should be truly global. Still, in their absence, bilateral and regional approaches may offer opportunities for 'coalitions of the willing' to move forward, including the participation of low- and middle-income countries, many of whom bear the brunt of the worst effects of global challenges.[23]

In this sense, the role of open platforms has become crucial for exchanging scientific developments, ideas, technological advances, etc., with a good number of tried-and-tested examples of open science and open innovation supporting multi-stakeholders platforms:[24]

1. *Cube*, the world's first-ever risk innovation incubator.[25] The concept originally worked around a series of workshops where clients and risk experts worked together to create solutions to the most complex risks. With the COVID-19 pandemic preventing the celebration of face-to-face workshops, the need for co-created solutions to complex risks was even more acute.
2. *European COVID-19 Data Platform* launched by European Commission as early as April 2020. The platform, part of the ERAvsCorona Action Plan, aims at providing an open, trusted, and scalable European and global environment where

[22] https://www.oecd.org/coronavirus/policy-responses/science-technology-and-innovation-how-co-ordination-at-home-can-help-the-global-fight-against-covid-19-aa547c11/.

[23] https://www.oecd-ilibrary.org/sites/e0643f52-en/index.html?itemId=/content/component/e0643f52-en.

[24] Non-exhaustive list, as the purpose of this study is to briefly introduce a selection of relevant worldwide initiatives (presented in alphabetical order).

[25] https://axaxl.com/fast-fast-forward/articles/the-big-pivot-how-covid19-has-changed-collaboration-and-innovation.

researchers can store and share datasets, such as DNA sequences, protein structures, data from pre-clinical research and clinical trials, as well as epidemiological data.

3. *EIT Health* European network of top companies, universities, research and development centres, as well as hospitals and institutes. EIT Health plays a matchmaking role, facilitating collaboration across regions of the best solutions, making the fight against the virus more effective.[26]
4. *European Cluster Collaboration Platform*[27]—at the service of the European and international cluster community mission is to be the European online hub for cluster stakeholders (cluster organisations, policymakers, and other related stakeholders from the cluster ecosystem) and the reference one-stop-shop for stakeholders in third countries aiming to set up partnerships with European counterparts.
5. *Pandemic Response CoLab,*[28] a joint project of the MIT Center for Collective Intelligence (CCI), the MIT Community Biotechnology Initiative (CBI) at the MIT Media Lab, and MilliporeSigma, as a founding member—launched with the goal of bringing together innovators from across the globe to work on solving problems created by the COVID-19 pandemic.

   By leveraging an open online collaboration platform, CCI and CBI aim to mobilise individuals, businesses, communities, and other groups to develop actionable solutions to pandemic-related problems.[29]
6. *SynSapien*, a decentralised research lab for the world's best innovators to develop critical technologies together. It develops an open innovation platform to bring together scientists, researchers, and innovators worldwide to share data and collaboratively solve global challenges.
7. *The Crowdhelix Network*[30] connects a group of leading research institutions and innovating companies around the world so that they can jointly plan and deliver pioneering Horizon Europe projects. Covid-19 Helix of Crowdhelix aims to bring together an international community of researchers and innovators with the expertise to help tackle the coronavirus (COVID-19) pandemic and contribute towards the development of societal resilience to future such outbreaks. The COVID-19 Helix joins 22 other such international Open Innovation communities hosted on the Crowdhelix collaboration platform.
8. The *digital response to Covid-19*[31] gives access to a large resource database, including open-source software, websites, and platforms that are useful for public

[26] https://emerging-europe.com/business/innovation-and-collaboration-are-at-the-heart-of-solutions-to-the-covid-19-crisis/.

[27] https://clustercollaboration.eu/.

[28] https://cci.mit.edu/pandemic-response-colab/.

[29] https://mitsloan.mit.edu/press/pandemic-response-colab-new-initiative-to-solve-covid-19-challenges-launched-mit-center-collective-intelligence-mit-community-biotechnology-initiative-and-milliporesigma.

[30] https://network.crowdhelix.com/.

[31] https://joinup.ec.europa.eu/collection/digital-response-covid-19/hackathons-and-events.

administrations, businesses, and citizens dealing with the ongoing crisis. The listed solutions and resources cover a wide range of areas from public health, education, e-events, and volunteering, to collaboration opportunities, among others.

4.3 Mission-Oriented Innovation Policies (MOIPs)

Countries are increasingly experimenting with the so-called mission-oriented innovation policies (MOIPs), including in the health area. This policy approach involves implementing a coordinated research and innovation policy package and regulatory measures tailored to address specific objectives in a defined timeframe. These measures span different stages of the innovation cycle, mix supply-push and demand-pull instruments, and cut across various policy fields. This is the case in Japan, where a newly established Moonshot R&D Program aims to solve six 'Moonshot goals', including one dedicated to the development of ultra-early disease prediction and intervention by 2050. In Australia, the Genomics Health Future's Mission (GHFM) aims to save or transform the lives of more than 200,000 Australians by 2030 through genomic-based testing, diagnosis, and treatment. Endowed with AUD 500 million over 10 years, the GHFM coordinates the activities of different sectoral, federal, and territorial public authorities, as well as other public and private entities in healthcare.

Better collection and dissemination of such information facilitates formal and informal coordination, thereby avoiding duplication and fostering potential cooperation between researchers. Some further examples of these types of initiatives at European level are:

1. The *European Commission* of the European Research Area (ERA) corona platform launched a one-stop shop for information on coronavirus research and innovation funding (calls, funded projects, etc.). The platform also includes a dedicated area for national activities.
2. In *France*, the REACTing consortium acts as a multidisciplinary collaborative network of French research institutions with the dual mission to increase research preparedness for future epidemics and coordinate research during epidemics. It notably monitors and encourages data sharing, promotes good practices and standardisation of data collection, and coordinates and brings together the French research actors on COVID-19.
3. In *Italy and Spain*, the Ministries of University and Research have launched a mapping activity to collect information about all ongoing COVID-19 research projects in universities and public research institutions in order to reduce fragmentation and prevent unnecessary duplication.
4. In *Luxembourg*, the Fonds National de la Recherche (FNR) has partnered with leading research institutions to launch a national COVID-19 platform in Luxembourg. The platform allows researchers to submit new project ideas, browse and

discuss ongoing projects and proposals, and review the latest COVID-19 literature.

5. In *Portugal*, the Foundation for Science and Technology and the Agency for Clinical Research and Biomedical Innovation partnered with public and private health authorities and scientific research institutions to develop the 'Science 4 Covid-19' portal. The portal brings together ideas, publications, funding opportunities, and other ongoing actions, and information on relevant research capacity.[32]
6. In the *United Kingdom*, there is OpenSAFELY, a secure, transparent, open-source software platform for analysis of electronic health data. The system provides access to de-identified (pseudonymised) personal data to support approved projects.

4.4 Talent (Person's, Ideas, Solutions) Finding Systems

There is a growing recognition that companies and universities really benefit from working collaboratively. Sharing complementary assets and talent is obviously a relevant factor of these relationships.[33]

In open-source communities, hackathons have long provided the opportunity for a distributed community to meet face-to-face and a burst of energy to tackle problems, innovate with software or maintain code.[34]

One of the first experiments that involved the use of hackathons for a health-related cause with long-lasting objectives was Hacking Health, the first health-focused hackathon in Canada, held in 2012. The event involved over 200 participants who worked in teams to produce 19 working prototypes during the 2 days. The short-term goal of the initiative was to develop working software that could immediately improve the healthcare system by solving known, bite-sized problems. At the same time, the long-term mission was to nurture a community with ongoing collaborative partnerships between healthcare professionals and technology innovators.[35]

Hackathons have been a largely used instrument during the COVID-19 pandemic to address the numerous challenges posed by the crisis. The following are some of the many examples of hackathons organised with different objectives:

- Beat the Pandemic organised by the Massachusetts Institute of Technology (MIT) included a series of virtual hackathons.

[32] https://www.oecd.org/coronavirus/policy-responses/science-technology-and-innovation-how-co-ordination-at-home-can-help-the-global-fight-against-covid-19-aa547c11/.

[33] https://www.elsevier.com/research-intelligence/the-power-of-university-industry-collaborations-podcast.

[34] http://www.nick-taylor.co.uk/wp-content/uploads/taylor-chi18-hackathons.pdf.

[35] https://timreview.ca/article/579.

- The Global Hack, where 15,000 coders, engineers, and designers came together to find innovative ways to help in the pandemic in April 2020. Famous supporters included LinkedIn's Reid Hoffman and Sam Altman, former president of Y-Combinator.
- Hack from Home, a global hackathon initiated by Dataswift, partnering universities and NHSX.
- The 'Hack the Crisis' hackathon was organised in Estonia by a group of developers just as the coronavirus crisis was starting to engulf Europe (13–15 March 2020). It succeeded in creating at least eight projects that went on to be adopted to fight the pandemic.[36] WHO Africa organised a hackathon with a regional focus.
- Wir vs. Virus, organised in Germany in March 2020, produced over 1500 potential solutions to a range of coronavirus-related issues. Around 600 jury members in politics, science, business, tech, and health evaluated the results, and 20 projects—from symptom management systems to logistics platforms—were picked as winners to be supported further.

5 Methodology and Research Design

On one side, the research design we deployed has been via the Academia Diffusion Experiment, a novel approach by itself. However, in this section, we will elaborate more on the methodology for our ADE goal—producing applicable scientific knowledge on how to co-create value together by capturing learning from and reflecting on the insights obtained from an analysis of the EUvsVirus initiative.

Data collection: As the crowdsourcing effort EUvsVirus was conducted and, thereby, documented online, our data collection consists of exclusive ethnographic data (Kozinets, 2010), interviewing data, triangulated by the data being retrieved from the websites of EUvsVirus and the open communication channels used throughout the process.

To heighten the quality of data collection, we pursued different strategies. For one, we built up an online repository that served as a case study database. This helped to increase reliability (Yin, 2017). In addition, we strengthened construct validity by pursuing data triangulation. Towards the end, different data sources were collected, predominantly gathering information being exchanged during the EUvsVirus crowdsourcing effort as a form of online observation (Kozinets, 2010). These data were accompanied by documents being exchanged (i.e., secondary data in the form of archival data) and interviews with organisers, volunteers, and other participants in diverse roles.

The list of data collections used incorporates (but is not limited to):

[36] https://sifted.eu/articles/covid-19-new-google-amazon/.

1. Slack 1 Hackathon organisation: EUvsVirus.
2. Slack 2 Hackathon operational: EU Hackathon.
   - 23,743 members from diverse profiles in various roles, including just some of the partners
   - 5380 channels
   - 260,000 messages.
3. Slack 3 Matchathon organisation: EU Matchathon.
4. Slack 4 Matchathon operational: EUvsVirus Matchathon.
5. Miro Boards Hackathon.
6. Miro Boards Matchathon.
7. Google Drive Repository Hackathon.
8. Google Drive Repository Matchathon.
9. Converve.
10. Consents, disclaimers, approvals.
11. Website Analytics.
12. FB, LinkedIn, Twitter Analytics/Access.
13. Mailing lists with categories of partners, projects, and collaborators.
14. Webex/Zoom Analytics.
15. Interviews with involved stakeholders of ALL roles in the hack/matchathon.
16. Surveys (from the hack, match, . . . -athons).
17. Other e-mails sent/received, text in each email.
18. DevPost.
19. Surveys.
20. Ethnographic statements.

Data Analysis Some individuals from the team of authors were partially involved in supporting the EUvsVirus efforts, seeking to 'produce practical knowledge' (Reason & Bradbury, 2001, 2), blurring the line between researcher and actual participant. Similarly to conducting action research (Eden & Huxham, 1996), this can be challenging as it might be difficult to critically reflect upon one's own input (Chisholm & Elden, 1993). However, we were able to mitigate possible bias utilising researcher and co-author triangulation to allow for high construct validity in the course of data analysis. This approach not only enabled us to analyse EUvsVirus from different epistemological, ontological, and theory-related backgrounds, but also allowed us to align insider (i.e., individuals participating actively in EUvsVirus) and outsider (i.e., individuals joining the academic research efforts at a later stage and having a more neutral stance) perspectives (Evered & Louis, 1981). The transdisciplinary approach also helped to collaboratively make sense (Lüscher & Lewis, 2008) of the interpretation of our findings throughout data analysis, modelling, and blueprint, and when crafting the manuscript. The Academia Diffusion

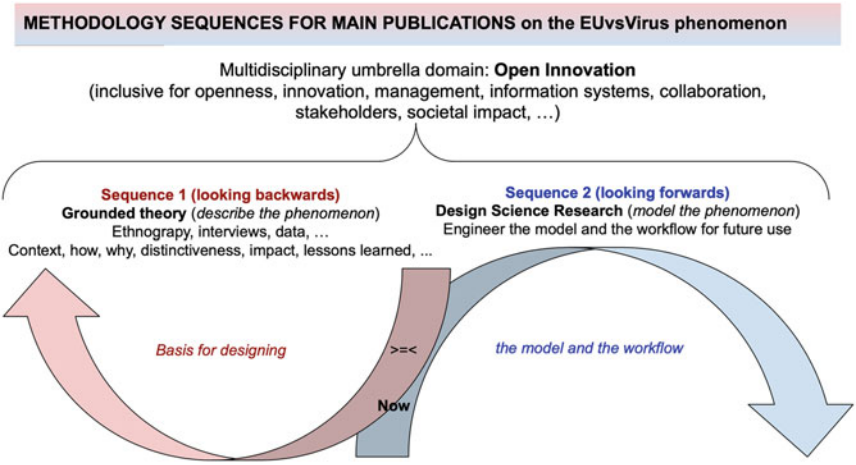


Fig. 2 Methodology sequences on describing and modelling EUvsVirus

Experiment information and communication setting (all-in-one Google Drive, web-portal[37]) has streamlined and acted as an intermediary during all times.

Methodology Throughout the ADE, we have iterated to set the proper methodology for the actual applicable knowledge development, which will serve twofold:

- To understand the phenomenon.
- To model it.

As we are accustomed to approach chunks of research challenges, we started to pick a methodology in a more straightforward manner—Design Science Research. However, understanding the phenomenon and Qualitative methodology also needed to be incorporated, and we reached dead-ends. Eventually, the methodology gurus (experienced scientists in the ADE) gathered and brainstormed around the 'how' and the 'what' and we have made a clear distinction as follows (visualised in Fig. 2):

- *Sequence 1 (looking backwards)*: The phenomenon needs to be understood and described qualitatively—via Qualitative methodology and Grounded theory.
- *Sequence 2 (looking forwards)*: The phenomenon needs to be modelled for generalisation and applicability, by using the inputs obtained in Sequence 1—via Design Science Research.

In several iterative discussions, we also clarified the umbrella domain of impact—open innovation, while not limiting the disciplines which would be used later on in the modelling sequence.

[37] http://tactical-management-in-complexity.com/course/view.php?id=18.

The merger or clash between behavioural and design science is one of the heaviest, when doing applied multidisciplinary research (Baskerville & Pries-Heje, 2010; Goldkuhl, 2016) The *potential fallacy* of having a DSR model, a phenomenon that already happened, has been addressed by re-evaluation of the model by the practitioners and main actors in the EUvsVirus phenomenon, providing simulation and reflection as final.

5.1 Sequence 1—Grounded Theory

The qualitative methodology incorporated ground theory, case studies, in-depth interviews, action research—enabling us to gain an understanding of the phenomenon, its components, mechanisms, and effects. We used heuristics, purpose and emergence, iterations, Denica method roles and accountabilities, diverse theories.

Grounded theory was a term coined by Glaser and Strauss (Glasser & Strauss, 1967; Strauss & Corbin, 1990) to describe a form of data analysis and theory development. A grounded theory is one that is inductively derived from the study of the phenomenon it represents (Strauss & Corbin, 1999, p. 23). However, according to Lincoln and Guba, defining grounded theory is more complicated than appreciating its need (Guba & Lincoln, 1994, p. 225).

This theory is thus inductively developed from a systematic analysis of data, rather than by formulating a hypothesis in advance which is then tested against data which has been collected. In grounded theory research, the unfolding theory is constantly referred back to the data to ensure that it remains grounded in the experiences and accounts of research informants or participants. Unlike quantitative data analysis, where the researcher tests the relationship between variables, in grounded theory analysis, the researcher is constantly seeking back to the data.

As it could not be explained and/or fully comprehended and captured from within, this work adopts the use of a heuristic approach to qualitative research beyond the grounded theory approach. The notion of researchers, including in our case also practitioners, as bricoleurs, will be considered in the light of the need to develop pluralistic strategies to qualitative research. Following West (1997), we will apply the process, not to counselling and psychotherapy like in his case, but the study of the EUvsVirus phenomenon, as an example of co-created innovative open science and open innovation solutions to grand societal challenges.

Some of the *heuristics* used at the beginning of the ADE (West, 2001), serving the purpose of this chapter have been captured in Figs. 3 and 4 which have been unprovoked perceptions by the ones who have actively participated in the EUvsVirus in diverse roles. Others have been the all-in-one Matrix for data reasoning (Fig. 7) as well as in the web-portal[38] especially dedicated to onboarding and alignment within the ADE.

[38] http://tactical-management-in-complexity.com/course/view.php?id=18.

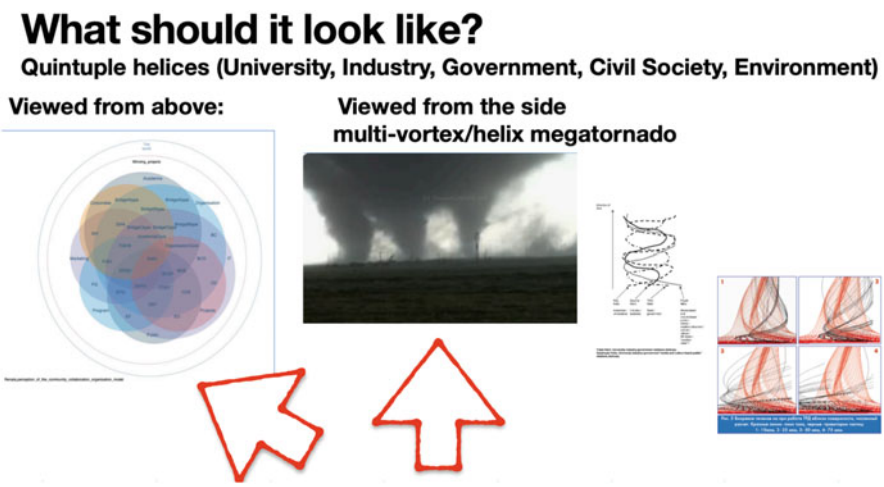


Fig. 3 Heuristics used early in the research as impressions on what EUvsVirus felt and looked like

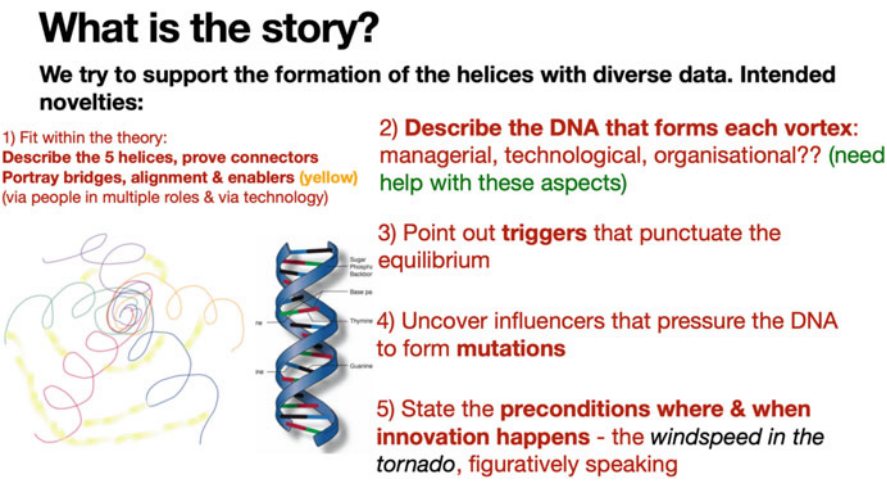


Fig. 4 Heuristics used midway in the research as impressions on what EUvsVirus felt and looked like

With the aim of traversing from understanding to modelling it, a qualitative approach with inductive findings for the field of grand challenges has been used, based on a multi-fold sampling strategy (data triangulation, ethnographic statements and analogies, and interviews). These have been used in a combined manner to unveil the main features and the complexity of the EUvsVirius phenomenon:

5.1.1 Ethnography

An ethnographic description through a legitimised digital anthropology where immersive cohabitation of key players of the phenomenon resulted in becoming observing participants with ethnographic statements as one direct source of research findings. 'Debate regarding how to conduct digital anthropology is currently contested, with two primary methodologies emerging: researchers who conduct projects wholly in cyber-space, and those who look at the use of digital technologies by their informants, contextualised in the offline world. There is also a third way, arguing that immersive cohabitation is possible where online and offline field sites are viewed as part of a larger blended field' (Bluteau, 2021). Ethnography has been one of the direct sources of the story, the impression, and the cross-fertilisation throughout the two sequences.

5.1.2 Interviews

The shaping of the phenomenon of interest has occurred via multiple approaches, and one important complementary to the others, especially to the ethnographic statements, have been the interviews.

Both the ethnographic statements and the interviews followed unified protocols devised to align across the multiple ADE members who have performed them.

The interviewing roadmap is visualised in Fig. 5.

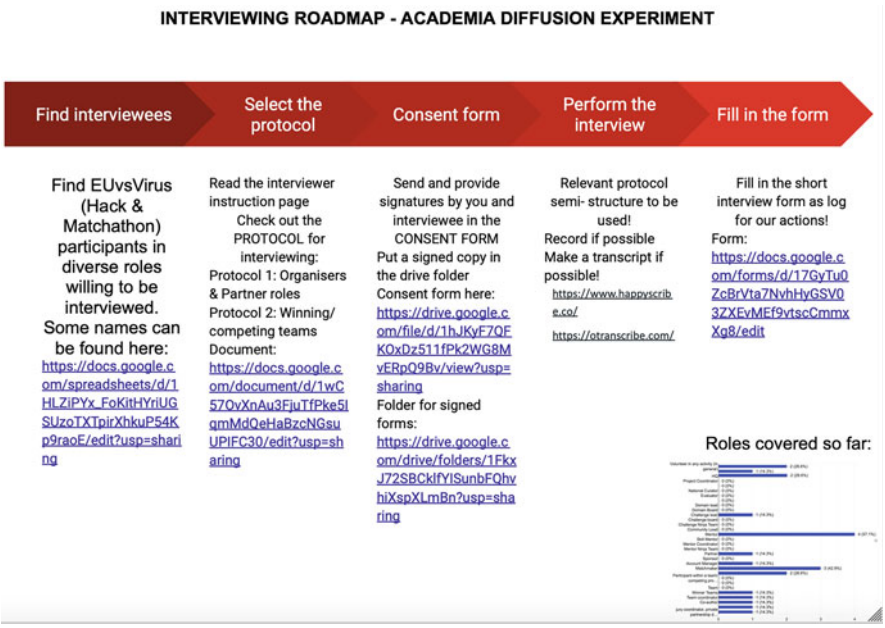


Fig. 5 Interviewing roadmap

5.1.3 Analogy

According to Gentner and Holyoak (1997), our world is considered as a 'perpetual novelty'. Thus, whether we consciously realise it or not, analogy pervades our existence and our everyday reasoning. No situation we encounter is exactly like a situation we have experienced previously. Our ability to learn and survive in the world is dependent on our ability to see parallels between past and present situations and apply what we have learned.

Ausubel et al. (1978) stated that in order to learn meaningfully, individuals must choose to relate new knowledge to concepts they already know. Thus, by sheer force, analogies and analogical models are frequently used in learning to support the understanding of theoretical and abstract concepts (Rogers et al., 2004). And that is why, we as individuals tend to use analogies.

So what is exactly an analogy?

In ancient Greek, the word analogy originally meant proportionality in the mathematical sense, deriving from a 1940 lexicon (Liddell & Scott, 1996). Later, the analogy has been understood as the establishment of the relation between any two ordered pairs, whether of mathematical nature or not, as in Kant's works of 1951 (Radcliffe, 2007).

According to Orgill and Bodner (2005), an analogy compares two domains of knowledge—one that is familiar and one that is less familiar. The more familiar domain is referred to as the 'analog' domain. The domain to be learned/understood, which is the less familiar domain, is referred to as the 'target' domain. Even so, considering an analogy as a comparison may be an oversimplification. In effect, and according to Gentner (1989), an analogy is a mapping of knowledge between two domains such that, the system of relationships that holds among the analogue domains also applies to the target domain's items. As a result, the objective of an analogy is to transfer a system of relationships from one familiar domain to another one that is less familiar (Mason & Sorzio, 1996).

Therefore, the power of an analogy is determined by the overlap of relational structure between the analogue and target domains rather than the number of features they share (Gentner, 1983).

For this, we consider a second explanation for analogies. Raviolo and Garritz (2009) explained that the term 'analogy' can be used for concept visualisation through the analogical comparison of the known field and the scientific conceptual field. Thus, analogies include:

1. An unfamiliar or unknown field (objective, target, object).
2. A familiar domain (analogue, base, source) recognised by the person who wants to learn.
3. A set of relations established between (a) and (b) or a series of correspondence processes between the components of both fields.

As a matter of fact, scientists have used analogies to ensure a better explanation of abstract scientific concepts and better description of their discoveries. The first

effective analogy in science occurred in the eighteenth century, where scientists first detected the similarity between the flow of charge and the flow of water (Ronald, 2006).

And then, numerous analogies took place in the history of sciences. We consider the following examples:

- Watson and Crick insisted that they arrived at the double helix structure of DNA by making analogical models that fitted their data (Aubusson et al., 2006).
- Stephen Hawking used at least 74 everyday analogies in his book 'A Brief History of Time' to explain astrophysics and quantum ideas (Aubusson et al., 2006).

Due to the complexity and multiple dimensions of the EUvsVirus phenomenon, analogies with the physical world have been chosen to explain it, along the lines of the physical phenomenon of tornadoes formation, development, sustainability, impact, and termination, as well as the DNA characteristics. This way, '*the multi-vortex tornado with good DNA* blueprint' metaphor illustrates the workflow from the inception phases of the phenomenon to the development and subsequent sustainability, intending to capture the complex, open, dynamic, flexible, and adaptive system of a phenomenon that has given way to the formation model and blueprint at hand. Some of the heuristics used from several disciplines are as used from several disciplines as in Figs. 3 and 4. The good DNA notion relates to the core elements which make it distinctive.

5.1.4 Triangulation

While doing research, we aim to achieve a more interdisciplinary approach to examine things. The triangulation method is helpful, as it helps to see things from different angles. The origins of this research method are determined to be found in ancient Greece and Egypt (An introduction to triangulation, p. 10). It has been used in different quantitative researches to broaden the perspective. It has its roots in geometry, where the investigator is trying to capture the course using longitude and latitude. In 1970, it started to be used in sociological studies.

The research theories, methodologies, and data aim to achieve the

- *Investigator triangulation*—multiple authors try to contribute to the subject. In this research, there are three profiles of involved co-authors and contributors: persons who were in the events as active participants, persons external to the events, and persons who have been between the EUvsVirus and the ADE; Last, but not least, the reviewers of the chapter have been both internal and external to the EUvsVirus.
- *Theory triangulation*—it is done by applying different perspectives into the research. It is done in this study by using multiple theories.
- *Data triangulation*—when the primary and secondary data are used to capture the phenomenon and verify the obtained impressions from multiple qualitative

research techniques. Whenever some data is missing which is essential for the topic, they can be obtained from different places.

- *Methodological triangulation*—various methods are used to study one topic. Using multiple methods can obtain more results and a broader contribution to science.

The use of triangulation is necessary for this study as it is an interdisciplinary one and encompasses both ground theory and design. Combining different data sources and research methods help to generate unique results. A broader audience is also more understandable as they have various backgrounds.

There are also some drawbacks to this perspective. Not every dataset is ready to be used to the other. Sometimes data needs to be adjusted, which can flatten the understanding. Having a different perspective also requires more effort, particularly more time, to conduct the study, and the probability of obtaining good results cannot be taken by granted. It also raises the challenge of working out a clear picture of the study.

The research directed to triangulation possesses the traits of innovation. While it might have a lot of angles, we focus mostly on open innovation and user innovation (Bogers & West, 2012). It is deeply situated in data, yet there is still very little quantitative data on this topic (Markovic et al., 2021; Bagherzadeh et al., 2021). It requires an interdisciplinary approach and collaborative research perspectives. Whereas there needs to be some constraints to organise the work, it is also proven that borderless communities are likely to produce innovation (Beck et al., 2021a).

5.2 *Sequence 2—Design Science Research*

Our sequence 2 has deployed Design Science Research as portrayed in Fig. 6.

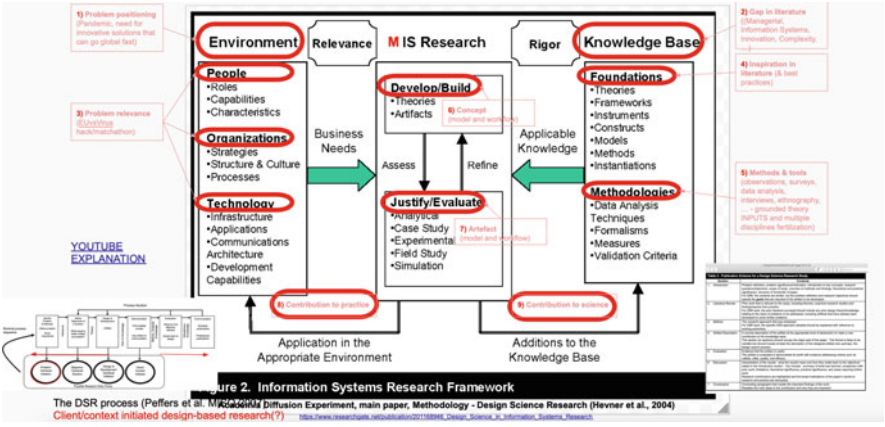


Fig. 6 Design Science Research methodology (adapted from Hevner et al., 2004) within the Academia Diffusion Experiment, as sequence 2

As in (Hevner et al., 2004; Peffers et al., 2007; Gregor & Hevner, 2013) as well as (Hahn & Lee, 2021) we have established the following iterations:

1. Problem positioning, identification, and motivation (Pandemic, need for innovative solutions that can go global fast)—*Relevance.*
2. Identifying gap(s) in literature (Managerial, Information Systems, Innovation, Complexity, ...)—*Rigour.*
3. Problem relevance (EUvsVirus hack/matchathon vs. grand challenge)—*Relevance.*
4. Inspiration in literature in multiple disciplines (& best practices)—*Rigour.*
5. Deploying methods & tools (observations, surveys, data analysis, interviews, ethnography, ... —grounded theory INPUTS and multiple disciplines cross-fertilisation)—*Rigour.*
6. Concept of the model and workflow (objectives of the solution)—(M)*IS Research.*
7. Artefact of the model and workflow—the blueprint! And its evaluation by the directly involved parties in the initial EUvsVirus phenomenon—(M)*IS Research.*
8. Contribution to practice by application in the appropriate environment—*Relevance.*
9. Contribution to science by producing additions to the knowledge base—*Rigour.*

These stages have been facilitated throughout the ADE dynamic reconfiguration, aligned around the same purpose—achieving applicable knowledge on how to co-create value together.

5.3 Data Analysis and Solution Conceptualisation

The EUvsVirus phenomenon started with the ideation and realisation of a hackathon that became the largest one celebrated ever (up to 2022, Fig. 1), with global voluntary capabilities. Hackathons bring together people with diverse backgrounds, experience, and expertise in a single location, physical or virtual, over a limited time, breaking down the barriers between technical experts who have the capabilities of building innovative technologies and practitioners who know which solutions are needed and how they can make an impact. The low cost and risk of these types of events make hackathons accessible and scalable means to foster innovation in almost any social sector.[39]

The backbone axes of the EUvsVirus phenomenon, and the resulting model, have been analysed based on four dimensions reflected in the Matrix for data reasoning and analysis. These dimensions are: (1) viewpoint, (2) experience, (3) perception, and (4) timeline of the phenomenon. This served as a heuristic in multi-fold manners:

[39] Briscoe, G. (2014). Digital innovation: The hackathon phenomenon.

– to align all the investigators towards the same purpose for data capture,
– to portray the ultimate goal of the research,
– to verify the findings,
– to perform initial semantic analysis (keywords, co-locations, and second-order themes) and,
– to be able to tell the narrative of the phenomenon,
– to model the phenomenon based on cross-discipline fertilisation aimed for applicability in future contexts.

These lenses, with their multiple variables, have been the guiding principles to capture, design, and analyse the Quintuple or N-Helix (university, industry, government, civil society, environment actors…), the model, mechanisms, dynamics or synergies generated, as well as the emergence and the novelty in co-creation and opportunity.

The general intention was: to capture unprovoked insights on the model & workflow AND find out the novel and distinctive aspects (as compared to state-of-the-art and global best practices). The data reasoning matrix helped dynamic alignment and common collective-brain kind of understanding of the ground theory undertaking and its aim to understand the phenomenon and describe it most accurately to uptake its core components and mechanisms and suggest a generalisable and applicable model later on called blueprint.

In the *Matrix for data reasoning, we have considered four dimensions* explained as follows:

1. Dimension 1: VIEWPOINT

   - Personal aspect, group aspect, and as a community
   - Technological
   - Organisational (including Managerial)

2. Dimension 2: EXPERIENCE

   - Motivation, expectations
   - Invested—Gained, Inputs–Outputs weighing
   - Knowledge, skills, competencies, network acquired
   - Alignment, benefits, barriers
   - Lessons learned, problems, risks
   - Own perception and articulation of novelty and innovation
   - The connection of the phenomenon with the individual future. Are you still holding on to the thread stretched out by EUvsVirus? Or lost it?
   - 4i collaborative efforts: international, interdisciplinary, intersectoral, and intergenerational
   - Improvisation and rapid prototyping, Eureka moments, testing
   - Technological and informational: (1) Infrastructure, (2) Tools, (3) Principles, (4) Channels to serve communication, collaboration, co-creation

- Unveil organisational/managerial approaches: (a) for the whole phenomenon to function, key players with a systemic approach, top-down, bottom-up, middle-round, (b) to ease the collaborative, inclusive approach: distributed collaboration, spontaneous evolution, and integration of elements, co-design and coordination, learning by doing, manage complexity... (c) individual engagement: self-motivated, pro-active, given the freedom to operate, threats, proper outcomes Governance structure, and Organisational dynamics, empowerment, accountability, trust, curiosity, passion, freedom

3. Dimension 3: PERCEPTION

- Ecosystem development—components and mechanisms
- 'Was EUvsVirus distinctive? Why and how'?
- MULTI-, CO-, OPEN-aspects
- Opportunity discovery and development
- Creativity, improvisation, testing, rapid prototyping
- Creation and growth possibilities
- Co-creation magic
- Purpose and impact
- Horrible/Regular/EXCEPTIONAL aspects in the EUvsVirus hack/matchathon

4. Dimension 4: TIMELINE

- Calendar and chronogramme
- Milestones & stages—incl. Intuiting, interpreting, integrating, institutionalising—as iterative processes happening at different stages

The matrix has been explained within the ADE information flows and made available as single reference document as in Fig. 7.

Due to the importance of inclusion of diverse participants in the EUvsVirus phenomenon, we have made an *inventory of roles* that needed to be covered with either ethnographic statements, interviews, and/or both.

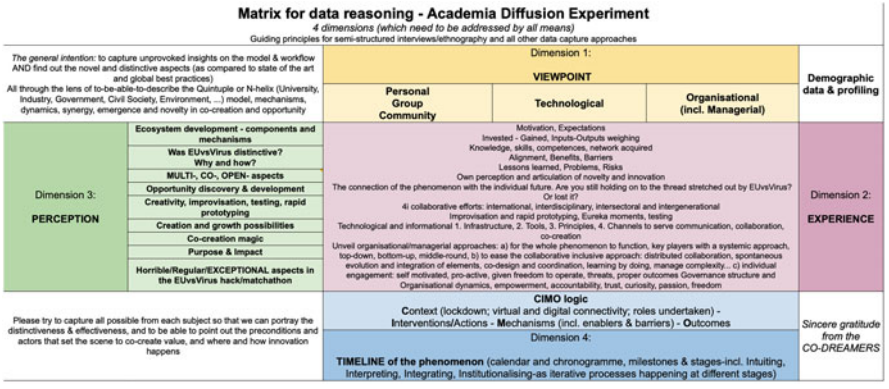


Fig. 7 Matrix for data reasoning—Academia Diffusion Experiment

The encompassing inventory of roles during EUvsVirus hackathon and matchathon consists of the following more or less defined roles:

- Volunteer in any activity (in general)—total number
- Organiser (EU and non-EU)
- Project coordinator
- National curator
- Evaluator/jury member
- Domain lead
- Domain board
- Challenge lead
- Challenge board
- Community lead
- Mentor
- Skill mentor
- Mentor coordinator
- Partner (institutions, companies, . . .) (over 800 for hackathon and 460 for the matchathon)
- Account manager
- Matchmaker
- Participant within a team/competing project (registered on DevPost)
- Team lead
- Teams
- Winner teams
- Team coordinator

We have obtained at least one interview or ethnographic statement for each role, while also having multiple ethnographies and/or interviews for most of the roles.

The following Figs. 8 and 9 describe the inventory containing the roles, number of people who populated it, the categorisation (in 1-Organisational roles, 2-Partners, 3-Projects AND 4-ALL) as well as the location of the role in the process of observation.

Due to the ethnographic nature of engaged researchers within the EUvsVirus, there has been an intuitive and deliberate pursuit for *emerging roles*, observed as specific and emergent within the phenomenon. They can be *humans or technology* (applications, software, platforms, apps, APIs, . . .):

- *Bridge type I* (towards public institutions, towards corporates, towards academia, . . .)—person/technology who acts as a bridge between (or among) different teams, cliques, projects, . . . at the same time or
- *Bridge type II*—PERSONS/TECHNOLOGY IN MULTIPLE ROLES AND CARRYING OUT MULTIPLE FUNCTIONS IN DIFFERENT LEVELS subsequently
- Both bridge types have *subtypes—A, B, C,* . . . depending on the specific connection they are making between

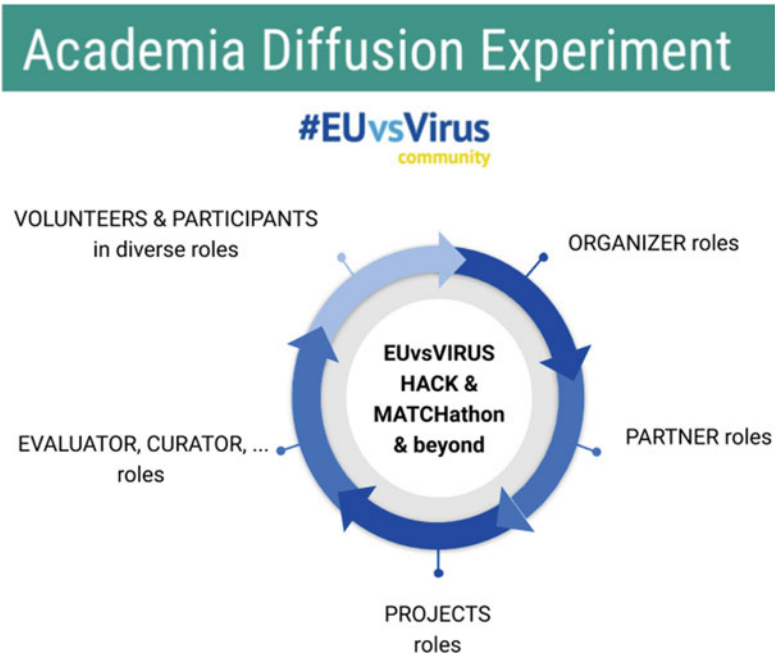


Fig. 8 Main categories of roles within the researched phenomenon of EUvsVirus

ID Role	INVENTORY OF ROLES OF EUVSVIRUS (HACKATHON, MATCHATHON, EIC COVID PLATFORM, COMMUNITY)	NUMBER of people who populated this role	PROTOCOL CATEGORISATION OF THE ROLES (1-Organisational roles, 2-Partners, 3-Projects) AND 4-ALL	LOCATION OF THE ROLE IN THE PROCESS (HACKATHON, MATCHATHON, EIC COVID PLATFORM, COMMUNITY) *Hack, Match, Plat, Comm, ALL*
1	Volunteer in any activity (in general) - total number	approx. 30K	4-ALL	ALL
2	Organiser (EU and non-EU)	32	1-Organisational roles	ALL
4	Project Coordinator	2	1-Organisational roles	ALL
6	National Curator	30	1-Organisational roles 2-Partners	Hack, Match
7	Evaluator	130	1-Organisational roles 2-Partners	Hack
9	Domain lead	6	1-Organisational roles	Hack
10	Domain Board	18	1-Organisational roles	Hack
11	Challenge lead	37	1-Organisational roles	Hack
12	Challenge board	37	1-Organisational roles	Hack
14	Community Lead	2	1-Organisational roles	ALL
15	Mentor	2598	1-Organisational roles 2-Partners	Hack, Plat
17	Mentor Coordinator	37	1-Organisational roles 2-Partners	Hack
19	Partner (institutions, companies, ...) (over 800 for hackathon and 460 for the matchathon)	1000	2-Partners	ALL
21	Account Manager	100	1-Organisational roles	Match
22	Matchmaker	100	1-Organisational roles	Match
24	Participant within a team/competing project (registered on DevPost)	9109	3-Projects	ALL
25	Team Lead	2165	3-Projects	ALL
26	Teams	2165	3-Projects	ALL
27	Winner Teams	120	3-Projects	Hack + Match
28	Team coordinator	37	3-Projects	Hack

Fig. 9 Structure and inventory of all roles within the EUvsVirus phenomenon

The main concepts and their co-locations obtained from the ethnographic statements and the interviews, resulting from the heuristic of the matrix for data reasoning, are visualised in Fig. 10.

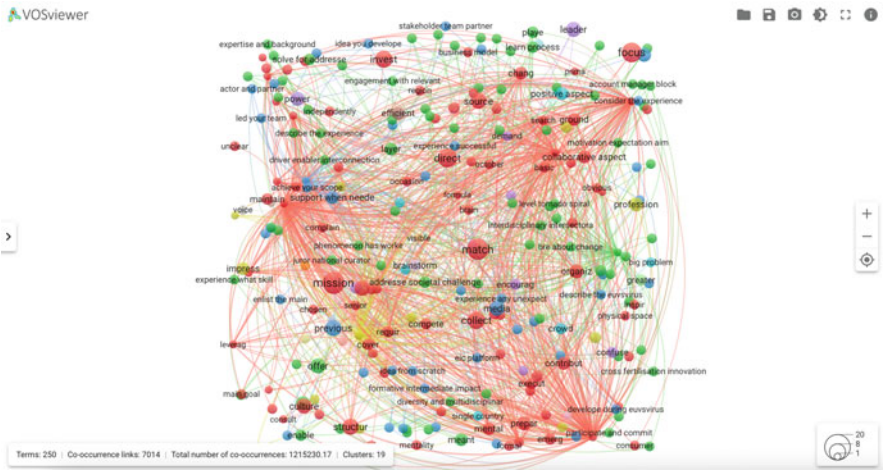


Fig. 10 Main concepts and their co-locations observed in the ethnographic statements and interviews (visualisation generated using nocodefunctions (https://nocodefunctions.com/topics/topic_extraction_tool.html;jsessionid=e39e8716dcd8405e24d8bc558c43) and vosviewer (https://www.vosviewer.com))

This figure visualises a graph with at least 250 terms, in 19 clusters with 7014 co-occurrence links and with 1,215,230 total number of co-occurrences.

The main concepts and key topics which have been strongly present in the ethnographies and interviews have enlisted the most distinctive ones, situated within the data reasoning matrix dimensions, would be:

- Dimension 1: VIEWPOINT (Change, Direct, Mentality, Leader, Diversity, Multi-agent collaboration, etc.)
- Dimension 2: EXPERIENCE (Match, Focus, Source, Collaborative, Support, Compete, Complete, Italy, Solve, Grow, Evolve, etc.)
- Dimension 3: PERCEPTION (Mission, Invest, When needed, Organisation, Contribute, Structure, Culture, Impress, Power, Purpose driven, etc.)
- Dimension 4: TIMELINE (Ground, Obvious, Media, Phenomenon, Temporal tension, etc.)

The matrix has been explained within the ADE information flows and made available as a single reference document as in Fig. 7.

These concepts are to be integrated, alongside the main analogy of the living organism of the phenomenon, in the blueprint, as explained in following headings.

5.3.1 Findings

The resulting model from the 'Academia Diffusion Experiment': '*the multi-vortex tornado with good DNA blueprint*', as presented in Chap. 10, has been developed based on a triple pillar:

1. an innovative, although still 'rare avis' multidisciplinary enabling framework, grounded in solid foundational values and principles (trust, openness,...) and enabling mechanisms (flexible, adaptable multi-i, n-tuple helix collaboration, multi-level, and contextual approaches), tornados, vital to encompass the development and the analysis of the complexity of the phenomenon at hand
2. the multidimensional matrix for data reasoning (Fig. 7) to capture, sense-and-respond strategically involving a hands-on tactical and operational management approach and
3. the triangulation of research theories, methodologies, investigators and data explained in the methodology section

The EUvsVirus phenomena can be seen as a gigantic open, flexible, and adaptable social innovation. Various studies of social innovation, e.g., the one carried out by Vinnova (Swedish Innovation Agency), point to the ability of social innovation to find solutions to different societal challenges by absorbing ideas and innovation from society as a whole. This can seldom be done within the framework of conventional research and innovation approaches. Besides, as a more rapid pace, the amalgamation of knowledge diversity (research and innovation results, citizen science, professional expertise, etc.) constitute a richer body of learning and sharing when addressing complex Grand Challenges.

Social innovations influence actors' behaviour in terms of the composition, motivation, and roles of participants in the innovation process. Conventional innovation systems are described in terms of a triple helix. In contrast, social innovation ecosystems refer to Penta or N-helix, involving the non-profit sector and citizens to help solve serious problems. The crucial question is not the precise number of actors, as demonstrated by the EUvsVirus phenomena. Still, the collaborative endeavours integrate diverse voices and interests (Caro-Gonzalez et al., 2020, 7; Caro-Gonzalez & Ferreira-Lopes, 2020), which in the case at hand have elongated over time.

The main analogy being deployed as perception of the EUvsVirus among the collaborations has been: Tornado formation. Its competing counterpart has been 'ripple effect' but it got dismissed through the course of the Academia Diffusion Experiment iterations. With this approach, we denote:

(a) the analogue: Tornado formation (familiar domain
(b) the target: EUvsVirus (unfamiliar domain).

Note to readers: the tornado has been selected not due to its negative connotation as a destructive force but its phenomenology as a creative force perceived by its internal ability to be created, to disrupt and to completely engage every particle while leaving a reconfigured and never the same landscape in the aftermath. It is nature's phenomenon of emergence, energy, self-creation, and self-organisation (it is not self: it is under the power of a great force or nature) upon certain preconditions which resembled with the greatest proximity the human kind's phenomenon of EUvsVirus.

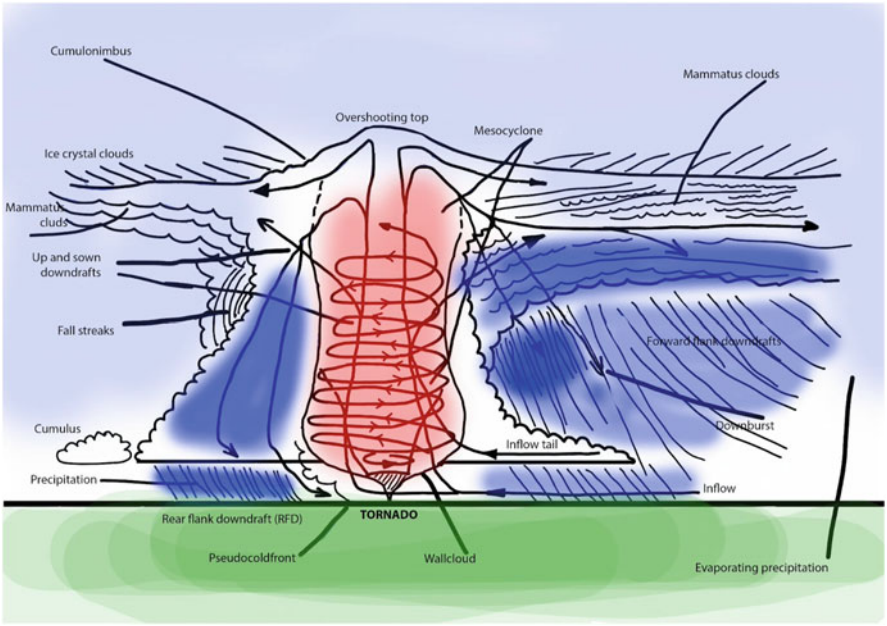


Fig. 11 Overall view of tornado elements and evolution from inception to termination

This section will analyse and describe the EUvsVirus phenomenon using the analogy of tornadoes formation, evolution, and termination. Experts in the field use supercomputers to render these simulations. In our case, Fig. 11 resembles the physical analogy used to explain the evolution of the EUvsVirus phenomenon. We have analysed and 'simulated' this unprecedented collaboration phenomenon to reveal the main traits that characterise this complex phenomenon, using the threefold strategy described before (data triangulation, ethnographic approaches and analogies).

Important Notice Since there is immediate negative connotation of the tornado notion, we are emphasising that the analogy being used here derives from the tornado characteristics:

- Strength
- Force
- Disruptive effect
- Potence
- Energy
- Blending capabilities
- Short life
- Uniqueness
- Need of special preconditions to be born

The tornado traits of devastation and damage are intended to be translated to the targeted danger, to the grand challenge, in this sense—the pandemic and the coronavirus, not to humanity and living per se.

And Why Is This Proper Analogy As humans we are reluctant to change, however, change is happening all the time and everywhere. We need to adapt and sometimes we need to react disruptively because 'business as usual' cannot solve crucial moments in the history of humanity. Tornadoes in the material world usually turn things upside down, mix different particles which usually do not go together, creating confusion and destroying buildings, existing structures, . . . giving birth to time for renewal and reconstruction of new structures in the aftermath. Making best use of difficult situations, turning risks into opportunities and positive outcomes. Figure 11 depicts the physical phenomenon of a tornado, while Fig. 12 shows the stages, which we make analogy for.

The Steps for the Multi-vortex Tornado with Distinctive DNA Formation

1. *A large thunderstorm occurs in a cumulonimbus cloud.*

The initial trigger of the EUvsVirus phenomenon was an initial blurred vision. Few European Commission officials had the idea to organise something that could potentially generate an impact on humanity at a time when an overwhelming threat (the COVID-19 pandemic) was widely and heavily felt and perceived at different countries, zones, and regions in the world as they were becoming into heavy lockdown for the first time in history (the incipient idea arose at the beginning of February 2020).

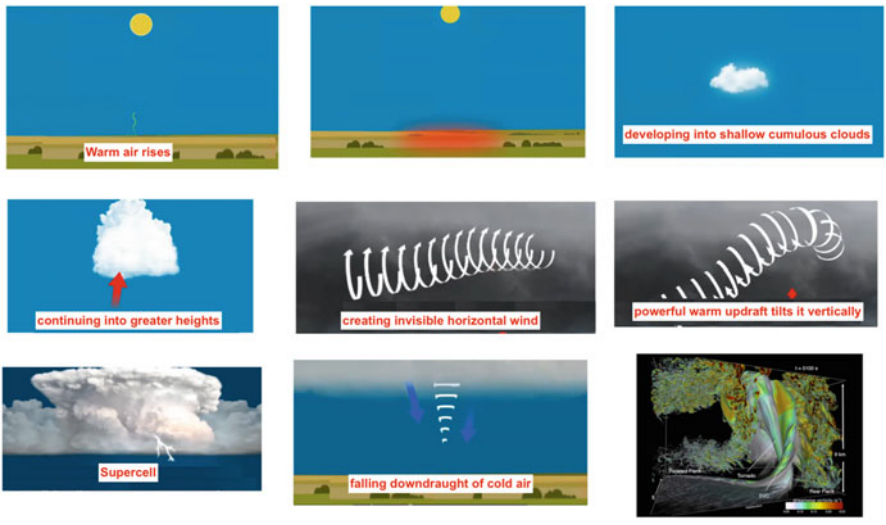


Fig. 12 Stages of tornado formation, as basis for the analogy

As in the inception stages of the tornado, in the EUvsVirus phenomenon, different particles mixed everywhere in the ground level (Dimension 1 of the Matrix for data reasoning). "These particles, such as the perceived fear and vulnerability of humankind, the problems, and risks caused by the COVID-19 pandemic, the lock-down situation, people motivation and expectations, etc.), were the basic elements without which the whole experiment had not been possible. People were in their houses, teleworking combined with home-schooling... using for the first time online tools and platforms in an unprecedented massive way, living in a dramatically changed context, in contrast with our normal known everyday life.

The initial preconditions for participating in the EUvsVirus hackathon were that everybody had the same starting point, meaning no borders, no hills... It was the basic level playing field for the willingness to participate and to provide the best for each person, group, institution, or network involved, offering their knowledge, availability, capabilities, ideas, etc. These were the basic ground elements, the particles, like in the tornadoes, without which this had not have happened. The drama and urgency of the situation formed what became a multi-vortex mega tornado very rapidly in only a few weeks.

But, what are the preconditions, and how do these phenomena form? They do pass the *stages* of calm before a storm, supercell, tornado formation and touch-down, dissipation and aftermath. And the steps are as follows.

In nature, tornadoes form when the sun hits the ground, and the air near the surface is warm and rises. Then the preconditions are that there needs to be a warm surface, as this air needs to go up. For the EUvsVirus to form, the warm surface was the urgent need, created from the pandemic that lifted up, so people and organisations were waiting as also were individuals and citizens as part of those institutions. Therefore, a cloud formation was made of human-kind vulnerability, health threat, lack of freedom to move, and uncertainty for their own lives as well as humanity.

This situation got very dramatic during the lockdown situation, the uncertainty of the future evolution of the pandemic, the threat for health systems to collapse, the news of thousands of people dying in different regions of the world... These were the main features and specificities of the context for the whole phenomenon to form. An unstable atmosphere with warm air rising.

2. *A change in wind direction and wind speed at high altitudes caused the air to swirl horizontally.*

In tornadoes formation, there is a change in wind direction, and speed at high altitudes that causes the air to swirl horizontally.

In the case of the EUvsVirus, this change meant a different approach adopted by the European Commission. This time, it was not business as usual, but a high attitude of policy makers at the Innovation ecosystem unit. Their clear leadership, voluntary approach (beyond regular duties), and decisive commitment had the impact to impel other actors at EU high instances and other committed players to join forces on a voluntary basis, eager to respond rapidly to the crisis.

The high-level will and leadership, combined with energy taken from the environment, caused the creation of invisible horizontal swirl winds. This spiralling

motion translated in the EUvsVirus experiment in cross/inter and transdisciplinary, intersectoral collaboration, as well as in inter-institutional and multi-stakeholder commitment.

3. *Rising air from the ground pushes up on the swirling air and flips it over.*

In tornadoes forming, the higher fast-moving horizontal air begins to spin and roll over the slower air below, forming powerful warm updraughts that tilt the cylinder vertically, creating a column of spinning winds, formed by sucking the pushing air from the ground up.

In the EUvsVirus, like in tornadoes evolution, eventually, a moist atmosphere with different directions of winds and updrafts sucking upward all from their energy sources, formed a dramatic thunderstorm. This responded, in a spiralling motion, to the urgent persistent need, forming 'supercells' with rain falling beyond it, surrounding it. Tornados do not like downdrafts because they bring them to a cease, they prefer updrafts that keep them going. This exactly happened during the EUvsVirus phenomenon: the solutions (downdrafts) were very far while uncertainty, fear, and threat kept the phenomenon growing.

4. *The funnel of swirling air begins to suck up more warm air from the ground.*

When the expanding clouds evolve to touch the ground, falling downdraughts of cold air within the supercell help to bring these vertical spiral forces downwards, touching base and forming vortices.

In the weeks prior to the hackathon, the regular ad hoc stand-up meetings played a key role for things to get exchanged, co-designed, adjusted, and re-defined in an ever ending feedback flexible and adaptable learning loop. Complex systems are regarded as adaptive (or Complex Adaptive Systems, CAS) when they 'are capable of solving problems creatively and they can learn and adapt quickly' (Uhl-Bien & Arena, 2018). In this case, learning and exchange processes happened in a speedy and prompt manner, like with solid updrafts as precursors of tornadoes. Besides, the energy source for the EUvsVirus phenomenon was the uptaking of the critical mass of self-energised volunteers.

In the physical tornadoes this takes 1 km, over 120 miles/h up, less than half a mile up. It brings the updraft closer to the ground as part of the tornado circulation with high velocities close to the ground.

In the EUvsVirus phenomenon, every participant was swirled into a rapid organisation solutions' oriented approach. As Uhl-Bien (2021) contends, the pandemic illustrates a compelling case study of complexity-based leadership, evoking the need for leaders' capacities for tackling adaptive challenges (such as forced lockdown) and support conditions in a dynamic context. While destabilising, the COVID-19 also allowed space for flexibility to explore new ideas and actions (ibid).

5. *The funnel grows longer and stretches towards the ground.*

As the tornado grows wider and bigger, the downdraft in the centre of the tornado eye is around 100 miles average an hour, with moist atmosphere and the updraft near the ground that takes it all.

In the EUvsVirus, this meant having the organisers, the precursors, were the strong updraft that touched base within regions, domains, networks, and institutions. In the base, the EUvsVirus' updraft, its energy source, was the critical mass of self-energised volunteers and ideas, the people who started to participate in teams. They were lifted up and immediately sucked upwards, set up to the decision-makers or funding bodies, angel investors,..

6. *When the funnel touches the ground, it becomes a tornado.*

The vertical component of wind, pulsating downdrafts, till the real thing touched the ground with high velocities. Streamwise vorticity current moving in the same direction as the vorticity vector.

In this sense, the EUvsVirus phenomenon had enforcers who kept the tornado alive, since as in nature, the phenomenon needed to last for some while to form the multi-vortex tornado it became. Those enforcers were the leaders, the people, the ideas, the dedication, the key players with the systemic approach to keep the whole thing moving in one direction.

There were separate vortices which formed the mega tornado the EUvsVirus became. These multiple tornado vortices were in the organisational parts, meaning corporates, academia, public authorities, different sectors… the intersectoral, intergenerational, interdisciplinary, and international collaboration, forming the n-helix components of the vortices. The effects of the multi-vortex tornado are disruptive and strong as witnessed in the aftermath of EUvsVirus phenomenon and all its impact, on collective and individual level.

6 EUvsVirus as Multi-Vortex Tornado—A Blueprint for Disruptive, Global co-Creation

This is the blueprint for global, open collaboration, (voluntary), open innovation, multi-aspected disruptive events which need to initiate, activate, engage, onboard, produce, emerge, and effectuate with great potency, in short periods, in urgencies and grand challenges—co-creative events such as hackathons/matchathons. Its inspiration has been the EUvsVirus phenomenon and its emergent aftereffects (such as the Academia Diffusion Experiment and distinctive others). It is co-creation every step of the way, denoting collective action of a complex adaptive system towards a mission, a purpose. All our work has led to being able to generalise this blueprint. We are structuring this blueprint with the components of governing principles (from the Denica method and the Sense-and-Respond framework) (Haeckel, 1999; Haeckel, 2016; Petrevska Nechkoska, 2020) and a roadmap (where primary purpose, roles, accountabilities, iterative adaptation, and dynamic reconfiguration are integral parts).

We would like to name this approach for facilitating co-creation, especially (but not limited to) hackathons or disruptive global collaboration events:

The Multi-vortex Tornado Blueprint for Disruptive Co-creation

6.1 Governing Principles

Organisation/Management

- Multi-level everything (empower each module/unit/team to be almost stand-alone, within the big organism).
- Flat hierarchy—roles and accountabilities towards a purpose.
- Facilitation and off-the-stage management (instead of top-down management). However, sending e-mails, instructions, and invites works best from traditionally established authority (e.g., European Commission domain).
- Ask for competence, volunteer competence and ideas any step of the way—all is welcome and appreciated and praised.
- *Dirty prototyping* is allowed—aiming for what can be done best under the circumstances.
- Opportunistic Creativity, Trial and Error.
- Horizontal, vertical and diagonal meetups and standups.
- Communication channels everywhere with everyone (technology+human).
- Extinguish burning fires and temporal tensions, clear congestion before it is too late! Clear up sufficiently to be able to move on.

Individual

- Proactivity of everyone, Trust, Openness, Kindness, Good intentions, and Honesty by default.
- Respect everybody and everything, especially the voluntary aspect. Accountability is expected until it is not—Allow for change of mind and change of heart.
- Professional & personal, work and family—all merge together.
- Communicate your doubts, point out the risks.

Specific

- Bridges need to exist—they can be humans and/or technology and/or a combination of both which are functional where domains, teams, siloes, projects overlap. They help purposive alignment.
- Matchmake every step of the way—answers can be found. Connect, reconnect, configure, reconfigure, iterate.

These governing principles are specific to global, voluntary hackathons/matchathons and do have their limitations if sustained over time and in terms of 'business as usual', especially since the collective mentality is: 'Everything is possible—nothing is impossible'. But, they do create an environment where most perfect people and most special things happen, transcending the 'I' into 'humanity'.

And here is the recommended:

6.2 Roadmap

6.2.1 The Calm before the Storm

- Face the problem, communicate its importance, and start raising up to it! (EUvsVirus: coronavirus pandemic, initiated by EC and partners).
- (Self)Appoint facilitator who would be a leader even without a title—extremely competent, established, wise, humane, empathetic, international (to achieve facilitation for co-creation without initial doubts) (EUvsVirus: Isidro Laso Ballesteros) and a clique of similar collaborates for the initial team
- Assemble the particles transcending boundaries of providers and customers (facilitators, knowledge, skills, competences, strategy/tactics/operations, willingness, motivation, information, iterations, population, outreach, relevance, need, multiple stakeholders, geographic coverage, multimodal everything) (EUvsVirus: citizens can be citizens, organisers, partners, competitors, . . . = doers).
- Get the main technology covered—it should be the backbone of your socio-technical living organism (EUvsVirus: Slack, WebEx, . . . then Miro, . . .).
- Zoom out and sketch the scene (as is and to be) and continuously reconfigure around it till purpose achieved! Zoom in and outline the steps! Alternate and keep the radar moving!
  - What do we know at this moment?
  - Where are we headed?
  - Does anyone know how to get there/do that?
  - Hear out some solutions and approaches!
  - Ask for volunteers and assign some more resources!
  - Perform the Sense-Interpret-Decide-Act and Plan-Do-Check-Act loops continuously!
  - Reconfigure (at least for the core essentials).

6.2.2 The Supercell Roar

- Clarify and constantly communicate the purpose! The mission! (EUvsVirus: Saving lives!)
- Rain abundant good energy and intentions everywhere! Let the vertical winds clear the malicious energies while proceeding without hesitation! Preconditions are in place—and we are ON.
- Swirl the funnel—Start doing the ‘project’ when critical (minimal) core is achieved and continue generating ripple effects (EUvsVirus: the few weeks before the hackathon).
- Forward flank: Structure the onboarding (EUvsVirus: protocols, roles, accountabilities, Slack channels, Miro boards, briefings, . . .) as much as possible. Sustain rear flank.

- Get several big players, referrals, national authorities, ... and individuals from every population at stake—make invited lectures, trainings, masterclasses, panels, referrals, addresses, ... all modalities of competence.
- Bring out positive deviances to exemplify and multiply.
- PR like crazy and keep the doors and windows open for all willing to join. Organised and lone wolf forces all are valid in PR.
- Do not be afraid, keep the updraft! (downdraft kills the tornadoes).
- Point out the change in wind direction—why is this distinctive and how? (EUvsVirus: voluntary, European Commission joining and partnering, relevant stakeholders open doors, everyone invests their best from the heart and mind).
- Absorb (suck up) the warm air from the ground (EUvsVirus: Enrol participants in diverse roles, and contestants and audience) and engage all who are willing.

6.2.3 Mature Multi-Vortex Tornado Touch-Down

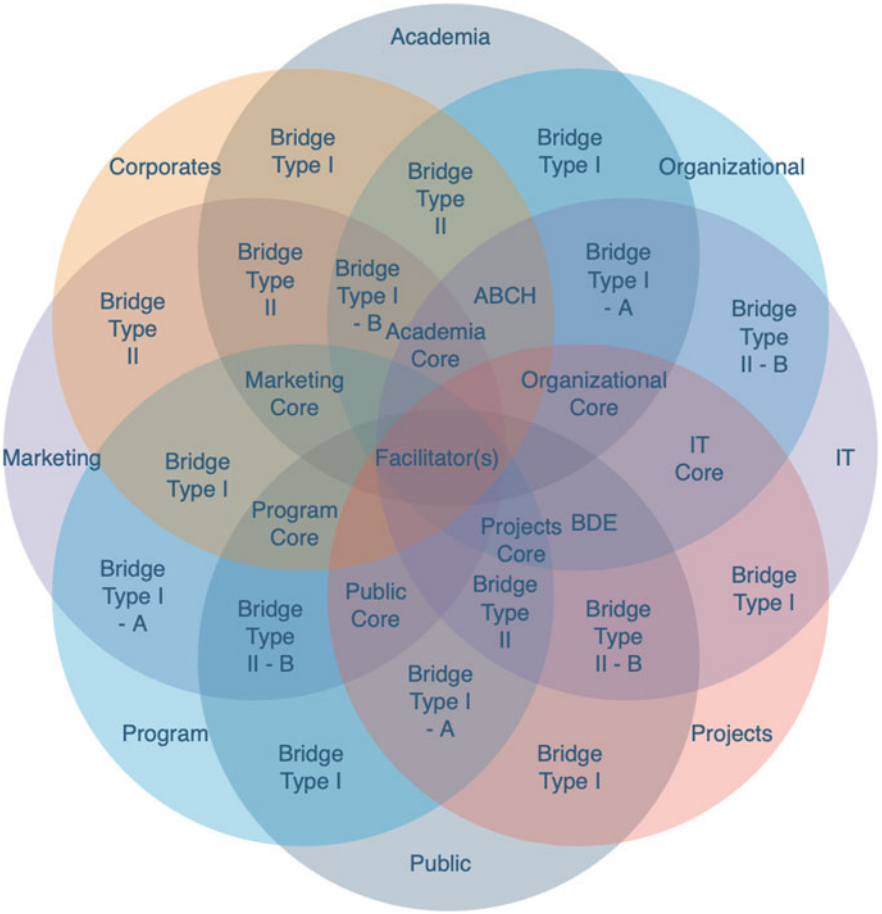
- Grow and stretch the funnel and expand to cover more ground! (EUvsVirus: keep everyone willing, onboarded, and in the game!)
- Showcase the exemplary vortex and dance with the multiple vortices, sometimes conjoining sometimes separating, by all means existing and merging.
- Enable platforms, answer needs to have collaboration space on all levels and across.
- Enable and facilitate bridges of all kinds—carried out by humans and/or technology.
- Boost motivation and allow for the human touch of everyone willing to emit positive energy, competence, assistance, support! Enjoy and have everyone feel the joy of rain going up and down, let go into the tornado forces and create magic selflessly! You are not breathless—you are energised! Spiral this across every touching point you have!
- Keep all channels open and functional.
- Meetings for direction, instruction, knowhow, as direct as possible.
- At this stage everything is feeding the tornado and its vortices—keep all awake and utilise all that!

6.2.4 Dissipation

- Realise the loss of fuel and go along with it! (at one point all is a dance feeding the tornado but it starts to be too much and cannot last much longer, so it will eventually die off. Such force cannot sustain on lifelong basis, it is powerful, short-lived, and disruptive).
- Adjourn every redundancy.

6.2.5 Emergence in the Aftermath

- Exemplify and acknowledge.
- Offer a helping hand or make a connection to assist.
- Incept an idea and pursue it! This way or another! You will never be the same as before.



The multi-vortex tornado blueprint for disruptive co-creation as seen from above

7 Conclusions and Implications

As we were working on these chapters about the special selfless humanity during the pandemic, war happened, and some of the co-dreamers across the globe have added 'bombs', 'no electricity', and other grave dangers to the already deadly coronavirus. What is to be said more, other than the deliberate fight between the good and the bad continues.

EUvsVirus, as a community that has been united, self-supported, and sustained (self-sustained) by the energy of the community, has evolved to develop the necessary potential to address certain aspects (uncertainty, sense of urgency, united by a common purpose) with the aim to fight and reduce the impact of the pandemic at a global scale.

The first characteristic is the existence of a sense of community, and the building of a degree of connectedness among members and recognition of the mutuality of circumstance.

The second characteristic of the EUvsVirus community is the existence of different degrees of commitment of particular individuals, and organisations, partners taking responsibility and accountability for what was happening in the community as the phenomenon evolved. Those have been the people on an individual or institutional ground that have invested time, energy, and other resources in promoting its propelling. There are, thus, two essential aspects of this characteristic: (1) the existence of community members who see themselves as 'stakeholders' with agency to commit towards the collective solution-finding of the grand challenge, as well as the wellbeing of the community involved (or who see their self-interest as tied to that of the EUvsVirus community as a whole); and (2) their willingness to perform actively in ever evolving roles, which were adapting to the circumstances and needs.

Third, a community with capacity will have mechanisms for problem-solving through which commitment can be translated into action.

The final characteristic of a community with capacity is access to resources (economic, human, physical, political) beyond paywalls and within capabilities.

7.1 The Challenges of 'Multi-/Cross-/Trans-/ Inter-Disciplinary' Research and Innovation

The COVID-19 crisis has faced humanity with a range of unprecedented complex problem-solving that have demanded urgent research and innovation responses and 'multi-i' orchestrated collaborations: inter−/multi−/trans−/cross-disciplinary and intersectoral, interinstitutional, international, and intergenerational.

New coordinated answers and the creation of more attuned 'glocal' ecosystems ranging from medicine to ecology, from politics to social and individual responsibility, from basic research to applied innovations became acute.

The EUvsVirus phenomenon, as a pan-European response to the crisis, became a playing ground to test and channel innovative ways to address the challenge of multidisciplinary research and innovation.

Our design principle—incorporating diversity, broad stakeholder ecosystem, big picture understanding, and multi-everything in terms of disciplines, profiles, roles, people, countries, languages, approaches has been intertwined throughout the entire EUvsVirus phenomenon and the Academia Diffusion Experiment. It denotes a novel, distinctive manner in practice on how to address real-life situations, which are not 'single' anything. Such an approach poses many challenges but also has numerous gains, the main one being its proximity to the philosophy and fabric of real life.

On the side of the challenges we faced, we can enlist several: not being able to understand each other due to diverse concept definitions and understanding, superficial grasp is needed and a lot of sensemaking, generic orientation, generalised with many in-depth specialities, nobody feels they have the big picture standpoint, yet everybody makes the big picture, collaboration is tough, facilitation, orchestration, top-down, bottom-up, lateral, communication and collaboration flows, nobody knows where to start, especially in a system (since there is no beginning and end), the only thing we did know is where we are headed (the primary purpose of the endeavour—saving lives EUvsVirus and produce relevant knowledge on how to co-create value together ADE), onboarding is continuous and needs to be done.

On the positive side of the benefits, we could emphasise the following: the individual and collective alignment, cross-exchange of inspiration, motivation, energy, support, addresses reality more properly, idea on top of idea, emergent collaborations beyond the events, nobody could have come up with this alone.

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Appendices

Appendix 1: Interview Protocol for Semi-Structured Interviews

#EUvsVirus

Academia Diffusion Experiment

INTERVIEW PROTOCOL FOR SEMI-STRUCTURED INTERVIEWS

INSTRUCTIONS FOR INTERVIEWERS

There is a set of two protocols for different roles:

1. organisers (EU officials, mentors, jurors, ...) and partners,
2. for projects as direct beneficiaries

All follow a similar logic within the matrix (most different is the one for projects), therefore cover the same blocks and key issues in the questions but focus on different angles depending on the role(s) of the person interviewed.

Please try to comprehend the essence of the interview protocol for the specific role to be able to catch the must-haves (hence semi-structure) while leaving space for natural flow (the unstructured side of the story).

Please also bear in mind that: **different roles can come from different backgrounds:** e.g. mentors can go with partners and organizers. But also, **different persons can have different roles** - the complexity starts even in the most basic step of which protocol to choose. Be prepared that when someone has populated different roles (it is important to be captured, not dismissed!) you will have to combine both protocols in the same interview. No one could have been in all three roles, as it was Conflict of Interest, so no triple-protocol combination exists.

The interview would take between 40' to one hour.

Prior to starting the interview, an 'informed consent sheet' should be signed by the interviewee, yourself, and please put a copy of it in the SIGNED CONSENT FORMS FOLDER: https://drive.google.com/drive/folders/1FkxJ72SBCklfYISunbFQhvhiXspXLmBn?usp=sharing

LINK TO FORM FOR SIGNATURE IN PDF HERE: https://drive.google.com/file/d/1hJKyF7QFKQxDz511fPk2WG8MvERpQ9Bv/view?usp=sharing

After the interview, please fill in this quick form and you have completed the task!

https://docs.google.com/forms/d/17GyTu0ZcBrVta7NvhHyGSV03ZXEvMEf9vtscCmmxXg8/edit

Tools for transcribing:

https://www.happyscribe.co/ - it's a paid (free for the first 60 minutes) automatic transcription software. You upload the audio file, the software transcribes it for you, and you can go through the transcription to check for and modify errors

Academia Diffusion Experiment

https://otranscribe.com/ - it's a free transcription software that allows you to transcribe real-time. It has features like pause, fast-forward, speed regulation, and timestamps. You can use it directly off your web browser and your transcriptions can be downloaded as a text file

TO SUMMARIZE: For the interviews, we need to clarify what we need to obtain from them:

A. **Experience within the entire organisational living organism**, with suggestions and perceptions on what went best and should be kept, what can be improved.
B. **Support and proof for some of our impressions and claims for novelty,** *so we can argument the tornado formation and building blocks*: close contact with the PMs (Isidro's standups, weekly project teams meetings with PMs, open channels to ask and find help, no need to know the head to find answers, because of self-motivated volunteers and sufficient knowledge of the organisation to either: give an answer/assistance or connect with respective responsive person), short ICT communication channels, clarity of procedures, ability to ask and propose, as well as point out major downsides
C. **Proof of impact of the winning teams solutions** so that the entire project is deemed worthwhile describing and modeling and all (**summative impact** - they developed, still work, …) - more tangible via qualitative stage of their development (compared to initial position) and some numbers of how many are at which stage now
Ways the EUvsVirus resulted with **formative impact** on the persons, their teams, networks, capabilities, coping mechanisms, voluntarism, openness, innovation

INTERVIEW PROTOCOL FOR SEMI-STRUCTURED INTERVIEWS

FOR PROJECTS TEAMS AS DIRECT BENEFICIARIES

A. THE PROJECT TEAMS AS DIRECT BENEFICIARIES

(to prove summative and formative (intermediate) impact, since the real impact is how many lives have been saved and how)

1) Tell us about yourself, and about the idea you developed during EUvsVirus programme (e.g. idea from scratch or already existing, role within the team)?

2) What motivations led your team/yourself to participate in the Hackathon? Would you consider the experience successful, and why?

3) Was the hackathon, and the matchathon, successful for achieving your scope? If yes, why? If not, why? Did anything unexpected happen?

4) How was your personal experience in this event? Could you make a comparison with other hackathons/*matchathons* you have participated in previously? Strength points and bottlenecks?

5) Did you only meet actors and partners that were specifically instrumental to the development of your project or you also extended your network with partners that could help you in any other project/collaboration?

6) Did this event help your idea to scale up? If yes, how? If not, why?

7) What is the current state of your project? Are you using the EIC COVID-19 platform?

8) Would you engage in other similar initiatives? Why?

B. THE ORGANISATION OF THE EUVSVIRUS HACK/MATCHATHON

(to help validate our description of the phenomenon)

9) Did you find timely support when needed? How many actors did you interact with during hackathon and matchathon? What was the responsiveness and assistance?

10) What does the organizational structure of the hackathon look like? Flexible, hierarchical, a mix of these two elements? Were you able to find the right support for any specific need?

11) Would you describe the EUvsVirus programme as a bottom-up initiative or a top-down initiative, or a mix of these two? Please describe why.

12) Did you feel free of operating and did you think the programme enhanced your team creativity? What was good and bad?

13) How about the evaluation criteria and the jury? Were they clear and transparent?

14) Were the actors you collaborated with reliable? Could you please indicate pros and cons of virtual collaboration?

C. THE CO-CREATION OF MULTIPLE STAKEHOLDERS: TEAMS, PARTNERS AND HACK/MATCHATHON

(to help argument the novel elements like bridges, preconditions for innovation, alignment) we will introduce as novelties)

15) Did this event help your idea to speed up? How? Innovation requires time when COVID-19 requires timeliness, how did you manage this tension in your team and how the programme managed this tension in your opinion?

16) Did you perceive this programme as competitive or collaborative? Why?

17) Did you experience any unexpected event that slowed down your project during this programme? How did you react and how did the organizers react?

18) How would you evaluate the role of the European Commission and the European Innovation Council? What role did they play in the single events (hackathon, matchathon) and what role in between the two events. And what role now?

19) Any suggestion on how to improve initiatives such as EUvsVirus?

20) Please enlist the main things that were novel and made EUvsVirus distinctive and how?

Appendix 2: Protocol for Ethnographic Statements

Organisational & Partner roles

(For EU officials, mentors, jurors, national curators,...)

Block 1. Describe the experience

(Important aspects to analyse: - personal and professional interests and motivations, expectations, aims and expected outcomes)

1.1. Have you participated in one or in the two events, in the hackathon, in the matchathon, or both? In which roles?

1.2. Could you give us an **account of your experience**, the role or roles that you have performed, a brief account on the activities that you carried out during the hackathon and the matchaton? *(Note for the interviewer: very short, we can triangulate this with other data)*

1.3. Please, let us know about your **motivations and personal interest** (your win-win) from getting involved in the organisation of such a phenomenon? In other words, why did you decide to participate?

1.4. Which were the aims and expected outcomes? and looking back, are you **satisfied with it**? Has it **fulfilled your expectations**?

Block 2. Describe the process

(to deepen on the holistic view (or not) and the multi-directional, open ecosystem perspective. Cross and multi-layered collaboration (why, how, distinctiveness), Installed expertise and background knowledge, identification of barriers, drivers, enablers; Interconnections (collaborative efforts done and perceived from others)

2.1. How would you **describe the process**? What have been, in your opinion, the main drivers that have made this possible? And the barriers and tensions (at policy level, at management level…, bottom-up, top-down? Please, explain it for your personal experience, but also your impression of the learning process for individuals, groups and as a wider EU community?

2.2. Can you tell us the **uniqueness** you have found in this specific process?

2.3. From your point of view, **why do you think there were so many people eager to participate and commit** in the hackathon and/or the matchathon? Or in other words, what in

your opinion made possible the involvement of so many people, in an inclusive way during the duration of the phenomenon and beyond?

2.4. We would like to **dig on the managerial, organisational and governance elements** with relevant people taking these roles, what would you underline as the most remarkable aspects? Which were the main concerns to find solutions for? Do you think that the instructions offered to participants in different roles were clear enough? and the mechanisms to participate sufficient? Has the process revealed new concerns that you would like to share with us?

2.5. To deepen on the process of key people transiting from one role to another or performing different roles at the same time and being bridgers and amplifiers, connectors... What do you think this has meant for:

a) their own experience in terms of personal empowerment, leadership skills, networking or engagement with relevant stakeholders, learning...
b) the implications for the managerial, governance dimension, in terms of connecting the dots and generating multi-agent collaboration (all the i-ielements: international, interdisciplinary, intersectoral, intergenerational); How would you summarise the virtual collaborative experience? Did you encounter many technical difficulties? Was it crucial, in your opinion, for open or distributed innovation? How important have diversity and multidisciplinarity been to problem solving for addressing societal challenges?
c) the Implication for the whole phenomenon in terms of involving more people, connecting,... bringing the experience to the next level (tornado spiral growing and involving more people...).

2.6. Can you describe the overall structure resulting from the process? How has it evolved? Can you explain how the process of integrating such a complexity was?

2.7. Have you perceived efforts for open, collaborative and cross-fertilisation innovation? What are the novel features that you can recall from this phenomenon?

2.8. What could have been introduced or made differently to maximise the impact?

Block 3. Reflect on the impact and NOVELTY (during and after the phenomenon)

3.1. What have you gained from the experience? What skills and/or knowledge have you developed or acquired during the process? Could you explain if you think people have learned from each other, how, what has made it possible?

3.2. In relation to impact: Do you think the phenomenon and the innovations developed will

really influence or bring about change via the actors and/or the project the phenomenon has worked with and through? How about the EU added value?

3.3. Have you got any confident plans for the future related to the EUvsVirus phenomenon and outcomes? What do you think could be done?

3.4. Do you think the medium and long term impacts of the initiative can be? What are your reflections for future policies as well as for corporate strategies?

Final question: Please, tell us **NOVELTIES** for the whole phenomenon, why was it **DISTINCTIVE** from others?

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