

Contributions to Management Science

Renata Petrevska Nechkoska
Gjorgji Manceski
Geert Poels *Editors*

Facilitation in Complexity

From Creation to Co-creation,
from Dreaming to Co-dreaming,
from Evolution to Co-evolution



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Contributions to Management Science

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Messages from the Editors

Geert

Van Renata's co-promotor in 2017 naar Renata's (en Goce's) co-auteur en co-editor in 2022. Collega's (dus co-werkers) zijn we altijd geweest en zullen we altijd blijven. 'Co-' dit en 'co-' dat zijn de buzzwords in dit boek. Welke mooiere boodschap kunnen we brengen dan een boodschap die we zelf in de praktijk brengen. Als 'co'-zoveel van Renata is zij de persoon die ik in de eerste plaats wil danken voor dit boek. Van al het dromen, plannen, coördineren (daar gaan we weer met 'co'), uitvoeren, zweten, zuchten, hopen, wanhopen, vloeken, juichen, enzovoort, heeft zij 97% gedaan, waardoor mijn 1% (en Goce's 2%) beperkt kon blijven tot corrigeren en tevergeefs tot schrappen condemneren ("less is more" gaat niet echt op voor dit boek). Dankjewel Renata voor het voorrecht om je co-denker geweest te mogen zijn bij dit project. Je hebt het mijn leven als co-editor echt makkelijk gemaakt. Ik kijk al uit naar ons volgende project. Verder gaat mijn dank uit naar Tom, Gilles en Wouter, drie voormalige MSc studenten aan de Universiteit Gent, wiens masterproeven herwerkt zijn naar twee hoofdstukken in dit boek te vinden. Dank voor de tijd die jullie in deze herwerking gestoken hebben, ondanks alle drukte van het prille beroepsleven. Dank ook aan de UGent collega's Stijn, Jan, Frederik, Amy, Dirk en Thomas voor het bereid zijn om moeilijke en lange teksten na te lezen. Uiteraard ook dank aan de lieve mama's van de vakgroep, Martine en Machteld, voor de logistieke en administratieve steun bij het tot stand komen van het Open Access deel van het boek. Tot slot dank ik mijn mega knappe vrouw Kaat en mijn hyper leuke dochter Siska voor het compenseren van de bij mij ontbrekende rechter hersenhelft. Dank voor jullie poëtische en artistieke bijdragen. Ik vind het echt heel mooi!

From Renata's co-promoter in 2017 to Renata's (and Goce's) co-author and co-editor in 2022. Colleagues (i.e., co-workers) we have always been and always will be. "Co-" this and "co-" that are the buzzwords in this book. What finer message can we deliver than one that we put into practice ourselves. As Renata's "co-" so

much, she is the person I want to thank for this book in the first place. Of all the dreaming, planning, coordinating (there we go with “co” again), executing, sweating, sighing, hoping, despairing, cursing, cheering, and so on, she did 97%, allowing my 1% (and Goce’s 2%) to be limited to correcting and vainly condemning to deletion (“less is more” does not really apply to this book). Thank you Renata for the privilege of having been your co-thinker on this project. You have really made my life as co-editor easy. I am already looking forward to our next project. Furthermore, my thanks go to Tom, Gilles, and Wouter, three former MSc students at Ghent University, whose master’s theses have been reworked into two chapters to be found in this book. Thank you for the time you put into this reworking, despite all the pressure of early professional life. Thanks also to the UGent colleagues Stijn, Jan, Frederik, Amy, Dirk, and Thomas for being prepared to read difficult and long texts. Of course, thanks also to the dear moms of the department, Martine and Machteld, for the logistical and administrative support in the creation of the Open Access part of the book. Finally, I would like to thank my mega gorgeous wife Kaat and my hyper cute daughter Siska for compensating for my missing right hemisphere. Thank you for your poetic and artistic contributions. I think it is really beautiful!

Gjorgji

Прекрасно е чувството (Рената) кога некој твој ученик на сите академски звања не штедејќи се себеси сака да го даде најубавото и највозвишеното од себе си и сличните на себе. Уште поголемо е задоволството кога во тој тим се твоите помлади колеги во друштво со колеги од други држави, други простори и други димензии. Не знам што е поубаво, дали тие што ги познаваш и соработуваш со нив, или тие што ме ги познаваш по лик но можеш да ги споделиш нивните дела, или пак некои кои само си ги сретнал и преку нивните дела ги запознаваш. Како и да е создавањето на нешто во кое сите веруваат и живеат за него и можноста да бидеш и минорен дел од тоа создава незаборавно чувство, на припадност, енергија и синергија која толку посебна и толку незаборавна. Особено ми е драго за професорот Герт кој заедно со неговиот тим дадоа непроценливо значење на ова дело. Се надевам дека овој проект е само зачеток на нешто кое само што започнува да ги отвора очите, а можеби е ZYGOT кој ќе ја доживее “светлината на сонцето.”

It is a beautiful feeling (Renata), when your mentee with all academic degrees selflessly gives the best from oneself and the most important to the world and the likes. It is even greater pleasure when such a team enlists your younger colleagues and collaborates from other countries, other contexts, and other dimensions. I could not choose what is better, the co-creation with the ones you know personally and in person, or with the ones you have had the pleasure to meet only through your mutual work and deeds. Either way, the co-creation of something everybody believes in, and living through it, and the opportunity to be a part of it gives birth to a memorable feeling of belonging, energy and synergy, unique and impactful. I am especially glad

for my friend and colleague, professor Geert and his department, who have contributed immensely to this work. I hope that this project is a pure eye-opening inception, or maybe it is a ZYGOT to see the light of the Sun!

Renata

Оваа книга е израз на огромна работа во тежок период за човештвото, а уште потежок за индивидуите и семејствата. Овие турбулентни години на пандемија и војни во кои одевме на работ на хаосот, меѓу животот и смртта, кон заедничкиот спас со внатрешниот мотор полн љубов, сочувство и поддршка, го овозможија патот на ко-сонување. Ова не беше пишување научни трудови. Ова беше кокреација на научно-апликативна основа. Низ изминатите години работевме во експерименти, измислени безбучетни волонтерски проекти, хакатони, бизнис концепти, човек да се зачуди колку многу се работело на применета наука. Во еден момент се создадоа услови тоа да се собере и објави во книга. Како е можно таа книга да има свој заеднички содржател, и како дојде до тоа да биде со ваква структура од два дела, едниот со состојки другиот со изработки и рецепти - тоа не можам да го објаснам. Опортунистичка креативност. Но дојде. Се инспириравме едни со други, си помагавме да преживееме, да се справиме, да процветаме, да го подигнеме светот, ко-сонувајќи. Оваа книга е светот, науката, практиката и нашите директни обиди за да изградиме милион функционални мостови во мало.

Од каде јас копнеам за кокреација и коеволуција? Сржта и перпетуалната инспирација доаѓа од моите родители. Целиот живот гледам како моите прекрасни родители создаваат нешто од ништо или од многу малку, а со сè што се има прават волшебни творби со многу способности, креативност, издржливост, работливост, отворен ум, срце полно љубов. Чудата што ги направиле моите родители јас само се обидувам да ги опишам, реплицирам, кодирам и преточам во насоки, упатства, принципи. Во тоа влегуваат чувствата - да се сака да се создава, а не уништува, да се сработи и облагороди и да се напредува заедно. Во тоа влегуваат квалитетите - работата на себе и поддршката на другите. Во тоа влегува несебичноста - волонтерството и давањето од себе. Во тоа влегува љубовта - за својот близок, за семејството, за животот и светот. Она што моите родители го вградуваат во мене цел живот, го продолжувам со моите најблиски пријатели и соработници, со моите ментори Гоце и Геерт кои ми ги одржуваат и корените и крилјата, со чудесните ко-сонувачи, и со луѓето што ги сакам, како дар за светот и животот што сè бесценети. И тука доаѓа мотивацијата за кокреирање подобар свет - нашите деца. Секое едно човечко битие е фрагилно и мортално, но човештвото живее и трае. Мојата волшебна, креативна и бисерна убавица Ноела ме прави да се раѓам одново и тоа секојпат посилна, почувствителна, подетерминирана да постојам чисто, искрено и да градам. За неа, за нив, за светот, за животот, знајте, возможно е, заедно да сонуваме и да создаваме.

So much work has been put into this book, in especially difficult times in the history of humanity, and even harder period for the individuals and families. These turbulent years of pandemic and wars, when we were walking on the edge of chaos, between life and death, toward mutual salvation with inner engines filled with love, compassion, and support, we were co-dreaming. This is not writing research papers. This is generating applicable science by co-creation. Through these years we have worked on experiments, made-up no-budget voluntary projects, hackathons, matchathons, business concepts, and so much work on applicable science. At one point in time, things matured to publish all that into a book. How it came to bundle, align, and configure all that work into such a structure—part with ingredients and another—with recipes, is beyond my comprehension. Opportunistic creativity. But, it is here. We have inspired each other, we helped to survive, deal, bloom, raise this world, co-dreaming. These works are the world, the science, the practice and our direct trailblazing efforts to construct million functional bridges in a book.

Why am I longing for co-creation and co-evolution? The core and the perpetual inspiration comes from my parents. All my life I witness how my amazing parents create and co-create something from nothing, or from very little, optimizing, managing, devising magical deeds with abundance of capabilities, creativity, perseverance, hard work, open minds, and hearts full of love. The wonders made by my parents I am just trying to describe, replicate, encode, translate into guidelines, models, principles. This means including feelings—the will to create—not destroy, to make and enrich to progress together. This means including competence—built within and for supporting others. This means selflessness—voluntary and emerging. This means love—for your family, for life and world. I am sustaining the ripples generated by my family with my closest friends and collaborates, with my eternal mentors Goce and Geert who sustain the roots and the wings, with the amazing co-dreamers and the people I love, as a gift for the world and life and all that is priceless. And here comes the main reason, the purpose, the motivation to co-create a better world—our children. Every human being is strong, yet fragile and mortal, but humanity lasts. My magical, creative, pearly beauty Noela makes me get reborn over and over again, each time becoming stronger, more sensible and more determined for pure and honest existence with building strength. For them, for her, for the world, for life, know this, dear readers, it is possible for us to co-dream and co-create!

Real-Life Analogy



Photo by Vladimir Petrovski

Dear reader, welcome to our co-creation!

We hope you will see trailblaze and it will cause ripples in your co-evolution with this world, in a good way.

We aimed to portray how “one plus one emerges to be greater than two,” but also why it is a remarkable setting when that “one” happens. Co-dreaming while co-creating, with eyes, minds, hearts wide open.

Who are the actors? What are the principles? Which are the mechanisms? Who is the boss or is there a boss? How can it be sustained? Can it be replicated? What was the strategy? Tactics? Operations? What was the budget? What was the primary purpose and how could people, nature, and all resulting from that coupling align so harmoniously around it?

Galichnik, North Macedonia (on the image above) ... and a certain number of other co-evolutionary tales across the world which overcame co-destruction, and co-evolved. So can and so should we.

Open the window and you may see the trail ...

of ants, ... the dancing vortices created by a windmill, ... of dreams, ...

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2. Tim O’Brien, Harvard University, Center for International Development, USA
3. Gilles Kittel, DG REGIO, European Commission
4. Prof. Dr. Jelena Zdravkovic, Stockholm University, Sweden
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6. Prof. Dr. Frederik Gailly, Ghent University, Belgium
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To Kristina Nikolova—Master student at Ca'Foscari University of Venice, Department of Philosophy and Cultural Heritage, a restless and creative intellect, who has opened her mind to understand and convey the multi-peaked environment and *facilitated co-creation image* (Fig. 1). And it is only a sneak peak of what she is capable of.

Another co-dreamer, Gordon, moved mountains and enabled us to co-create the amazing *visual abstracts* of chapters “Academia Diffusion Experiment: Trailblazing the Emergence from Co-creation” and “Multi-vortex Tornado Blueprint for Disruptive Global Co-creation (Inspired by the EUvsVirus Phenomenon)”—the ones to disrupt the applied science communication principles for sure. The works have been effectuated by Lukas Kaisler.

To our colleagues, friends, collaborators who have joined us in this endeavor—thank you and it has been a privilege to have worked together with you. We are honored and this is our way to show our appreciation. Let the future generations be the validators of this trailblazer.

Repository of materials regarding this book can be found on <http://tactical-management-in-complexity.com> and more specifically on <http://tactical-management-in-complexity.com/course/view.php?id=25>



FULLY HUMAN

Life unfolds to us in never ending spirals. Most probably we'll never accomplish the final Courage-Collaboration-Connection steps towards real and pure whole-hearted creative living. But some of us sure will live (and breathe in-and-out) trying.

Kaat Van Wonterghem and Siska Poels (poem), Noela Nechkoska (drawing)

Editorial (Fig. 1)

From Creation to Co-creation, from Dreaming to Co-dreaming, from Evolution to Co-evolution: Complexity in Foresight

Create ... but also ... Co-create!
Dream ... but also ... Co-dream!
Evolve ... but also ... Co-evolve!



Fig. 1 Imaginary, dynamic, self-organised yet facilitated system of roles and accountabilities for alignment of individual and collective purpose(s), using the Denica managerial method

In times of pandemics, wars, despair, humanity creates in order to save life. However, science knows of no borders since it aims to sustain life. There has to be a matching force in academia and allies which knows no borders; in volunteers which know no profits; and in co-creation which knows no isolation. We have been part of such real-life/academic/voluntary endeavors, in all their beauty and hardship, so *this book is the story of “we,” generated from “I” where both the “I” and the “we” come to fruition.*

The introductory visual depicts a multi-peaked environment humanity is situated in. For some, the challenges are substantial, diverse, for others the view is better, higher, but also more dangerous, for third ones there are environmental difficulties or ease and so on. The contexts are different, and evolution cannot occur if it is not co-evolution. Especially humanity. The ovals denote an imaginary managerial system of roles and accountabilities all aligned around a purpose (the Sun) and diverse tactics (Denica star)¹. We need to co-create because zoomed out like this we are in this together. We need to self-organize around collective and individual aligned purpose(s). The actors on this planet need to co-evolve. Not co-destroy for sure. We need to co-dream because we challenge ourselves for beauty and creation then. And we can do that. This book attempts to portray “why” and to some extent, with original and interesting blueprints—“how.”

Setting the Scene

How do we grasp the notion of *facilitated co-creation*, after this amazing set of co-authors worked on generating and intertwining the science and practice and writing about them in this book?

Historically threaded under diverse notions, such as participatory design, collaborative inquiry, placemaking, human-centered design, crowdsourcing, co-creation in its broadest sense includes various actors jointly identifying problems, setting the action, conveying it, generating solutions, undertaking missions. Our in-house historian of art, selfless volunteer saving and improving the world, Kaat Van Wonterghem would say: “Co-creation has been a widely accepted value-creation tool in various contexts. No matter in which context co-creation is being used, it enables different stakeholders to take part in and bring new perspectives on, either on a small scale or on a large scale. Whether it is a relationship between customers and companies, or in an educational context facilitating lifelong learning or in an artistic context where poets are working together with street artists and everybody is doing his utmost best in creativity,... There are so many possibilities created via co-creation. But one correlation can be seen throughout history: co-creation has

¹DENICA and DENICA 2.0 managerial method as described in the first book entitled Tactical Management in Complexity: Managerial and Informational Aspects, and in this book. Hopefully in future works too.

been there since man, after a prehistory of 40,000 years, began to think about heaven and earth and the afterlife, and started on different places on earth—at the same time—to build big cultures and mighty memorials all together. These gigantic monuments were based on star constellations and had all more or less the same scientific base with even spiritual teaching aims. We’re talking here about the great pyramids in Egypt, the pyramids in Teotihuacan in Mexico, Machu Picchu in Peru, the web figures in Bolivia, the temple complexes of Angkor Wat and Angkor Thom in Cambodia, the Moai statues on Easter Island as the most known. Never, ever these majestic and phenomenal buildings would be our witness today, if not every member of these civilizations was eager to co-create and learn. Amongst humans themselves, but also with and within nature.” Our idea of *co-creation* denotes multiple stakeholders being actively involved in each of the stages of development and action creating and shaping both the content and the flow, the motivation and the drive, the output and the outcome, in diverse contexts of space and time. We perceive it as “the” situation where $1 + 1$ is greater than 2 (i.e., synergy) but also where 1 happens (i.e., action)!

If it wasn’t for the pandemic, the work to generate chapters . . . wouldn’t happen. Traditional or life as usual, continues with not-so-disruptive stamina. The imaginary projects addressing real issues with voluntary effort, the real phenomena whose vortices created a disruptive beautiful amalgamation of particles never being joined together before nor afterwards, . . . they all happened during the pandemic. And we encode and describe them firsthand in the chapters in Part II of this book. Most of these engagements and co-creation occurred within the realm of academic citizenship, proving that so much can be done with zero money transfers but with priceless competence and co-creation.

A Brief Reflection and Scoping of This Manuscript

This book succeeds the Tactical Management in Complexity: Managerial and Informational Aspects, where this editorial trio then had the setting of a Ph.D. student and two mentors as initial conditions for this fruition. The Denica managerial method for tactical management, based on the Sense-and-Respond framework by Haeckel (for strategic management) has been plowed into different grounds in the chapters here. But also, some of the generic aspects such as complex adaptive systems, complex environment, governing principles, primary purpose, system of roles and accountabilities have been threaded as applicable in very creative manners across the different challenges in the chapters. More importantly, this book attempts to bundle the main “ingredients” for its mission.

The first part starts with initial conditions for triple transition (digital, social, and green) as radical position for global co-evolution in complexity, then shape management and management information systems accordingly and touch upon project management, gig economy, circular economy, and collaborative innovation with agent-based modeling, considering disruptive technologies for marketplaces for

coopetition. We are also incorporating Harvard's PDIA as a strategy for complexity, to ensure the complexity profile is met.

Part II showcases four "recipes" on facilitated co-creation scoping diverse functional and/or geographical areas: MultiCreation ecosystem for academia/business/civil society/institutional co-creation on local scale, regional positive deviance in the Western Balkans Alumni Association, then global Academia Diffusion Experiment sustained through the years, with global EUvsVirus phenomenon—swirling disruptive co-creation.

You will read many "we have performed this, . . . we have experienced that" as firsthand experiences, but it is because we, the co-authors, have been doing that, as involved parties, action researchers, and ethnographers. Feelings, impressions, motivation, passion, belief, metaphors, voluntarism, and academic citizenship—need to be mentioned too, as the non-standard ingredients in the rigorous scientific intellectual outputs. But maybe the most important ones in the "how to" manual of applicable science.

Key Concepts of and for Co-creation, Co-dreaming, and Co-evolution

We perceive *Complex Adaptive Systems (CAS)* as a set of interrelated independent agents interacting to achieve individual, and ideally collective purpose(s). Facilitating CAS in our understanding means finding ways to dynamically reconfigure the alignment of those individual and collective purpose(s), ideally utilizing the potentials to achieve emergence.

One of the distinctive points on facilitating co-creation: *The purpose is on a higher level than any individual actor's motivation for participating in the co-creation system.* In this context, the individual or collective motivation is not just (or any) profit, getting salary, . . . but it is to achieve something, solve problems, address challenges by co-creative action.

As you read the book, you will come across another new concept we are introducing: the "*opportunistic creation*," "*opportunistic creativity*," and "*opportunistic co-creation*." Hence, tracing *facilitated opportunistic co-creation* is one of the main goals of this book. It is needed because of the complexity of the inner and outer environment and its turbulent dynamics, where planning and exact competence cannot be obtained, but intuitive, creative, iterative probing and shaping of solutions which work in that spacetime is a feasible road to be taken. Of course, our lifelong pursuit is to uncover and discover ways how humanity can self-organize and self-manage as if being facilitated and managed. But that is not yet our truth. However, the *opportunistic creativity* denotes ceasing the opportunity when it occurs, with resources at hand, even though it has not been in the initial plan, nor was an expectation or prediction. It is about skimming the core competence agents possess without inevitably engaging the entire professional/private being. Facilitating

chunks and modules of knowledge, workload, inspiration, heart and motivation. Juggling with what is at hand, given. For this to be brought to fruition, a great deal of individual and collective creativity, competence, and knowledge are needed. But when done so, the effects are very original, unique, and amazing.

Bridges of all kinds (physical and metaphorical) are detected as needed in each of the multi/trans/cross/interdisciplinary solutions, approaches, and blueprints in the second part of the book. Not dividers. In our Venn-diagrams as visuals, the zones of overlaps are where alignment occurs between the worlds. Not as a clash between the East and the West (Ukraine), nor as a clash between Non-EU and EU (Western Balkans), nor as a clash between traditional and open collaboration in science even though indeed those are geographic regions and metaphysical edges where it is most turbulent but because the tectonic plates meet. We are emphasizing those meeting points and bridges as maybe most important, for alignment.

Matchmaking is yet another significant concept for facilitating co-creation. It is an action when one knows a person, solution, platform, referral for another's problem, need, interest, challenge, ambition, mission and acts to get them together. It needs to happen on every level, in any context, circumstance, problem, mission. And it needs to be conveyed by each agent in any role, as a governing principle.

Some of the main *challenges* in facilitating co-creation: with a constant switch turned on/off of human resources, the magic lies in steering and navigating with what exists as resource, capability dedicated at the moment, now and here; utilizing its full potential then and there, without promises for future sustainability (but with hopes to do so). If you are a human, you should know that: (1) you need to take on diverse roles, (2) be proactive, and (3) know that if there is a will there is a way, it all comes down to how much we are willing to invest.

We find ourselves in the premise of Gell-Mann, paralleling quarks and living beings: "*Think how hard physics would be if particles could think!*"² And we have been excited and overwhelmed to find and shape the answers to the questions posed in this book: can it be done? Can humanity and its cohabitation partners on this planet self-organize to co-create and co-evolve? And why has not it been done so far on a global scale? Or has it? The list of excuses includes being idle, incompetent, lazy, with no interest, but then, how do we co-evolve if the actors reason this way? Platforms, instruction, competence, honesty, matchmaking, virtual and global are ingredients in our recipe for facilitating co-creation.

Methodology

Methodology is a multi-layered scientifically-philosophical discipline which allows us to dive into the secrets of scientific research. Being led through the labyrinth of what is already known, and what needs to be uncovered, with certain trails on how it is to be done.

²Murray Gell-Mann. 1995. The quark and the jaguar: adventures in the simple and the complex. W. H. Freeman & Co., USA. <https://dl.acm.org/doi/10.5555/211536>

Methodology attempts, in the endlessly complex and substantially chaotic interrelatedness of events, mechanisms and processes, to uncover certain order. It is one of the ways to understand this world and life—by realizing a certain regularity in it. Otherwise, we would be facing endless enigma and mystery. Hence, the methodology, founded on the logical and normative, is the most essential epistemological instrument on the road of humanity's scientific understanding of reality, of course, with the inherent limitations of its creator and his/her cognitive capacity. Science attempts to tell a story, and sensemaking consists of stories we can tell against reality. However, each of them is coloured by the profile of the storyteller, by his/her personality, experience, orientation . . . so the result is not and cannot be one universal story (Pecijareski, 2020).

In order to be true to our words, we engaged in deeds and codified them. The content in this book has been predominantly created within the realms of *Qualitative research* and *Design Science Research*, as methodological foundations. Within those tracks, you will encounter methods, tools, approaches, techniques enlisting but not limited to: qualitative analysis and qualitative comparative analysis, GAP analysis, Action Design Research, modeling, simulations, Problem Driven Iterative Adaptation (PDIA), fishbone analysis, experimentation, ethnography, interviewing, analogy, grounded theory, triangulation, all used with the purpose to situate, understand phenomena, initial conditions, principles, mechanisms, components, guide our efforts to applying ideas and concepts and encode that for application and inspiration.

We have produced *novel artifacts* in these endeavors. From position and principles, through Denica 2.0 managerial method, Tactical Management Information System (TMIS) requirements and prototype, a concept for Project Management Tactics (PMT), (re)definition and conceptual model of the gig economy, model of the circular production chain via its micro and meso perspective, a PLS-ABM simulator for collaborative innovation, ERP marketplace model, principles and solution with disruptive technologies such as blockchain, MultiCreation generic model, PDIA strategy for higher education systems across Western Balkans and codification of a positive deviance of Western Balkans Alumni Association, Academia Diffusion Roadmap and methodology for open innovation and open collaboration and a Tornado blueprint for global disruptive co-creation. And last, but not least, as book editors, we devised the strategic foresight on human co-creation and purpose, via multi/trans/cross/interdisciplinary collaboration and the pheromone trail process for co-creative writing and reviewing in open collaboration in science to contribute to applied science generation, publication, and dissemination.

There are substantial challenges when it comes to multidisciplinary as a design decision, coupled with openness in the collaboration, science, and innovation and even more so with global, regional, and local voluntary effort. On one side, there was always the impact domain, the main focus of the co-creation efforts. But, and especially visible in the Part II chapters, the disciplines on the side of the solutions have not necessarily derived from the impact domain, but we sourced our inspiration from nature, physics, society, poetry, and so on, to be able to emerge with appropriate artifacts.

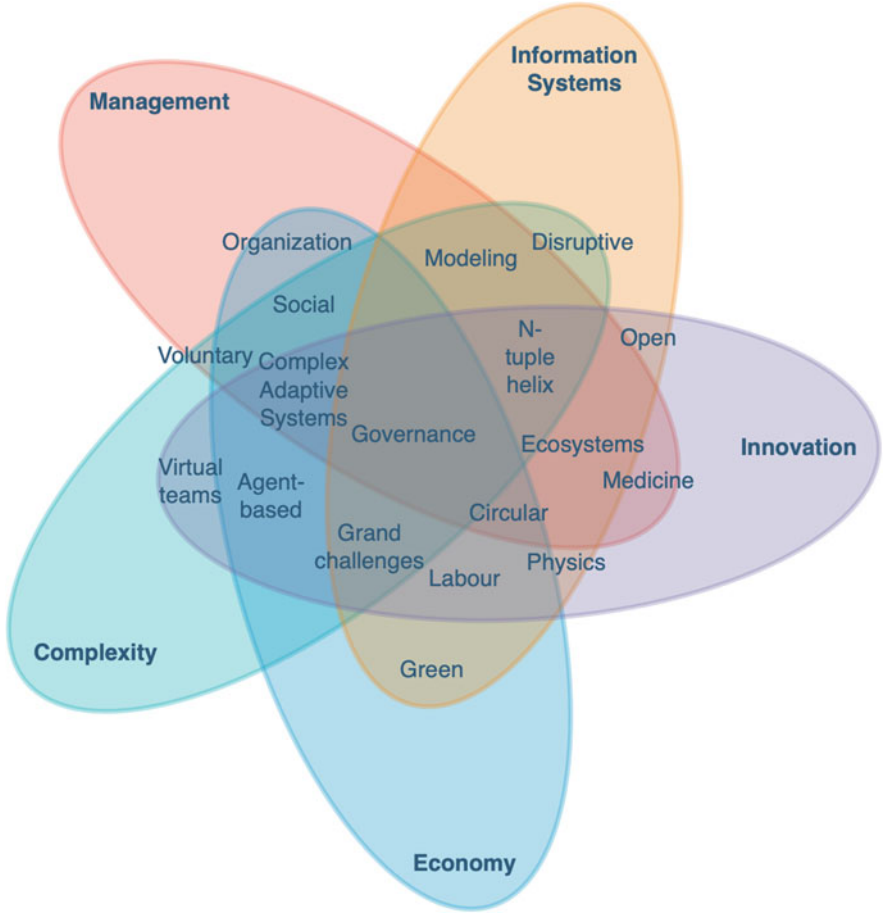


Fig. 2 Main disciplines used and addressed in the book chapters, and inter/cross/transdisciplinary bridges

Figure 2 visualizes the main pillars of sciences and only a few of the multiple intertwinings used in the works in this book, as paths to be followed, but also as approach to be extended further on.

The PHEROMONE TRAIL: Co-creative Writing and Reviewing in Open Collaboration in Science

With this book, we are also introducing a rather new co-creation process for generating the research, writing the chapters, and reviewing them, when practicing open collaboration in science. Like the ant colonies, as complex adaptive systems,

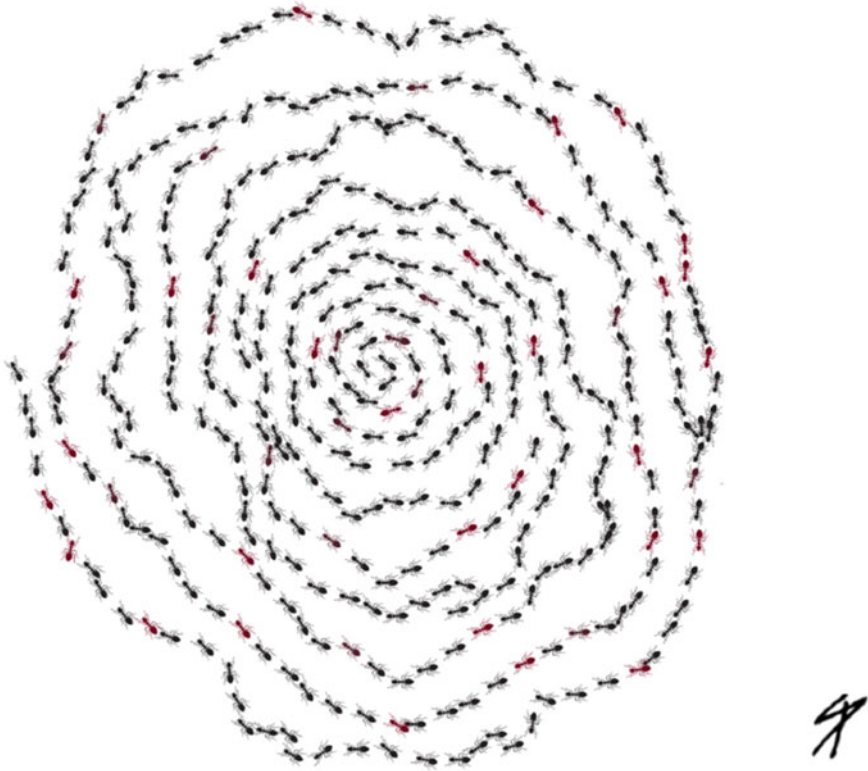


Fig. 3 The pheromone trail for co-creative writing and reviewing in open collaboration in science

use pheromone trail as a communication system to inform other members about resources, sources of food or dangers, so have our co-authors and reviewers followed the pheromone trail of the work underlying the chapters and their actual writing. Figure 3 (designed by our Siska Poels) visualizes an ant colony, where different colored ants denote different roles they have in their collective life, as the spiral of the trail reaches its summit.

Namely, especially in the chapters in Part II of this book, the co-creation process has used open collaboration in science and open innovation approach, as defined in the UNESCO Recommendation on Open Science³. During the chapter co-creation, there have been **co-creators (with diverse backgrounds from academia and practice)** who have been *authors* (1) *directly involved in the topic of interest*; combined with (2) others who have been *acquainted* with the work/phenomenon but not directly involved in its generation to provide semi-external perspective;

³<https://unesdoc.unesco.org/ark:/48223/pf0000379949?4=null&queryId=3db9e61e-2bd6-402f-9da1-896a3d328868>

(3) third profile of ones who *haven't had idea about the work*, but were willing to dive in, due to common interests, passions, or prospects acting as *internal reviewers and aligners* of the chapter texts; and finally (4) *external reviewers* who have been accessing the chapter text in their draft version (with conceptual outline, written ideas and content, but still in formation stage), to be able to provide input on the main construction, idea of the chapter and co-create with their constructive feedback the final 30% of the chapters. The reviewers had a lot of sensemaking needed, a lot of in-depth understanding and conceptual comprehension, so it was harder work than usual, but it did provide timely guidance even in the construction stages. The onboarding, sensemaking, and the alignment around the purpose, on individual and collective level have been also challenging for all the co-authors, especially the ones from the third profile. That “dance” of many seemingly unrelated people going through the text at different times all adding and reconfiguring to make it more true is an amazing dynamic to be witnessed. Hence, our pheromone trail which has been produced by co-creation in doing/writing/reviewing helps sustain the pheromone trail for humanity to follow.

STRATEGIC FORESIGHT: Exploiting and Addressing Complexity in Organizing the Works and the Book

Our quest to trailblaze humanity's migration from co-destruction toward co-evolution, via multidisciplinary approaches which help facilitate co-creation, co-dreaming, and emergence, has led us to the following distinctive trait of this manuscript—using strategic foresight to situate the motivation, ambition, and work in the chapters.

Strategic Foresight is one of the most appropriate techniques for complexity. “In times of increasingly rapid change, growing complexity, and critical uncertainty, responsible governance requires preparing for the unexpected. Strategic Foresight is required whenever there is a high degree of uncertainty surrounding changes to the relevant future context. Strategic foresight does not attempt to offer definitive answers about what the future will hold. Foresight understands the future as an emerging entity that's only partially visible in the present, not a predetermined destiny that can be fully known in advance (predicted). There are no hard facts about the future and the evidence base is always incomplete. The objective is not to ‘get the future right,’ but to expand and reframe the range of plausible developments that need to be taken into consideration.”⁴ It incorporates consideration of the global megatrends, trends, contextual trends, change drivers in the specific domains/regions of interest and it requires in-depth big picture understanding, capabilities to maneuver the strategic altitude to helicopter view to ground view and vice versa. Also, other factors need to be considered, including weak signals and contextual

⁴<https://www.oecd.org/strategic-foresight/whatisforesight/>

developments to be able to contemplate, in our case two continuums—horizontal and vertical axis that help devise four scenarios—as some authors suggest: possible, probable, plausible, preferable also called futures, to be used by all relevant stakeholders when taking affirmative action, including portrayal of what happens when being inactive or doing damaging activities.

In turbulent times, as we are today, but also half a century ago, these following aspects have been taken into account, to establish nation-wide actions (Brown, 1968):

1. Efficient management of operations
2. Choice of tactical alternatives
3. Systems engineering, design, and research—e.g. finding better measures for evaluating the performance of alternative systems
4. Determining major policy alternatives—e.g. analysis of alternative means for implementing basic strategies; analysis of the impact of force posture; strategic alternatives on ability to achieve foreign policy objectives

We have considered the megatrends from the past several years, such as and some with a tendency to exacerbate exclusion, disruption, and discontent, and positive connotation toward “healing fractures, building bridges” (PMI, 2021) on “how a new ecosystem of change-makers is finding business opportunities with positive social impact” enlisting: COVID-19; Climate Crisis; Civil, Civic, and Equality Movements; Shifting Globalization Dynamics and Mainstream Artificial Intelligence, as well as multipliers such as: Making Social Impact Projects a Strategic Priority, Fostering Open and Innovative Partnership Ecosystems, Rethinking Relationships with Customers and Wider Stakeholders. European Commission (EC, 2021) recognizes the global megatrends of Climate change and other environmental challenges; Digital hyperconnectivity and technological transformations; Pressure on democracy and values; Shifts in the global order and demography.

In various groupings and categories, the ones for 2022, are as follows, including, but not limited to (PMI, 2022):

1. Digital Disruption
2. Climate Crisis
3. Demographic Shifts
4. Economic Shifts
5. Labor Shortages
6. Civil, Civic, and Equality Movements

When considering megatrends, to be able to produce futures and scenarios, we have dived into human nature, not just considering the megatrends of the time and space dimension. Our scenarios, thus, apply the thread of human nature as individuals and humanity as a whole, in order to capture that third dimension of content and incorporate it into important insight for our readers but also for the future, to be the judge.

For the purpose of situating this book, as well as deploying strategic foresight for the complex context it addresses, we have identified two continuums (axes):

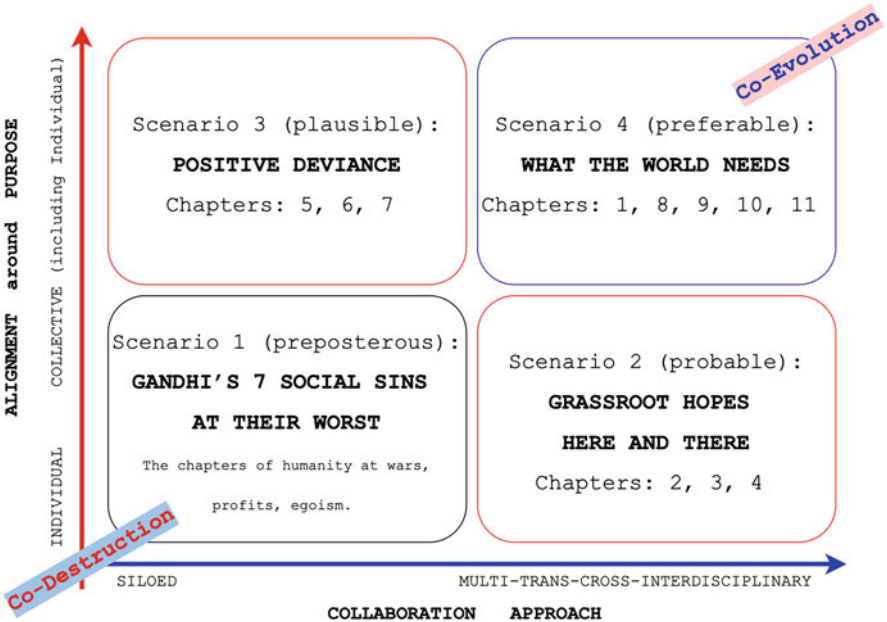


Fig. 4 Strategic foresight for facilitating co-creation: Multidisciplinary approaches to complexity

Horizontal axis about the Collaboration approach and Vertical axis about Alignment around purpose. Within these axes, we have generated four scenarios (Fig. 4).

The continuums denote the possible planes where the futures can develop, and if we analyze them in their extremes, it would be as follows:

- **X-axis: Collaboration approaches** can range from *siloed* (not very strong in terms of bridges), which is not such a favorable situation, to *multi-trans-cross-interdisciplinary* collaboration, where bridges and matchmaking are the norm, value co-creation is the common intention and goal.
- **Y-axis: Alignment around purpose** can range from pursuit of *individual* goals, rather egoistic behavior, to the other extreme of alignment around *collective purpose*, which includes (does not dismiss) the individual goals, denoting more ideal situation where humanity does see its strength as a whole, and aims to co-create and co-evolve together.

The four scenarios possible within this plane of futures are to be described as follows:

- Scenario 1 (**preposterous**): “GANDHI’S 7 SOCIAL SINS AT THEIR WORST” (denoting siloed collaboration, individual purpose pursuit). This is where the world and humanity is at now. Gandhi’s servant leadership and selflessness directed into common purpose points out seven behavioral dangers which when exhibited drag the world in a bad place. They are: “Wealth without work, pleasure

without conscience, knowledge without character, commerce (business) without morality (ethics), science without humanity, religion without sacrifice, politics without principle.” Here belong the chapters written by humanity, when in wars, profits, egoism, homelessness, hopelessness. This is what our open, co-creative, co-evolutionary applied science and practice is trying to improve.

- Scenario 2 (**probable**): “GRASSROOT HOPES HERE AND THERE” (denoting some multi-trans-cross-interdisciplinary collaboration, but still individual purpose pursuit, to achieve own needs). This is a scenario of developments driven by the same motivation—profit, growth, own progress, but via the route of collaboration. These are chapters “DENICA 2.0 and Tactical Management Information System (TMIS)”, “Key Directions for the New Project Manager: Project Management Tactics (PMT)”, and “The Gig Economy in the Post-COVID Era”.
- Scenario 3 (**plausible**): “POSITIVE DEVIANCE” (denoting siloed collaboration transcending borders, collective and individual alignment around purpose). This is where individuals aggregated around purpose (usually volunteers) have the heart and mind in the right place and dedicate their work into selfless co-evolution, to showcase a roadmap of what can be done to co-evolve. These are chapters “Circular Production Chains: A Micro and Meso Approach”, “Simulating Collaborative Innovation: A PLS—Agent Based Model”, and “Conceptualisation of Decentralised Blockchain-Based, Open-Source ERP Coopetition Marketplace”.
- Scenario 4 (**preferable**): “WHAT THE WORLD NEEDS” (denoting multi-trans-cross-interdisciplinary collaboration, collective (including individual) alignment around purpose(s)). This is where we co-dream to be. People see the greater purpose of humanity co-evolving and co-creating, while of course, the individual purposes align within the mutual direction, slowly but surely. We have the strongest ripples set within our position in chapter “The Three MusKEUteers: Pushing and Pursuing a ‘One for All, All for One’ Triple Transition: Social, Green and Digital” and the blueprints in chapters “MultiCREATION: Multi-stakeholder Problem-Driven Approach”, “PDIA in the Balkans: The Western Balkans Alumni Association (WBAA) as Positive Deviance”, “Academia Diffusion Experiment: Trailblazing the Emergence from Co-creation”, and “Multi-vortex Tornado Blueprint for Disruptive Global co-creation (Inspired by the EUvsVirus Phenomenon)” where academic citizenship, voluntary engagements allow us to write about firsthand experiences in co-dreaming while co-creating to co-evolve.

To summarize, all book chapters bring a positive and hopeful story. They describe plausible, probable, and preferable futures. The chapters in Part I, except for chapter “The Three MusKEUteers: Pushing and Pursuing a ‘One for All, All for One’ Triple Transition: Social, Green and Digital”, convey a message of “grassroot hopes here and there” or showcase “positive deviance.” Chapter “The Three MusKEUteers: Pushing and Pursuing a ‘One for All, All for One’ Triple Transition: Social, Green and Digital” as a position and the chapters of Part II go one step further in their ambition to tell us “what the world needs.” All chapters and the book as a

whole express our hope that you as a reader will co-dream with us, to co-create and co-evolve as a responsible person in a society and world that is daily challenged, and in which human creativity and action, together, all of us, and helped by the lessons of this book, will be the trusted source for finding solutions.

Renata Petrevska Nechkoska
Geert Poels
Gjorgji Manceski

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Part I

The Main Ingredients and Positions

The Three MuskEUteers



Pushing and Pursuing a “One for All, All for One” Triple Transition: Social, Green, and Digital

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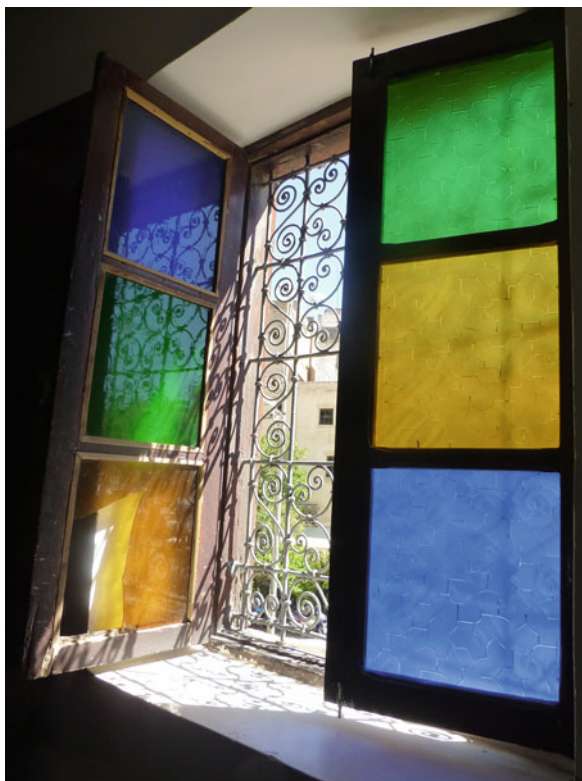


Photo by Vladimir Petrovski

When a window is opened, a magical play of light, fresh air, and dissipation of shadows takes place. Suddenly we can look outside, widen our gaze, and look for ways to go beyond the bars in pursuit of a broader view of the horizon. This is the role of the MusKEuteers opening the window to pave the way for pushing and pursuing a “one for all, all for one” triple transition: social, green, and digital!

Abstract Under the inspiring and aspiring title: *Paving the way for pushing and pursuing a “one for all, all for one” triple transition: social, green, and digital: The Three MusKEuteers*, a group of remarkable co-authors and contributors have developed radically new forward-looking visions, principles, approaches, and action recommendations for an attuned indivisible social, green, and digital transition.

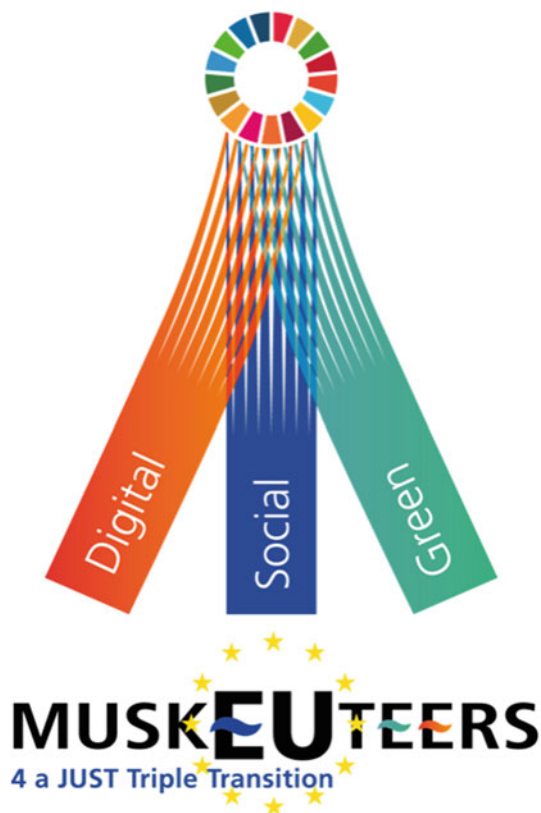
The triple transition is aimed at helping humanity gather around a life-sustaining purpose, as opposed to life-destroying one in terms of wars of all kinds (military, economic, political, etc.); nature decay and wreckage (carbon footprint, plastic pollution, soil poisoning, etc.); human alienation (favelas, homeless persons, refugee

camp, child malnutrition, poverty, exclusion of any kind); and geographic imbalances with empty rural spaces and overcrowded megacities (creating difficult access of rural and/or remote population to care, health, and other essential services; difficulty of urban population to contact with natural environments).

The work highlights the urgent need to speed up a third social transition (Within this social transition dimension we understand the socio-cultural scope as any social shift implies a cultural transition and vice versa, with its very deep implications.), in addition to the green and digital transitions more widely recognised by the international community. Innovation, or a European industry-led twin transition aiming for climate neutrality and digital leadership, cannot be supported without a firm, responsive, responsible social and environmental engagement. Neither is it possible to tackle a JUST triple transition which is not firmly rooted in worthwhile human development, underpinned by the Sustainable Development Goals. And none of these transitions can go separately and/or isolated; they all need to intertwine around the notion of (more, firmer, and determined) just transition.

European society is presented as a huge “co-laboratory” for this “*all for one, one for all*” boundaryless triple transition to respond to the urgent radical changes demanded by humanity and by the planet. The chapter proposes a radically new vision to pursue a non-explored transformative way to ideate, design, develop, and deliver science, innovation, and collaboration through experimentation and learning, and throughout multi-stakeholder engagement from the n-helix spectrum. It proposes systemic innovation tactics for the “how” (green, techno-digital), for the strategic “what” (green, social), for the purposeful “why” (green, social), and for the operational “how best” (green, social, techno-digital) within the governing principles of eco-centric society. This encompasses:

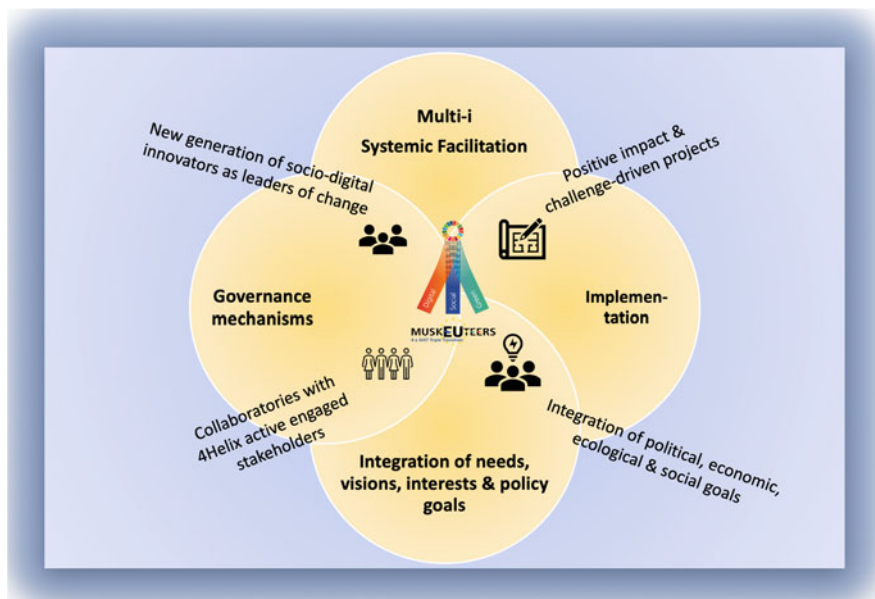
- Courageous goal-aligned alternatives, as a shift to new (yet ancient) principles of eco-centric rather than ego-centric behaviour.
- The adoption of a “complex system mind-set” to build up dynamic, context-sensitive, and holistic approaches to co-design mission and purpose-driven actions, outcomes, outputs, and no-harm impacts.
- The ignition of the transformative capacity of all forms of collaboration (international, interdisciplinary, intersectoral, intergenerational, inter-institutional, inter-genders) vs hierarchy as alternative governance and distribution models to overcome the unjust and unsustainable biased status quo within evolving, adaptable, flexible, and transformational n-helix ecosystems.



The Three MusKEUTEers, deeply anchored in European values (human dignity, freedom, democracy, equality, rule of law, and human rights), will pave the way and drive humanity towards the achievement of the ambitious, but achievable, targets of the United Nations 2030 Global Agenda, the Sustainable Development Goals.

Europe can be the initiator of co-laboratory experiments where social change drives the “all for one, one for all” dream into transforming this three-prong transition into possible real good ecosystems working.

Graphical Abstract



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“Europe’s industry is the motor of growth and prosperity in Europe.
And it is at its best when it draws on what makes it strong:
its people and their ideas, talents, diversity and entrepreneurial spirit”.¹
Ursula von der Leyen.

The “Social MuskEUteer”, a “heroic, chivalrous intrepid humankind”,²
on an equal footing within the triple transition.

1 Introduction

The post-COVID scenario and the new geopolitical confrontation are bringing Europe and the world into a new political era (Alashhab et al. 2021). The European Union (EU) is triggering ambitious initiatives encompassing the three

¹https://ec.europa.eu/commission/presscorner/detail/en/ip_20_416

²Evolving from a “sword-man-kind” outmoded idea to a more up-to-date inclusive vision of the intrepid humankind to accommodate gender and age balance, along with the metaphysical translation for protecting life, humanity, home.

pillars of sustainability³ such as the European Pillar of Social Rights,⁴ the Green Deal,⁵ the EU Digital Strategy,⁶ or the EU's new industrial policy.⁷ This is accompanied by quick socio-technical developments⁸ setting a new framework that contains opportunities and uncertainties. Strong emphasis has been placed on the need to assign funds to the green and digital transition. Nevertheless, little attention has been paid to co-evolution and interweaving with the social elements that should be placed at the forefront,⁹ not only tailored for the EU countries, but for Europe as a whole¹⁰ and the world. Society is at the beginning, throughout, and at the end of all processes.

The recently adopted Next Generation EU Recovery Plan which, together with the multiannual financial framework 2021–2027, represents “the largest stimulus package ever” is placing our continent in a unique position to boost the *triple transition*. This chapter aims to put in motion a new conceptualisation for a triple transition in Europe and beyond¹¹: a more holistic and transformative vision on the imperative need to boost a more human-cultural-centred and planet-friendly not twin but triple transition.

Placing social innovation at the centre, as the axis and essential pillar for the generation of positive ecological and digital impacts, is the guide for a positive green

³https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy_en. Many of these initiatives pre-date COVID-19, but, by contrast with the previous crisis, this time the crisis has reinforced them rather than cornering them.

⁴https://ec.europa.eu/info/strategy/priorities-2019-2024/economy-works-people/jobs-growth-and-investment/european-pillar-social-rights/european-pillar-social-rights-20-principles_en. In this new deal, it is necessary to recognise not only social rights, but also socio-cultural rights, since “Europe society” is not homogeneous and the cultural rights of this very diverse society have to be recognised as well as a central part of its social rights.

⁵https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en and https://ec.europa.eu/growth/single-market/single-market-strategy_en

⁶<https://digital-strategy.ec.europa.eu/en>

⁷European Innovation Council (EIC) (2022), https://eic.ec.europa.eu/eic-work-programme-2022_en

⁸But also with developments such as the races for new-generation mobile networks and artificial intelligence.

⁹Indeed, Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 establishing the Recovery and Resilience Facility states that “the COVID-19 outbreak in early 2020 changed the economic, social and budgetary outlook in the Union and in the world, calling for an urgent and coordinated response both at Union and national level in order to cope with the enormous economic and social consequences as well as asymmetrical effects for Member States”.

¹⁰So far, only passing mentions have been made to the role, contributions, and expected positive impacts of joint defined and shared agendas between the EU and its partnering countries (candidate countries, potential candidates and neighbouring countries), as in https://ec.europa.eu/neighbourhood-enlargement/index_en and https://ec.europa.eu/neighbourhood-enlargement/enlargement-policy/strategy-and-reports_en. The entire essence of co-creation and co-evolution denotes someone who takes the lead (developed EU) and facilitates others (Europe, for example) so they co-evolve together.

¹¹Initially conceived as a position paper to raise awareness, it was briefly published at the Deusto Research website for a couple of days (end of May 2021) and then it was further co-developed into the current chapter.

and digital transition. This means an extended concept of social innovation, *intersectional social innovation*, *socio-cultural innovation*, or *diverse social innovation*, which takes into account the different contexts and cultural dimensions. This enriched concept will go beyond an open innovation system where everybody collaborates towards an innovation system that is open, resilient, and diverse and whose main “food” is difference. It is diversity that will bring alternative solutions, accommodating rhythms and different outcomes, resulting in higher possibilities to produce positive impacts adapted at each context and need.

As G. Thunberg said: “We can’t save the world by playing by the rules, because the rules have to be changed. Everything needs to change—and it has to start today”. Therefore, to get different results, we must take a different approach!¹²

This chapter proposes moving towards more human-centred, planet-friendly sustainable and digitally mediated, inclusive, and long-term results in line with (a) the achievement of the Sustainable Development Goals; (b) the agreed agendas and political objectives at the local and regional communities, and/or national, European, and international contexts; and (c) through the active engagement, commitment, and interrelation of multi-stakeholder and agents. All result in more integrated innovation ecosystems for the common good, envisioning European society as a transformational “*co-laboratory*”.

A “*co-laboratory*” is a neologism to express the new emerging innovation ecosystems including people, natural ecosystems, and machines, working together to find innovative solutions to our common challenges. The European Union as the Lab is a vision that already has appeared in EU papers¹³ and initiatives.¹⁴

¹² Albert Einstein is widely credited with saying, “The definition of insanity is doing the same thing over and over again, but expecting different results.”

¹³ European Commission, DG Research (RTD) (2016), Open Innovation, Open Science and Open to the World. A vision for Europe. 2016, p.32. In <https://www.fosteropenscience.eu/sites/default/files/pdf/2557.pdf>: “A Vision of the Future The year is 2030. Open Science has become a reality and is offering a whole range of new, unlimited opportunities for research and discovery worldwide. Scientists, citizens, publishers, research institutions, public and private research funders, students and education professionals as well as companies from around the globe are sharing an open, virtual environment, called The Lab. Open source communities and scientists, publishing companies and the high-tech industry have pushed the EU and UNESCO to develop common open research standards, establishing a virtual learning gateway, offering free public access to all scientific data as well as to all publicly funded research. The OECD as well as many countries from Africa, Asia, and Latin America have adopted these new standards, allowing users to share a common platform to exchange knowledge at a global scale. High-tech start-ups and small public-private partnerships have spread across the globe to become the service providers of the new digital science learning network, empowering researchers, citizens, educators, innovators and students worldwide to share knowledge by using the best available technology. Free and open, high quality and crowd-sourced science, focusing on the grand societal challenges of our time, shapes the daily life of a new generation of researchers”.

¹⁴ The [European Open Science Cloud \(EOSC\)](#) implementation roadmap and portal has been conceived as “federating core” services contributing to the implementation of the “access and interface” action line to provide a European delivery channel connecting the demand side and the supply side of the EOSC and all its stakeholders.

COVID-19 has already demonstrated the profound lack of resilience that societies around the world have shown when confronted by a sudden systemic shock. Most observers predict the continuation of such shocks, whether in the form of further pandemics, crossing environmental tipping points, geopolitical balances and understandings and trade tensions (like the lack of semiconductors or the global supply chain chaos), or growing economic fragility and societal division.¹⁵

Nevertheless, it is just in such existential times when people from all over the world are starting to collaborate to find new solutions, new social innovations, new technologies, and a more sustainable relationship with our natural environments. The OECD has already highlighted in a recent report “*the importance of knowledge co-creation—the joint production of innovation between industry, research and possibly other stakeholders, such as civil society*”, especially evident during the COVID pandemic, showing a great variety of forms and shapes of this co-creation processes.¹⁶

The planet, our societies, our natural ecosystems, and our digital systems are becoming open laboratories, potentially universal research and innovation ecosystems for this triple transition: social, green, and digital.

The chapter is organised into three sections: the first one, titled “Three Challenges in a New Paradigm”, presents the rationale of the NEED for an encompassing “boundaryless” triple transition, the WHY. The second one presents the notion of the European Union as the co-laboratory for this triple transition: the HOW BEST to bring about the needed transformations. And a third section that integrates the key messages to call for new policy actions able to push and pursue the “one for all, all for one”: The HOW to turn the forward-looking vision into a call for new policy actions.

2 Three Challenges in a New Paradigm

The “*all for one, one for all*” motto of Alexandre Dumas’ *three Musketeers* perfectly fits with the imperative for an encompassing, boundaryless¹⁷ shared vision of this triple transition in Europe: an attuned indivisible

¹⁵ WEF Global Risks Report, 2021: <https://www.weforum.org/reports/the-global-risks-report-2021>, accessed July 2021.

¹⁶ Laura Kreiling and Caroline Paunov (2021), Knowledge Co-Creation in the twenty-first Century. A Cross-Country Experience Based Policy Report. OECD Science, Technology and Industry Policy Papers, June 2021 No. 115. <https://www.oecd.org/innovation/knowledge-co-creation-in-the-21st-century-c067606f-en.htm>

¹⁷ “Boundaryless” is a neologism that has become a slogan of business practice. “A boundaryless organisation” is supposed to transcend the rigid lines of bureaucracy and divisional boundaries within a corporation and ignore the borders where the corporation itself is separated from its markets, customers, and “stakeholders”. The emphasis of the boundaryless organisation is on fluid and adaptive behaviour modelled on organic structures rather than mechanical. Change is a welcome constant. Professionals inside the organisation form networks and links and emphasise collaboration on projects. Business relationships are informal and people come together when they

green,¹⁸ digital,¹⁹ and social²⁰ agenda. This triple transition can accelerate the achievement of the Sustainable Development Goals and the urgent need to speed up the readiness for responding to sudden shocks (e.g. COVID crisis, armed conflicts, and human displacements).

The question is: can we support a twin transition towards climate neutrality and digital transformation without an inclusive, responsive, and responsible social transition? Without acknowledging that people are always behind the invention and implementation of technologies? The social dimension is not only a matter of assistance; it is something bigger. It includes how the whole society is re-organised and engaged to face our existential challenges. COVID has shown that, in addition to a green and digital transition, our societies urgently need deeper social transformation,²¹ starting by the renewal of our healthcare systems and followed by our educational and labour systems. We need globally new healthcare systems, more preventive and transparent, co-created with citizens and researchers, companies, and public bodies collaborating with a more humble, responsible, and open attitude. We need more coordinated health and well-being “knowledge co-creation” communities.

Not only due to the 2019–2020 crisis, but with preceding social and economic ones, natural disasters, armed conflicts, human displacements, etc., our societies are constantly subjected to unprecedented challenges and this has demonstrated the need for profound reflection and a reset. As a society, we need to reflect and act in a responsive, proactive way in regard to what needs to be changed in this world. Now, more than ever, humanity needs to respond collectively²² and holistically to the most urgent, most unavoidable transformations of our time²³: green transition, which includes:

- Creating mitigation and adaptation strategies for climate change, circular economy, restoring biodiversity and cutting pollution, etc.
- Fostering digital change and social change by mainstreaming technology to avoid turning the digital divide into a digital social chasm in different fields (like health and well-being, ageing, and overpopulation²⁴).

share a common need or problem. Employees are grouped by competencies centred on technology, information, and expertise. Global operations and, indeed, the outsourcing of labour are implicit in the concept and, for some, have negative connotations. <https://www.inc.com/encyclopedia/boundaryless.html>

¹⁸https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

¹⁹https://europa.eu/european-union/file/digital-agenda-europe_es

²⁰https://ec.europa.eu/growth/industry/policy/innovation/social_en

²¹Debagoiena 2030 initiative, <https://debagoiena2030.eus/es/que-es/>

²²With civil society, third sector organisations, institutions, and policymakers.

²³The main question is how to stop the worsening, deterioration, or mis-management in each sector and at each policy level in each of the three dimensions of the transition.

²⁴For example, developed countries, despite declining populations, still consume beyond planetary boundaries.

- Tackling social justice, growing inequalities, and the stigma of aporophobia and defining a strategy to cope with the necessity of fair migration as developed countries absolutely need younger people, etc.
- Developing the social structures, such as *collaboratories*, to coordinate all together for the same mission.

But why this urgency? Because the PRIMARY PURPOSE of humanity on the planet (i.e. the socio-technical-economical-environmental system) is to sustain life—it is being disturbed and less likely achievable. Once a system's reason for being is endangered, all other sub-outcomes become secondary.

Change needs to come not only from outside but also from inside: “*If not now, when? If not us, who?*”²⁵

It is clear that we are not moving in the right direction or at the right pace, as emphasised by the IPCC Sixth Assessment Report,²⁶ which urges “...*immediate and more ambitious action to address climate risks. Half measures are no longer an option*”. There is a growing gap and imbalance between developed regions with wealthier citizens and those who do not possess much, the different rhythms of societal and techno-digital transformations, harm to the planet, etc. The EU social market economy, which is unique in the world, must work for all: people who need to invest in their skills, re- or upskilling, child guarantee and protection, employers' investments, etc., and, of course, to acquire digital, creative, and innovative skills and sensibility for the future of humanity and the territories where we live. The EU is turning principles into actions through ambitious, achievable targets.

Global poverty is one of the very worst problems that the world faces today. The poorest in the world [are often hungry, have much less access to education, regularly have no light at night, and suffer from much poorer health](#). To make progress against poverty is therefore one of the most urgent global goals.²⁷ Since early 2020, we have seen dramatic increases in poverty and inequality²⁸ around the world and the erosion of trust and increase of anxiety and stress,²⁹ and also a polarisation of people opened

²⁵ June (17) and Victor (16) at the 13th European Forum on the rights of the child, 29—1 October, 2020.

²⁶ See the [IPCC Sixth Assessment Report on Climate Change 2022: Impacts, Adaptation and Vulnerability](#), which assesses the impacts of climate change, looking at ecosystems, biodiversity, and human communities at global and regional levels, reviewing the vulnerabilities and the capacities and limits of the natural world and human societies to adapt to climate change (IPCC 2022).

²⁷ Roser & Ortiz-Ospina (2019), <https://ourworldindata.org/extreme-poverty>

²⁸ European Anti-Poverty Network – Spain (EAPN) (2020) Poverty Watch Spain 2020 https://www.eapn.es/ARCHIVO/documentos/documentos/1604053806_poverty-watch-2020.pdf; European Anti-Poverty Network (2021). Working towards a Socially Inclusive and Poverty-proof Recovery from the COVID-19 Pandemic. In <https://www.eapn.eu/wp-content/uploads/2021/02/EAPN-EAPN-Assessment-ASGS-JER-2021-Finaal-4970.pdf>

²⁹ European Anti-Poverty Network (2020). The impact of COVID-19 on people experiencing poverty and vulnerability: Rebuilding Europe with a social heart. In https://www.eapn.eu/wp-content/uploads/2020/07/EAPN-EAPN_REPORT_IMPACT_COVID19-4554.pdf

and closed to socio-digital transformation.³⁰ However, we have also witnessed a heightened realisation that society relies on so-called essential workers across health, service, delivery, and manufacturing sectors, who are, at the same time, precisely those in insecure and low-paid jobs with poor and sometimes dangerous working conditions.³¹ In this context, a prime lesson is that we need to rethink what is meant by sustainability towards an approach where long-term resilience becomes a key pillar that provides a counterweight against the short-term “efficiency” mind-set that dominates most current economic and social systems and that brought us to where we are today.³²

In addition to a narrow economic perspective, resilience also needs to be seen in social and environmental terms and increase the introduction of diversity and interconnectivity from the initial set-up and each step along the way of each endeavour. Diversity in its multiple forms (cultural, gender, generation, etc.) provides greater social and economic slack, more sources of innovation with bottom-up, open, and socio-cultural-contextual innovation becoming mainstream, with additional alternative value chains if one fails, and multiple experimental and cultural environments (e.g. living labs, collaboratories). This is the opposite of just-in-time and “lean” systems that squeeze assets (including people) to breaking point and are chief drivers of the current situation. The more the flow through a system is made “efficient” by streamlining and simplification, the more brittle it becomes. The key question is: how can we pursue intersectional resilience that unleashes the creative potential of humanity?

Sitting alongside diversity, interconnectivity, through for example, digital technologies that support tele and inter-working, communication, trust, and collaboration, increases the number of system nodes and connections into ecosystems, and thereby overall resilience. Even strong shocks to a diverse and interconnected n-helix ecosystems can be much better absorbed through the rerouting and repair of conventional innovation ecosystems flows.³³

³⁰Cap. 8: “Brecha digital, reproducción virtual de las desigualdades sociales”, in Ayala, L. et al. (coords.) (2022). *Evolución de la cohesión social y consecuencias de la COVID-19 en España*. Fundación FOESSA & Caritas Española. In https://caritas365-my.sharepoint.com/personal/cominc_caritas_es/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fcominc%5Fcaritas%5Fes%2FDocuments%2FSensibilización%2FFOESSA%2FWEB%2FDocumentos%20enlazados%2Finforme%20FOESSA%202022%2Epdf&parent=%2Fpersonal%2Fcominc%5Fcaritas%5Fes%2FDocuments%2FSensibilización%2FFOESSA%2FWEB%2FDocumentos%20enlazados

³¹The weak point in the narrative of sustainability is that, as a metaphor, it sustains what is inherited, but it does not pay enough attention to the novelties that appear in the digital world. It addresses these novelties in a continuum without recognising the special socio-political support needed for these innovations as, from the new, it is what we will live in the future.

³²Impacts of COVID-19 on social development and implications for the just transition to sustainable development, 4 August 2020: <https://www.un.org/development/desd/dspd/wp-content/uploads/sites/22/2020/08/Impacts-of-COVID-19-on-social-development-and-implications-for-the-just-transition-to-sustainable-development-4-8-20.pdf>

³³<https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>, accessed August 2021.

Against this background, the UN 2030 Agenda offers a collective framework for driving the needed changes in a consistent, coherent, mutually reinforcing way. Its 17 Sustainable Development Goals (SDGs) are a “common language” that governments at all levels and organisations of all kinds (private sector, NGOs, academia) can use to seek alliances (starting from a common set of specific targets in a wide range of areas: from social justice to climate action, from gender equality to quality education, from ecosystem protection to health and well-being) and find the best ways to bring forward a transformative new paradigm leaving no one behind.^{34,35} The Global Agenda, approved in 2015 and covering 15 years, has now entered what UN Secretary-General Antonio Guterres has called “the decade of action”, for which the strategy and (supposedly) the expected outcomes are set, though there is as yet little or no sign of the tactics needed.

That means especially tactics which address the radical shifts needed from siloed to collaborative, from narrow perspectives to big-picture, and from one-time action to purposeful, purposive collective co-creation. The world needs to deliver, and the pandemic—with all its dramatic consequences—can also be seen as an opportunity to *build back better*.

The COVID-19 crisis has hugely accelerated an already incipient refocus back to more domestic economic systems through new forms of “re-shoring” and re-localisation also down to regional and city levels, the great resignation effect, also known as the Big Quit,³⁶ and the internal migration outside of cities due to teleworking.³⁷ Policies at the local, municipality, and city levels often have the most impact, as they are closest to citizens and most businesses. This so-called *new localism* aims to empower local stakeholders and retain as much of the value as possible created by a given community for their own use and further investment, rather than seeing this value seep away to a multinational with no local commitment and often to a tax haven. There are, for example, many social innovations, experimenting with and developing circular cities and local jobs, local currencies and tokens, blockchain as an emerging and promising approach in managing decentralised local energy markets (LEM) (Strepparava et al., 2022), basic income schemes,³⁸ and employee-owned enterprises.³⁹ This does not mean that local areas

³⁴<https://unsdg.un.org/2030-agenda/universal-values/leave-no-one-behind>

³⁵European Court of Human Rights. (2021)

³⁶Curtis, Lisa (2021). “Why The Big Quit Is Happening And Why Every Boss Should Embrace It”. *Forbes*.

³⁷Mariotti (2021), <https://regions.regionalstudies.org/ezine/article/remote-working-covid/?print=print>

³⁸VATT Institute for Economic Research (2021), <https://phys.org/news/2021-06-finnish-basic-income-short-term-employment.html>

³⁹For example, the Work Integration Social Enterprises are the result of collaboration in local networks among social organisations with public and private entities in order to improve socio-occupational integration with innovative responses. See for more details Mugarra-Elorriaga (2021). Also the Social Initiative Cooperative (Bretos et al., 2020). Or as a concrete experience KoopFabrika (<https://koopfabrika.eus/app/uploads/2020/01/koopfabrika-bilbo-es.pdf>). More

should become “independent” or isolated from the outside world, but that they are given every incentive and opportunity to self-help in addition to any needed external help because of poverty and vulnerability.

Policymakers should also ensure that such efforts are not wasted, degraded, or captured by free-riders,⁴⁰ whether operating in the market or other contexts. Also important for the new localism are local research, engagement and evaluation, good governance, and management, to ensure efficiency, accountability, and beneficial regional development (Millard, 2020, 2021).

3 The European Union as the Co-laboratory for the Triple Transition

The EU’s role as a trend-setter at global level must not be underestimated: the new president of the USA is setting up a new social policy agenda, seeking to emulate European policies. This is a great historical opportunity for the EU to become the “co-laboratory” for the main transitions that the world is expected to face simultaneously in this decade: the green, digital, and social transitions. The concept of “Climate Transition Superlabs” has already appeared in recent Horizon Europe calls.⁴¹ Similar to “living labs” but operating on a much larger scale, they spur the transformation of whole entities—such as non-sustainable business complexes, mining regions, and polluted metropolitan areas—in an economically, socially, and environmentally sustainable manner.

Becoming the first universal innovation ecosystem (Serra, 2018),⁴² a continent of 27 countries with 448 millions of citizens means opening up our innovation ecosystems to everyone, engaging every citizen and stakeholders in the challenges we all are facing, setting up strategies and expectations on “what” we want or need to achieve, and also focusing on the “how”, the new ways, the new mechanisms we need to achieve such goals.

These three transitions are interdependent: we cannot solve climate change without digital innovations and a profound social and behavioural approach. By the same token, the digital transition needs a new energy model and the

experiences as Servicios Sociales Integrados S. Coop. in social services or Goiener S. Coop. in energy, explained in Enciso-Santocildes et al., 2019. All those effects are recognised by the European Union in the communication “Building an economy that works for people: an action plan for the social economy” (COM(2021) 778 final) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0778&from=ES>

⁴⁰Which is what some little entrepreneurs and multinationals are in practice, caching social innovations and transforming them into their own private business.

⁴¹<https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl5-2021-d2-01-14> <https://www.youtube.com/watch?v=k9JrmkChiZs>

⁴²Serra, A. (2018). Citizen labs: basis for universal innovation ecosystems. <https://www.ecsite.eu/activities-and-services/news-and-publications/digital-spokes/issue-45>

democratisation and adoption of technological transformation for all if it is to avoid negative impacts.⁴³ Finally, a social Europe that is fair, inclusive, creative, innovative, open, collaborative, and full of opportunities needs input from green and digital innovation with initiatives such as the EU Health Union or the New Jobs strategy.

All for one, one for all.

We definitely need to lay down the foundations for developing a more open and inclusive innovation ecosystem removing the numerous literal and figurative political, social, cultural, spatial, temporal, disciplinary, paradigmatic, and other boundaries that currently exist in addressing the complex challenges of our time.

We must determine what needs to be achieved by co-evolution as the ultimate goal for growing together (EU, candidate countries, and global scale) to align with the motto “*one for all, all for one*” and make the three transitions work together consistently.

In addition to the green and digital transitions, humanity urgently needs a social transition. Without it, citizens from all over the world will not be interested in saving the planet or believing in digital transformations, if their daily life gets steadily worse. *The EU is the political project that can offer to the world such a joint narrative, encompassing a sustainable planet, a visionary digital future, and a humane and sustainable society, all together. The EU finally can become a first prototype of the Lab, our real and possible new global order.*

4 Key Messages to Push and Pursue the “One for All, All for One” Forward-Looking Vision into a Call for New EU Policy Actions

This chapter summons for new EU policy actions that secure a truly JUST triple transition, which involves and commits individuals, citizenry, organisations, public and private bodies, companies, and the EU to take action on the “how” in addition to the “what” and “why” need to be done and achieved. The following main elements would be a clear indication of the roadmap ahead:

1. Stressing the official recognition that a third social transition⁴⁴ needs to be reinforced as an EU political priority to strengthen the other two compelling but more widely accepted ones: the green and digital transitions.

The Porto Social Summit of the European Council was a good change to recognise and set in motion the European Pillar of Social Rights (European Union 2017), placing its principles and values at the core. This has become a golden

⁴³ <https://www.bbc.com/news/technology-56012952>

⁴⁴ Supporting the UE efforts and initiatives related with the European Pillar of Social Rights: https://ec.europa.eu/info/strategy/priorities-2019-2024/economy-works-people/jobs-growth-and-investment/european-pillar-social-rights/european-pillar-social-rights-20-principles_en

window of opportunity to build a shared vision of the future able to inform short-, medium-, and long-term decision-making processes.

There is a perceived excess of environmental, political, economic, and social posturing while failing to face the real problems; the wealth distribution; the policy, sectoral, geographical, and other divides; and the temporary and eligibility mismatching between supposedly synergetic initiatives. We all need to make a radical change in our habits.⁴⁵

Throughout the life cycle of any policy, programme, industrial initiative, or service, from its inception to the final co-delivery, all involved actors should embrace the social axis with the firm engagement of citizens and end users. Whoever co-creates should also have a stake and a responsibility in ensuring that what was co-created is maintained and sustained over time, opening up further possibilities of generating worthwhile value-based preventive and anticipation actions.

The participation of everyone in governance is essentially democracy, but when it comes to the complex challenges of our time (e.g. environmental issues), the digital transitions must be accompanied by the exercise of individual responsibility by every single citizen regardless of his/her/their role, age, or position. Each of us has impacts on the environment through our everyday actions and we are not willing to make “sacrifices”: having a waste, water, or air treatment facility next to our homes, or lowering our levels, habits, and forms of consumption. Rather than take a NIMBY (not-in-my-back-yard) stance we should adopt a YIMBY (yes-in-my-back-yard) mind-set and thereby share responsibilities and take ownership of our life-support systems.

We would thus be able to establish a caring, preventive attitude and avoid continuously having to react to harmful impacts through damage control and costly recovery plans.

2. *Courageous mission-oriented research and innovation projects and the adoption of the new (yet ancient) principle of collaborative innovation* should be the basic driver of the new EU policies. Thus, individual, institutional, sectoral, geographical, and other interests should be aligned for the common good. *All the initiatives and actions should be really based on respecting the “do no significant harm” principle. “Not leaving anyone behind” and “promoting everyone ahead” should be our cohesion goals* (Ayala et al. 2022).
3. *The EU triple transition’s co-laboratory needs “a complex system mind-set” building up on dynamic, context-sensitive, and holistic approaches.*⁴⁶ The EU emerging mission-oriented research and innovation is an appropriate framework to co-design mission and purpose-driven actions, outcomes, outputs, and no-harm

⁴⁵ In the Green Pact (point 4) this is clearly identified to better prepare society to form an opinion on the environment, providing it with the information and tools to promote responsibility, not environmental activism or posturing.

⁴⁶ As argued by Widmer et al. (2018, 630), Marion and Uhl-Bien (2001), Marion, R., McKelvey, B., & Uhl-Bien, M. (2007).

inclusive sustainable impacts. *Are we ready and willing to embrace open research, innovation, transfer of knowledge, and impact? How can resistance be overcome? How can stimulus be multiplied? There is no planet B, there are many lives at stake (e.g. opening up vaccine patents to save lives), we need to assure the lifelong stability of the welfare system, well-being and quality of life, quality of education, and just employment for all.*

4. *Igniting the transformative capacity of all forms of collaboration (international, interdisciplinary, intersectoral, intergenerational) to allow interactions to emerge around purposes for the common good. Europe should be ready to build the first universal innovation ecosystem. If the universal access of the Internet is becoming a new human right in some countries,⁴⁷ the new horizon of the EU is the building of universal innovation ecosystems allowing every citizen the right of becoming part of this common enterprise.*

The active engagement of stakeholders from the n-helix innovation ecosystems is a must (Caro-Gonzalez et al., 2020).⁴⁸ *How can we boost the negotiated, shared, co-evolved multi-cross-inter-transnational, disciplinary, sectoral, generational cooperation ecosystems?* The MuskEUteers are all of us: each one of us committed to the change, with this triple, urgent, encompassing transition. Our dreams for a better world, our talents, our skills, capabilities, agency, motivation, ideas, and endeavours should be swirled into a meaningful creative vortex for positive impactful results. Every person⁴⁹ and every action matters!

Active citizen responsive, responsible engagement is the base of these new mission-oriented innovation ecosystems. Without citizen engagement in collaborative innovation projects, no transition is possible. Alternative open, collaborative, co-creative, co-evolving innovative social initiatives have proven effective in reacting quickly to acute global socio-sanitary emergencies (e.g. the

⁴⁷ Some examples of countries that are pioneers in recognising the Internet as a basic digital right are the following: Estonia that has been rated as the country with the freest Internet in the world, according to the Freedom on the Net Index 2018, elaborated by Freedom House. The government has sponsored the e-Estonia programme where it is included as the first country to include e-voting, e-health, e-banking, and even e-residency. Finland in 2010 became the first country in the world to recognise the right of all its citizens to have access to a broadband connection. After having analysed these two pioneers more countries have also followed their steps and have recognised the right to Internet as a basic right: like in Europe (Spain, Sweden, France, etc.), North (Canada and USA) and South America (Brazil, Argentina, etc.), and others like (Australia, Japan) and we hope that in the coming years many more countries will do so (OECD 2020).

⁴⁸ Caro-Gonzalez, A; Serra, A. (coords.) et al. (2020). "Towards social innovation ecosystems: From linear pairwise forms of interaction to common-purpose-driven networks for shared prosperity", Position Paper, Bilbao. Retrieved from: https://www.academia.edu/42476112/POSITION_PAPER_Towards_Social_Innovation_Ecosystems_From_linear_pairwise_forms_of_interaction_to_common_purpose_driven_networks_for_shared_prosperity

⁴⁹ Without discrimination on any ground such as sex, race, colour, language, religion, political or other opinion, national or social origin, association with a national minority, property, birth, or other status. https://www.echr.coe.int/documents/convention_eng.pdf

EUvsVirus Hackathon and Matchaton⁵⁰ co-organised with high-level policy commitment and massive multi-stakeholder collaboration^{51,52} further explained in Chapters “Academia Diffusion Experiment: Trailblazing the Emergence from Co-Creation” and “Multi-Vortex Tornado Blueprint for Disruptive Global Co-Creation (Inspired by EUvsVirus)” in the book). Furthermore, we need to bring together traditional top-down and bottom-up grassroots approaches involving middle-ground collaborative leadership models seeking sustainable and JUST solutions.

5. Grounding the social transition, like the green and digital transitions, on innovation in context,⁵³ focused on the main challenges of this social transition: health, education, jobs, poverty, transhumanism, culture of innovation.⁵⁴ And devising technologies, societies, and green deals that are able to respect, be implemented, and protected by the cultural diversity that characterises the EU. *Promoting social technologies based on the diversity of engagements, backgrounds, cultures, profiles, stakeholders, and approaches,*⁵⁵ to design, build, and activate social structures to support transformational processes.

We need to set up an EU Task Force on Social Transition to gather and mainstream innovative answers to these challenges in existing and new initiatives: The European Health Union; the Renovation Wave⁵⁶; The European New Skills and New Jobs strategy; and more inclusive, more accessible education.⁵⁷

⁵⁰<https://www.euvsvirus.org/>

⁵¹<http://tactical-management-in-complexity.com/course/view.php?id=18>

⁵²Millard, J. (2018). Open governance systems: Doing more with more, *Government Information Quarterly*, vol.35, issue 4, pp.S77–S87, <https://doi.org/10.1016/j.giq.2015.08.003>

⁵³Otherwise, we could just be flying sky high inventing unnecessary things, while the “simple” copy-pasting of good practices and actual solutions to underdeveloped contexts necessitates so much innovation in context.

⁵⁴It is worth mentioning the attempts that are already being carried out, such as the Just Transition Platform set up by the European Commission: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/just-transition-mechanism/just-transition-platform_en#about-the-just-transition-platform

⁵⁵This is a key principle which can be observed in each chapter that follows as it is a crucial underlying concept of the solutions in the entire book.

⁵⁶An EU initiative seeking to increase the pace and depth of building renovation in Europe with high potential for job creation and the social impacts of urban regeneration projects (building renovation “enlarged” to a neighbourhood approach, focusing on impacting the social fabric, fighting fuel poverty, improving indoor health environments, etc)

⁵⁷The pandemic has shown us how important it is to make quality and secure education, activities, and events more accessible and inclusive: Alashhab, Ziyad R.; Anbar, Mohammed; Manmeet Mahinderjit Singh; Yu-Beng, Leau; Zaher Ali, Al-Sai; and Alhayja, Sami Abu (2021). Impact of coronavirus pandemic crisis on technologies and cloud computing applications. *Journal of Electronic Science and Technology*, Vol.19, Issue 1, March 2021. <https://doi.org/10.1016/j.jnlest.2020.100059> (accessed February 17, 2022).

To that end, the EU should definitively recognise intersectional social innovation⁵⁸ as the way in which social transition should be tackled. Since 2000 social innovation has been recognised by the OECD⁵⁹ as a way to find new solutions to the complex problems of our societies. Several European organisations (ESSI,⁶⁰ ENoLL,⁶¹ etc.) have since promoted this new approach, putting citizens at the heart of this open, collaborative model of innovation.

- a. Working in local contexts with a global view, promoting a deeply intertwined global agenda.

Grassroots initiatives based on responsive, responsible intergenerational participation can boost and channel citizens' science and engagement to achieve Sustainable Development Goal targets. Local responses to global challenges aligned with the context of challenges identified by the given community can connect the local and global communities in joint capacity-building efforts, following the principle of "Think global, act local".

- b. Used in conjunction with digital and technological solutions, social innovation creates complementarities and synergies between policy levels, fields, and sectors and programmes and initiatives, bridging the policy and territorial divides.
- c. Devising intermediate spaces and labs, as social innovation in social structures, in collaborations of a new kind, has the potential to lead processes of inclusion, co-creation, sustainable, JUST change, building socio-economic developments within context-driven ecosystems for the common good. Co-laboratories ("labs of labs") working together at the European level for face-to-face and virtual exchange and co-creation are beginning to emerge connecting bottom-up living labs, fablabs, and social innovation labs with top-down labs at universities, public administrations, and companies to embrace this triple transition (see *Collaboratories* CatSud⁶² and the European project VITALISE⁶³). Social innovators, entrepreneurs, and enablers (with proven moral principles working for the common good) will intervene as facilitators in order to improve the space for collaboration and the interactions of the multiple stakeholders.

⁵⁸ According to Howaldt et al. (2018), social innovation has an intersectoral approach and is universally applicable. *Atlas of Social Innovation. New Practices for a Better Future*. Sozialforschungsstelle, TU Dortmund University. Moreover, transformative social innovation introduces new processes, approaches and innovative initiatives, and/or collaborative solutions to seemingly challenging problems.

⁵⁹ <https://www.oecd.org/regional/leed/social-innovation.htm>

⁶⁰ <https://www.essi-net.eu/>

⁶¹ <https://enoll.org/>

⁶² <https://i2cat.net/projects/collaboratory-cat-sud/>

⁶³ <https://vitalise-project.eu/>, which is just starting, is harmonising the health living labs policies and resources of the different EU countries.

6. Articulating these green, social, and techno-digital transitions as one (single), “one for all, all for one” continuous ambitious mission-driven research and innovation programme, setting up an EU Task Force including experts on the three transitions supported by the different funding mechanisms: Next Generation Europe, Horizon Europe, Digital Europe, Connecting Europe Facility, EU Structural Funds. This should translate into:
 - a. Conferring a more crucial role to the social and solidarity economy with its key, complementary, and disruptive socio-economic alternatives and capability to bring about change.
 - b. Enabling encompassing policies and initiatives to boost circular economy solutions with resilience and planet-neutral value chain systems.
 - c. Changing the view of technology as an enabler, serving people, complementing Industry 4.0 by a human-centric, sustainable, resilient Industry 5.0⁶⁴—leading to new social practices and options for digital, green, and social industrial development.
7. Encompassing complexity management approaches^{65,66,67} systems thinking, and open innovation to bridge science and practice so as to facilitate the triple transition on a global scale.

How can complex adaptive systems be facilitated for the alignment of individual and collective purpose(s)? This is a challenge that we have not yet mastered (and in some cases not even touched upon) as humanity. It is the hardest to achieve co-evolution via systems design and alignment of strategy, tactics, and operations as managerial approaches fit for complexity, contextual capture, unpredictability, and iterative⁶⁸ adaptation.

We find ourselves in the premise of Gell-Mann, paralleling quarks and living beings: “*Think how hard physics would be if particles could think!*”⁶⁹ There is no “manager of the world”, but we should achieve global dynamic reconfiguration of

⁶⁴ European Commission, DG Research, and Innovation (2021). Industry 5.0 Towards a sustainable, human-centric and resilient European industry, <https://op.europa.eu/en/publication-detail/-/publication/468a892a-5097-11eb-b59f-01aa75ed71a1/>; European Union (2021).

⁶⁵ Petrevska Nechkoska, R. (2019). Tactical Management in Complexity: Managerial and Informational Aspects. Heidelberg: Springer Nature, <https://link.springer.com/book/10.1007%2F978-3-030-22804-0>

⁶⁶ Building State Capability, Problem Driven Iterative Adaptation, Center for International Development at Harvard University <https://bsc.cid.harvard.edu/PDIAtoolkit>

⁶⁷ Caro-Gonzalez, A.; Anabo, I. & Ferreira-Lopes Silva, L. (2021). Adopting Complexity Leadership in University Research and Innovation Management: A Framework Proposal, in Mansoor A. Alaali, *Assessing University Governance and Policies in Relation to the COVID-19 Pandemic*, IGI-Global.

⁶⁸ Transition Super-Labs. Horizon Europe. Call 2021, in which transition Superlabs are presented as real-life laboratories where a rapid shift to climate neutrality is conceptualised, implemented, monitored, and revised in an integrated way.

⁶⁹ Murray, (1995). The quark and the jaguar: adventures in the simple and the complex. W. H. Freeman & Co., USA. <https://dl.acm.org/doi/10.5555/211536>

capabilities by competence and passion, by ecosystems of co-creation, sustaining outcomes, not just outputs, by multi/cross/trans/interdisciplinary problem-based collaborative actions, by dissolving boundaries, and by making functional bridges while aiming to achieve collective (and individual) purpose(s). These approaches are needed for each clique, union, region, global citizen.

This is how complex adaptive systems interrelate—this must be taken into consideration if we wish to initiate positive change proactively, rather than reacting to calls for help.

8. Evolving new models of collaborative efforts and engagement such as vortices of co-creation and alignment of ideas, innovations, and unavoidable co-design priorities and agenda setting.

The adoption of multi-agent engagement (citizens, professionals, policymakers, and experts) in specific transformative actions will generate new ways of defining shared purposes and visions; integrating encompassing⁷⁰ strategies and initiatives; and their co-evolving implementation in the relevant contexts (neighbourhoods, communities, cities, territories, etc.).

- a. Building needed skills, training enablers, and forging a new generation of role models and leaders, designing capacity building, mentoring, and lifelong learning to enhance career path programmes for leaders, enablers, and agents of change.

The new digital world will be about tackling problems together. This means that a wide variety of professional groups, cultures, and qualifications must work together to find ways of mastering challenges. Specific policies, programmes, and initiatives can enhance citizens' training in exercising responsibility, with all individuals investing their own time and energy in developing their perspective of responsibility. Technology and digitisation are just the tools (and the same goes for the legal and policy frameworks) that we will all be using.

Mind-set and role models are far more important, as are people who have already proven how they can combine these different qualifications to create successful new business models and new interactions. In a similar way that we need to share good stories about our visions and how we achieve them, we need qualified role models who can master new challenges. How we push this role model idea will also be crucial for transformation. If people learn firsthand from role models how they have dealt with different challenges, the fear of the new and unknown will no longer be prevalent.

- b. Including individuals and groups usually left out (the younger⁷¹ and older generations, people with functional diversity, etc., developing non-EU

⁷⁰Intersectoral, interdisciplinary, cross-policy, etc.

⁷¹The role of pro-children's and youth rights organisations is noteworthy (Eurochild, UNICEF, Save the Children, etc.).

candidate countries⁷² and neighbours’ capabilities, migrants and refugees from other cultures, etc.) as key players and full actors with a voice, agency, and active participation within the triple transition processes^{73,74}. The social transition can help open up innovation ecosystems to new actors through different community projects and labs, helping national innovation ecosystems and institutions (universities, industrial labs, public administration) and increasing their social impact. In that sense, tackling the social transition can help to build up universal innovation ecosystems, when every citizen can learn to innovate, as in the Citilab⁷⁵ and FabLabs⁷⁶ networks.

- c. Using the SDGs as a framework for collaborative action: The Sustainable Development Goals offer a coherent common set of goals, targets, and indicators as reference points for fostering multi-level, multi-stakeholder cooperation. International multi-stakeholder platforms, such as the multi-stakeholder platform on SDGs,⁷⁷ should be fostered at EU level to promote specific joint actions from a triple transition based on cross-sector partnerships within and between institutions, academia, the private sector, civil society, etc.

5 Conclusion

One of the collateral effects of the COVID-19 pandemic has been to put in evidence the problems derived from the lack of integration of social, digital, and environmental factors and dimensions. In a time of massive digital technologies deployment, determined by social and environmental concerns, the traditional functionalist approach as a way to organise complex societies has limited possibilities to sort out the multiple interactions and factors involved in transformational processes. We need a systemic approach, centred in societal development, which facilitates the interaction of people, digital, energy, and environmental concerns in order to balance economy and society in a more sustainable way.

To do this, we need to catalyse, encompass, and integrate existing and emerging social and digital technologies, which help us articulate a universal innovation system. The “*collaboratories*”, the new generation of innovation models and “*artefacts*”, are cooperative innovative instruments based on a peer-to-peer systemic approach. These are needed to organise and properly address the complex transition

⁷²Stuck in developmental limbo (including but not limited to Western Balkans EU accession countries).

⁷³No-one left behind and no-harm principles.

⁷⁴<https://skills4future.mk/western-balkans-green-agenda/>

⁷⁵<https://www.citilab.eu/>

⁷⁶<https://www.fablabs.io>

⁷⁷https://ec.europa.eu/info/strategy/international-strategies/sustainable-development-goals/engagement-civil-society-private-sector-and-other-stakeholders/multi-stakeholder-platform-sdgs_en

that humanity has ahead. The collaboratories will help us co-create the collaborative society of the future, developing win-win games (green, social, economic, political) through multi-i flexible facilitation dynamics⁷⁸. They will allow us to coordinate the multiple stakeholders involved and foster social and digital innovation projects to transform our society into a knowledge-based society grounded on the intensive use of digital technologies.

We need radically new tactics for the “how” (green, techno-digital), for the *strategic* “what” (green, social), for the *purposeful* “why” (green, social), and for the *operational* “how best” (green, social, techno-digital) within the *governing principles* of eco-centric society.

Co-evolution is the only evolution that is there, and we need it so that we all improve together (that includes the EU, Europe as a whole, and the world), by activating the collective brain and co-dreaming.

Innovation in context can help the replication, translation, and localisation⁷⁹ of best practices. We must wrap up with openness (of boundaryless, paywall-less science, projects, missions, and purposes) encompassing flows of ideas and the emergence of solutions from the potential of the world in regard to what each of us can bring to life on this planet.

In this chapter, we used the image of the “trois Mousquetaires” (read: MuskEUteers) to put in value the need of a systemic approach to integrate social, digital, and green transitions as a “one for all and all for one” solution for the European and the world challenges ahead.

⁷⁸ A proven example is the ‘Eoh-for-Good Multi-i Co-creative vortexes’. This is a flexible and adaptable methodology to co-design and accompany processes of change at institutions and innovation ecosystems. It combines a number of elements that start with an ‘i’, hence its name, and it entails capacity building for leaders and agents of change, and methodologies and tools that operationalise transformation initiatives.

The strategy consultancy, Eoh-for-Good-Leading Systemic Change for the Common Good, has been born from the experience gained during 23 years managing the R&I internationalisation, outreach, engagement and impact strategy at a first-rate educational institution. It pursues long-lasting positive impacts based on co-creation multi-i iterative processes of:

- collaborations: interpersonal, intergenerational, intercultural, inter-institutional, interdisciplinary, intersectoral, international;
- feedback and feedforward learning loops: ideating, intuiting, interpreting, integrating, and institutionalising; and
- enabling mechanisms: investing and incentivising.

⁷⁹ Or, as we are referring in everyday life the copy-paste notion in software applications: “copy-paste special” (Windows) or “copy-paste and match style” (Mac OS) denoting taking anything from its source as ready solution, and pasting it in another place, but adjusting to the formatting of the destination context, which means adapting it to the context, so it works. If we simply “copy-paste” (or replicate) approaches, solutions, and ideas, from one context to another, without considering the context itself, the content will be pasted, but will not integrate to fruition (translation and localisation).

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Denica 2.0 and Tactical Management Information System (TMIS)



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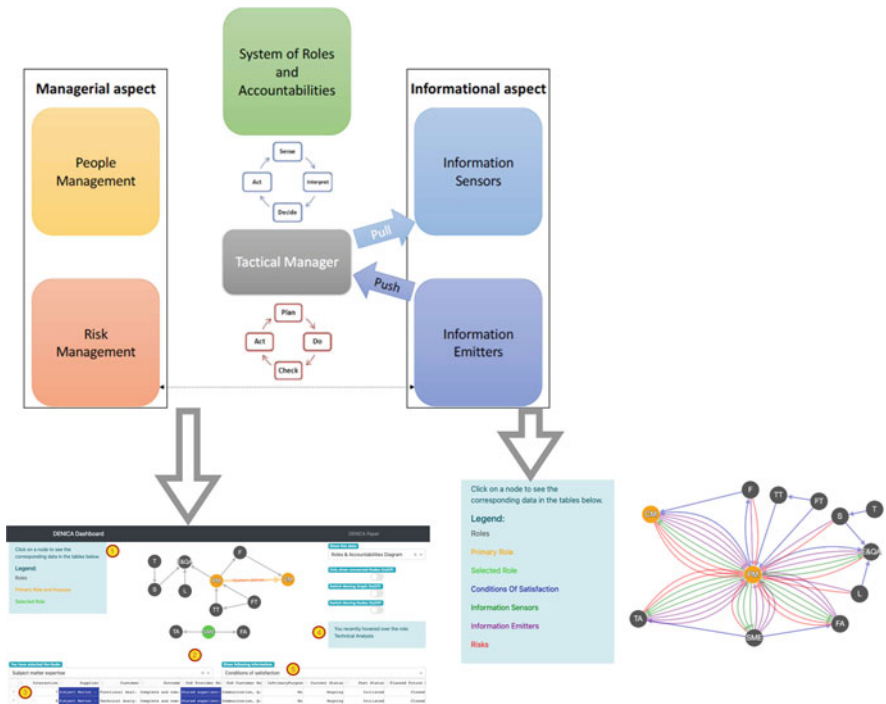
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Photo by Vladimir Petrovski

Real-life analogy. The Denica managerial method and its Tactical Management Information System enable adaptive managerial perception from diverse altitudes, width, breadth, enabling dynamic reconfiguration, zoom in/out on the “living organism” as a system being managed/facilitated to produce desired effects

Graphical Abstract



1 Introduction

Middle managers are often operating in complex and fast-moving environments, resulting in having to deal with enormous challenges in a short span of time, maneuvering diverse and numerous “givens” and aiming to achieve specific goals. These challenges are very diverse and require support tailored to the needs and characteristics of middle management. Due to the lack of tailored tools, middle managers often use methods that were originally designed for strategic or operational management, which they then adapt as best as possible to fit their tactical management needs. We thus see middle managers as the prototype of managers that have tactical management responsibilities, even though tactical management issues are also faced by executive, operational, and project managers. In a fast-changing world, heavily impacted by globalization and digitization, adaptability is one of the most essential characteristics of a middle manager. However, because of the lack of methods and systems tailored specifically to the tactical management level, middle managers are often not sufficiently supported to be able to deal with numerous givens, unpredictability, and a dynamic, turbulent, and complex environment. Hence, they lack proper support for being adaptable.

To address the lack of tactical management tools, the DENICA artifact (Petrevska Nechkoska, 2020) was designed. This artifact consists of a managerial method designed to support the individual in facing the abovementioned challenges, with the goal of achieving a set purpose. It is founded on management science, management information systems, and complexity science, while it can be applied in diverse domains that require tactical management decisions.

In this chapter, the Denica method is used to develop a prototype of a software tool that can be used to implement a Tactical Management Information System (TMIS) that is adapted to the needs of the individual manager with tactical management responsibilities. For doing so, we enhanced the Denica method to better address the tactical management needs in highly unpredictable environments such as those observed during the COVID-19 pandemic, resulting in the proposal of Denica 2.0. The chapter starts with a literature study where all relevant concepts are described. Next, the research methodology is presented. This is followed by an analysis of the ability of the Denica method to be used as a method for developing a TMIS intended for use in a highly unpredictable environment. Then, Denica 2.0 is presented along with its use to develop a software prototype for implementing a TMIS. Finally, the chapter ends with conclusions, limitations, and recommendations for future work.

2 Background Section

To develop a TMIS that is tailored to the needs of the individual middle manager, a clear and comprehensive definition of what tactical management entails is needed. In what follows, the definition of tactical management which was used to create the DENICA artifact will be used. Thus, **tactical management** (Petrevska Nechkoska et al., 2015) is a managerial function on:

- **How** to achieve (tactics),
- What is **expected** (strategy),
- By **utilizing** what is **given** (operations),
- Following certain **governing principles** (strategic guidelines),
- In the **current context** of the **organization and environment** (adaptability).

To understand tactical management as a managerial function, it is crucial to know the system which is being managed or facilitated toward producing outcomes. This will be looked into through the research on complex adaptive systems. Afterward, the adaptation to the environment in which the system is being managed is discussed using the concept of situational awareness.

A **complex adaptive system** (CAS) is a “neural network”-like constellation of interacting, interdependent agents who are bonded in a cooperative dynamic whole by a common goal (Uhl-Bien et al., 2007). Such systems are adaptive in nature due to their individual and collective behavior mutations as a result of constant reaction between agents (Holland, 1992). Typical examples of CAS are cities, governments,

and animal swarms (Strogatz et al., 2009). Also societies, organizations, states, unions, projects, etc. can all be seen as a CAS. Even a human being is by some considered as a CAS.

This definition has many similarities with how the middle manager function was described at the beginning of this chapter. The “neural network”-like constellations represent the roles interacting with each other and working toward the primary purpose of the system. Furthermore, Uhl-Bien states that a CAS is a changeable structure with multiple, overlapping hierarchies. This implies that the entities populating the roles interchangeably take leadership, or at least ownership. It takes several entities with different sets of skills, experiences, and resources to achieve predetermined outcomes. Depending on the requirements of the common goal, the roles will therefore be populated with different entities, based on their abilities. Therefore, it is crucial for the middle manager to have good people management, such that optimal teams can be composed.

Adaptability is the ability of a system to adapt itself efficiently and quickly to changes in the environment. An adaptive system is therefore a system composed of interacting entities forming an integrated whole that are able to respond to environmental changes together.

A CAS can also be defined through its distinctive features (Turner et al., 2018). A CAS operates in and as an **open system**. Closed systems are not influenced by external forces, which makes these systems much more predictable compared to open systems. An open system is non-linear and unpredictable due to many incoming external signals and interactions. The implications of this non-linearity and unpredictability will be investigated in the next section. A direct cause of unpredictability is the need to account for (possibly unknown) external signals, which makes planning less feasible. To cope with this, the CAS must be **self-organizing** to be effective. This happens through interaction and feedback between the agents of the CAS. This interaction is almost always characterized by the exchange of information (Stacey et al., 2000). Furthermore, the CAS operates at the **edge of chaos**, which can plastically be portrayed as the intermediate space between order and disorder as a result of the system having little structure. Having little structure provides the CAS with much more **flexibility** to cope with unpredictable influences. So, the CAS will allocate resources and reorganize itself as a response based on external signals received.

As seen in the definition of the middle manager, the manager must achieve what is expected by utilizing what is given while following certain rules in the context of its organization and environment. Certain implications have to be considered when combining this definition with the knowledge gathered around CAS. The middle manager must manage the CAS to achieve its goal through the provision of simple rules, creating and maintaining moderately dense connections and providing clear guidelines on how to detect and interpret information and how to act in response (Waldrop, 1993; Petrevska Nechkoska, 2020). Because of the distinctive characteristics of a CAS, planning to the detail and 100% automatization may be counter-productive and a waste of time, as it will only complicate things further. Instead, the middle manager should be continually aware of the behavior of the CAS and take

control of the CAS by managing the complexity of the system. This can be accomplished by visualizing the managerial (adaptable) system and communicating the visuals of the system among stakeholders, accompanied with the goals and governing principles.

To discover the needs of tactical management, it is crucial to get a grip on the environment in which the manager operates on a daily basis. The omnipresence of technology has transformed the world from the industrial age to the information age. This shift has led to a volatile environment bringing along challenges for organizations and the managers in charge. Many traditional managerial approaches and their supporting information systems rely on a relatively stable and predictable world (Reeves & Deimler, 2011). The *sense-and-respond framework* (Haeckel, 1999) provides a new way of reasoning to handle these new circumstances and challenges. Instead of trying to plan the future, the manager shall probe the environment to identify changing givens and challenges. Afterward, the manager will respond appropriately and timely with the purpose of eliminating potentially incoming risks or engaging on interesting opportunities before it is too late. This model clearly highlights the key characteristic of the middle manager, including the adaptability that is needed for achieving strategic goals, with its operative capacity at hand.

Figure 1 showcases the change that organizations must make to respond to a rapid changing environment with unpredictable dynamic changes. The key to thrive in the industrial age, where companies were defined by make-and-sell processes, was to be

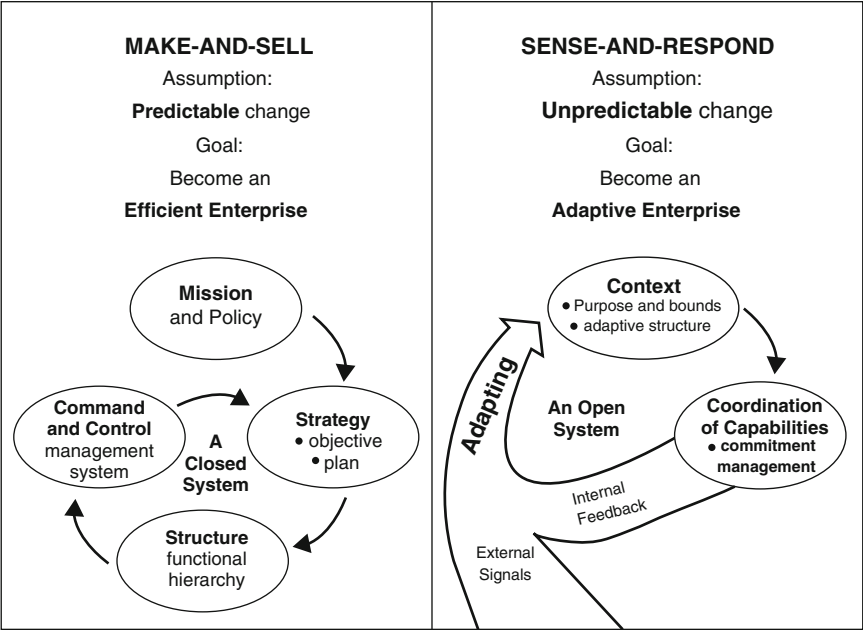


Fig. 1 Transformation from make-and-sell enterprise to sense-and-respond enterprise (Haeckel, 1999)

more efficient than their competitors. This has changed drastically. To thrive in the informational age, a company and its composing entities must dynamically adapt to the new environment and be able to respond to an abundance of incoming internal and external signals.

This transformation from a closed system to an open system, or from an introverted system to an extroverted system, also requires changes to the information systems needed to support the manager. Ultimately, the organization which can sense the most crucial signals and is able to respond in the most effective and fastest way will be able to reap the most advantages, and surf the waves standing. Thus, the information system should inform the manager of both weak and strong signals and support responsive decision-making, along with many other core requirements encapsulated in the Denica method (Petrevska Nechkoska, 2020).

Catching and interpreting signals and making the right decisions is dependent on whether the manager has a good awareness of the environment of the managed system. **Situational awareness (SA)** is defined as the perception of environmental elements and events with respect to time or space, the comprehension of their meaning, and the projection of their future status (Endsley, 1995). This dynamic environment requires the middle manager to make many decisions in short periods of time. This timely and responsive decision-making requires an up-to-date analysis of the environment. Thus, the challenge is to maintain an accurate and complete SA while the environment is constantly changing, often in complex ways (Endsley, 1995).

With this background it is now possible to conceive a generic method for developing a TMIS specifically designed for the middle manager. This method makes use of **prototyping**, which will be explained first.

Software engineering is an engineering discipline that is concerned with all aspects related to the production of software (Carrizo & Quintanilla, 2018). Therefore, it is highly recommended to use a systematic, disciplined, and quantifiable approach for the development of software (Radatz et al., 1990). It is good practice in software engineering to use the prototype methodology, which is a software development approach with the goal of creating, testing, and reworking a prototype until it fulfills the user's requirements. Prototyping demonstrates the feasibility of a system early in the life cycle and allows for risk assessment and validation of user requirements (Rome, 1992). Experiments show that prototyping reduces the number of problems related to requirements specifications (Boehm et al., 1984). Other important benefits of using prototypes are the detection of missing user services, identification of misunderstandings between software developers and users, the adjustment of difficult-to-use or confusing user services, and the identification of inconsistent or incomplete requirements.

One framework to develop prototypes is the *prototyping aspects model* (Lang & Mjöberg, 2020), which is supported by Agile Prototyping Guidelines. There are several reasons for choosing this framework. Firstly, it supports evolutionary prototyping, which is the process of giving an incomplete system to the user, afterward modifying it, and augmenting it iteratively based on feedback; the outcome is a working software system for end users. This approach is important because

the main focus is on the design of the software tool. Secondly, the framework guides the designer from start to finish, which is crucial for discovering the user requirements at the beginning while being able to validate the prototyped model at the end. The method also supports validation and improvement through user feedback. This is important because it allows the designer to improve the prototype based on real-life expectations and experiences of middle managers.

This approach to prototyping is based on four levels of aspects as shown in Table 1. These aspects represent the underlying methodology of prototyping activities. The model guides the developer by offering several choices for each prototyping activity and showcases the applications of prototyping. Understanding this model is crucial for the implementation of the Agile Prototyping Guidelines, which will be discussed in the next section.

The prototyping aspects model is supported by the *Agile Prototyping Guidelines*. The guidelines consist of five steps that should be followed in the development process of the prototype. These steps are the exploration of concepts, the discovery of software requirements, the device design suggestion, the testing and improving step, and lastly confirming the design. Each step is characterized by the choice made for each aspect; the choices are summarized in Table 2.

Table 1 The four aspects of prototyping and their hierarchy, as adapted from the prototyping aspects model

Prototyping aspect	Choices
Purpose <i>What is the reason for prototyping? Pick one or more.</i>	Exploration, Desirability testing Viability testing, Feasibility testing Communication, Usability testing Partial product, Validation Performance improvement
Strategy <i>How should we handle uncertainty? Pick one.</i>	Point-based design, Set-based solution array Performance set investigation, Flexible design
Scope <i>What level of refinement should be used? Decide for each dimension.</i>	Visual refinement dimension Functional refinement dimension
Review method <i>How should the prototype be evaluated? Decide for each dimension.</i>	User presentation Proximity to actual conditions Feedback collection

Source: Lang and Mjöberg (2020)

Table 2 Choice of every aspect for each step

Aspect Step	Purpose	Strategy	Scope	Review Method	Requirements Engineering Activity
Concept Exploration	Exploration	Set-based solution array	Low-visual Low-functional	/	Elicitation
Discovery of the Software Requirements	Desirability Exploration	Flexible design	Low-visual Low-functional	/	Elicitation
Devise Design Suggestion	Desirability Communication	Point-based design	Mid-visual Low-functional	/	Specification
Test and Improve	Desirability Communication	Flexible design	Mid-visual Low-functional	Demonstration Scenario testing	Specification Validation
Confirm Design	Communication Partial product Validation	Point-based design	Mid-visual High-functional	/	Validation

Source: Authors

3 Methodology

We have deployed a combination of qualitative and quantitative research methods, incorporating developmental methodology (prototyping and agile) to contemplate this chapter. Initially, the Denica method as the main theoretical pillar has been analyzed in depth and instantiated via training of managers and application of the method to their context, reflecting on their day-to-day tactical management issues. Then the cases were analyzed to fit the Denica generic principles and workflow (Petrevska Nechkoska, 2020). By doing this, we were able to discover some aspects of the method that were up for improvement. The conceptual learnings have been incorporated as enhancements into the Denica 2.0 managerial method, incorporating both managerial and informational aspects.

The resulting information requirements (structured via Agile Prototyping Guidelines) have been mapped and then translated into a software prototype for implementing Tactical Management Information Systems (TMIS), which was then validated on real cases—tactical managers who conveyed in-depth use of the Denica method in their actual work content. The managers are approximately in the same

situation and populate the same role in the big four consultancy firms in Belgium. Manager A works as a manager, while Manager B is a senior manager for the team. The greater seniority of Manager B could possibly result in more extensive knowledge of the company and the ins and outs of the team. The same list with predetermined questions was used during the two interviews, which happened throughout half a year briefly before and during the coronavirus pandemic. While main functionalities have been achieved, the work in progress (at this moment) elaborates the dynamic and multi-user aspects for the software prototype application.

Throughout the artifact enhancement, from Denica to Denica 2.0, and from information requirements to the TMIS software prototype, the research has incorporated knowledge from multiple supportive disciplines, such as requirements engineering, communication methods, and managerial theories (systems theory, control theory, etc.). The software prototype development was guided by software development methodologies such as evolutionary prototyping, the Prototyping Aspects Model (Lang & Mjöberg, 2020), and the Agile Prototyping Guidelines. The overall research methodology that guided our research and development efforts was Design Science (Simon, 2019; Hevner, 2007). Research activities included desk research and (semi-)structured interviews.

4 Analysis

This section describes the results of the interviews conducted to test the original DENICA components, with the purpose of assessing the ability of the Denica method to be used as a method for developing a TMIS intended for use in a highly unpredictable environment. The aim of the analysis was to investigate how managers perceive their system and information flows, and the results they obtain when applying the DENICA managerial method to their current situation. It also elaborates on changes to the managerial systems caused by the COVID-19 pandemic, differences between respondents, and their feedback. This was used as input to conceive an improved artifact, DENICA 2.0.

In the further paragraphs, we present and discuss the analysis of the Denica components, following the initial Denica method roadmap (Petrevska Nechkoska, 2020).

4.1 *Primary Constituents and Reason for Being*

The primary constituents identified during the meetings were the project manager (provider) and client management (customer). The provider has the final responsibility of accomplishing the primary purpose. The customer validates whether the desired outcome was reached.

The identification of the reason for being proceeded in a similar fashion for the two managers, but with notable differences. The delivery of an ERP system to a client was the starting point for both. A mere system delivery (output) is no guarantee for a satisfied customer, and both emphasized that as well. They focus on delivering a qualitative and all-entailing service to their customer (outcome). Two tactical managers have been involved in depth with the Denica method. **Manager A** identified a “no-error solution” for the client as a desirable outcome. **Manager B** identified “system delivery and/or advice based on leading practices” as the primary purpose. However, this is more an example of an output (what one is producing) while the DENICA method focuses more on desired outcomes (what one is achieving).

4.2 Governing Principles

Governing principles are standards, as well as always/never principles, that managers are expected to know and expected to do. These are mostly communicated top-down by upper management and can be seen as one of the givens for the tactical manager to work with. **Manager A** identified the general way of working as the most important general principle. **Manager B** did not necessarily disagree with these principles but saw them more as processes than as governing principles. Governing principles that were agreed upon by both managers included the need for clear, consistent, and timely informing of the client surrounding the project and where it was at, before moving on to the next phase of the project.

4.3 Role-and-Accountability Diagram

The design of the role-and-accountability diagram (R&A diagram) can be seen as the most important step when binding DENICA’s theoretical concepts to an actual business case, where the method is being instantiated. It is a form of system design with a purposeful nature, generic enough to be applied to any kind of situation. The roles that are displayed do not comprise job positions but are located on a higher conceptual level. Thinking in terms of roles can be challenging for managers, since it is not used in organizations. This became clear when conducting the interviews. Every interaction in the diagram is defined with conditions of satisfaction under which the accountability is valid. It is important to note that the R&A diagram has no time dimension and that it focuses on desired outcomes, not outputs. The interviews resulted in similar diagrams, but with interesting differences. Manager A saw an extra role in the “operational” part of the diagram, in the form of an expert. Manager B thought that the role populated by upper management was directly accountable to the customer as well. These were the biggest contrasts between the respondents (Figs. 2 and 3).

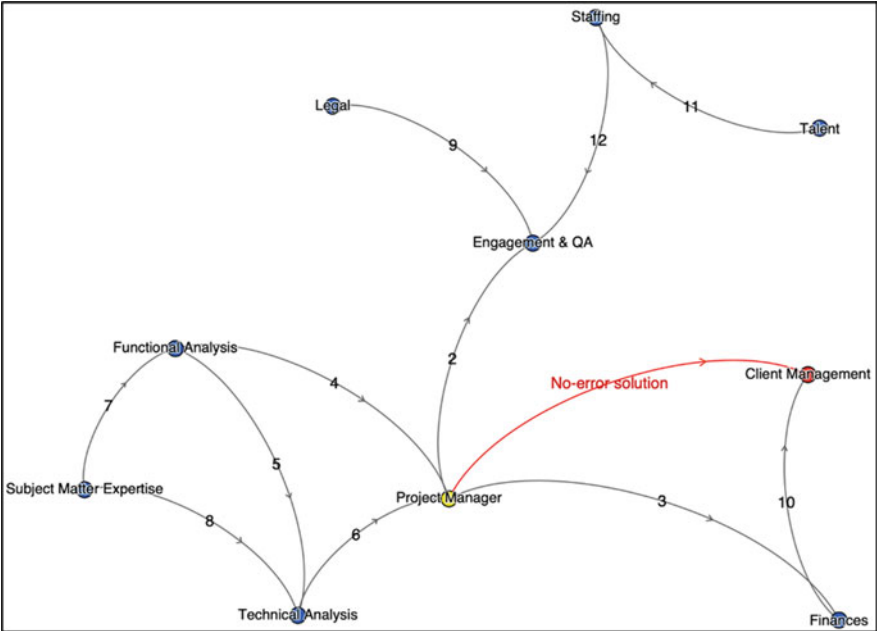


Fig. 2 Role-and-accountability diagram of Manager A (Source: Authors)

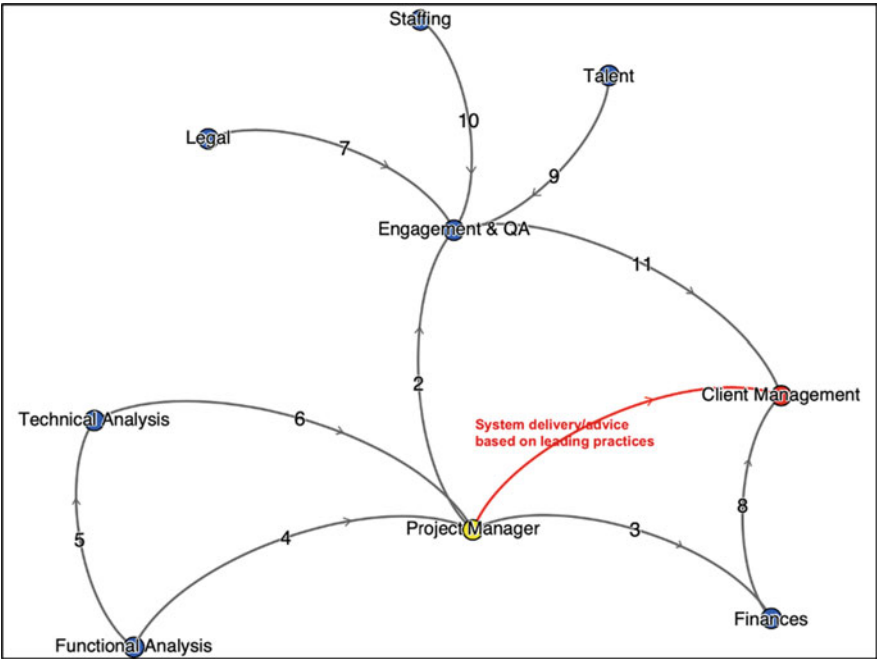


Fig. 3 Role-and-accountability diagram of Manager B (Source: Authors)

4.4 Conditions of Satisfaction

For all the outcomes accountable for interactions in the R&A diagram, there needs to be a specification of the conditions of satisfaction (CoS). Both the provider and customer need to agree upon the CoS in order for them to consider the outcome valid. This proves that a desired outcome actually is a two-way street. CoS are directly linked to the interdependencies identified in the R&A diagram. Thus, the differences in the aforementioned diagrams also explain a lot of the differences in the CoS. Outcomes that were common resulted mostly in the same CoS (Table 3).

Table 3 Conditions of satisfaction

Interaction	Provider	Customer	Outcome	Conditions of Satisfaction (Provider role > Customer role or <)
1	Project Manager	Client Management	No-error solution based on leading practices	> Implemented solution that really addresses all clients needs and problems, within foreseen budget and timeline < Information needed for project, Expectations, Co-operation, Feedback, Problems
2	Project Manager	Engagement & QA	Successfully completed project	> Project completion, Well-run team, Financial assessment < Authority, Team, Communication lines, Tools, Assistance
3	Functional Analysis	Project Manager	Alignment between requirements and system capabilities	> Participation, Input, Completion of assignments < Communication, Expectations, Performance management, Motivation, Empowerment
4	Functional Analysis	Technical Analysis	Clear functional analysis of situation	> Properly communicated functionality analysis with correct and complete information < Communication, Feedback, System ready for testing
5	Technical Analysis	Project Manager	Correct and complete system delivery	> Completion of system delivery with as much standard functionalities as possible, efficient coding < Communication, Expectations, Performance management, Motivation, Empowerment
6	Subject Matter Expertise	Functional Analysis	Complete and comprehensive subject matter	> Shared experience on topics relevant for project, Participation, Completion of assignments < Communication, Questions, Expectations, Performance Management, Empowerment
7	Subject Matter Expertise	Technical Analysis	Complete and comprehensive subject matter	> Shared experience on topics relevant for project, Participation, Completion of assignments < Communication, Questions, Expectations, Performance Management, Empowerment
8	Legal	Engagement & QA	Full legal compliance	> Drafted contract, Legal check-up of client situation < Complete client information on upcoming projects, Alterations on running projects
9	Staffing	Engagement & QA	Efficient staff deployment	> Planning of project teams < Information on upcoming projects, Information on employees
10	Talent	Engagement & QA	Clearly updated employee profiles	> Performance Framework Tool < Up-to-date profiling of employees, Performance management overview
11	Finances	Project Manager	Timely and correct billing	> Billing tool, Updates on client payments < Provide billing information on clients in a timely manner
12	Finances	Client Management	Ensured financial reconciliation	> Invoicing in a correct and timely manner < Correct and timely payment
13	Engagement & QA	Client Management	Guaranteed quality of service	> Information, Quality assurance < Expectations, Problems, Feedback

Source: Authors

Table 4 Information sensors

Interaction	Interested	Sensor	Type of Information	Way of receiving	Qualitative / Quantitative	Frequency
1	Project Manager	Client Management 1	Workshop	Event driven, Oral/Written	Both	Per meeting
2	Project Manager	Client Management 2	Status meeting (Scope)	Event driven, Oral/Written	Both	Weekly
3	Project Manager	Client Management 3	Status meeting (Financials)	Event driven, Oral/Written	Both	Weekly
4	Project Manager	Engagement & QA 1	Support/Advice on project	On demand, Oral/Written	Qualitative	Ad hoc
5	Project Manager	Engagement & QA 2	Financial overview	Event driven, Oral/Written	Quantitative	Monthly
6	Project Manager	Functional Analysis 1	Internal status meeting	On demand, Oral	Both	Weekly
7	Project Manager	Functional Analysis 2	Project input (functional)	Event driven, Oral/Written	Qualitative	Ad hoc
8	Project Manager	Functional Analysis 3	Performance management	On demand, Oral	Qualitative	Bi-weekly
9	Project Manager	Technical Analysis 1	Internal status meeting	On demand, Oral/Written	Both	Weekly
10	Project Manager	Technical Analysis 2	Project input (technical)	Event driven, Oral/Written	Qualitative	Ad hoc
11	Project Manager	Technical Analysis 3	Performance management	On demand, Oral	Qualitative	Bi-weekly
12	Project Manager	Subject Matter Expertise 1	Status meeting	On demand, Oral	Both	Weekly
13	Project Manager	Subject Matter Expertise 2	Project input	Event driven, Oral/Written	Qualitative	Ad hoc
14	Project Manager	Subject Matter Expertise 3	Performance management	On demand, Oral	Qualitative	Bi-weekly
15	Project Manager	Staffing	Staffing update	On demand, Written	Both	Ad hoc
16	Project Manager	Finances	Update on client payments	On demand, Written	Quantitative	Ad hoc

Source: Authors

4.5 Information Sensors

Information sensors are “what the tactical manager would need to have as information (regardless of the current supply with reports) in order to have dynamic and continuous overview of his system” (Petrevska Nechkoska, 2020, p. 216). The two managers each put up sensors with five roles, among which four were shared. Manager B had more detailed sensors: a fact that could be explained by Manager B’s seniority and experience (Table 4).

4.6 Information Emitters

Information emitters are “what the tactical manager would like to have been told by the other roles in order to be aware in a timely manner of possible issues disturbing the agreed outcomes” (Petrevska Nechkoska, 2020, p. 217). Unlike for the information sensors, Manager A had more emitters than Manager B. Most of the emitters were common. The difference is mainly due to an extra role that Manager B did not have in her R&A diagram (subject matter expert) (Table 5).

4.7 Risk Management

Risk management is about mapping possible risks that can get in the way of reaching desired outcomes of the R&A diagram (Petrevska Nechkoska, 2020). Here we see

Table 5 Information emitters

Interaction	Interested	Emitter	Type of Information
1	Project Management	Client Management 1	Changes in expectations
2	Project Management	Client Management 2	Issues
3	Project Management	Client Management 3	Progress
4	Project Management	Engagement & QA 1	Client satisfaction
5	Project Management	Engagement & QA 2	Risk/discussion at Client
6	Project Management	Functional Analysis 1	Personal issues
7	Project Management	Functional Analysis 2	Not being able to meet assignments
8	Project Management	Technical Analysis 1	Personal issues
9	Project Management	Technical Analysis 2	Not being able to meet assignments
10	Project Management	Technical Analysis 3	Issues with the system
11	Project Management	Subject Matter Expertise 1	Personal issues
12	Project Management	Subject Matter Expertise 2	Not being able to meet assignments
13	Project Management	Subject Matter Expertise 3	Risk/discussion at Client
14	Project Management	Finances	Financial risks
15	Project Management	Legal	Legal risks
16	Project Management	Talent	Personnel changes
17	Project Management	Staffing	Team changes

Source: Authors

Table 6 Risk management

Interaction	Interested	Sensor	Risk	Probability (1,3,5)	Impact on Business (1,3,5)	Approach
1	Project Manager	Client Management 1	Change in scope	3	5	Accept / Decline
2	Project Manager	Client Management 2	Change in timeline	3	3	Contingency plans
3	Project Manager	Client Management 3	Change in budget	3	3	Contingency plans
4	Project Manager	Client Management 4	Not enough empowerment	1	5	Contingency plans
5	Project Manager	Client Management 5	Insufficient involvement	1	3	Contingency plans
6	Project Manager	Engagement & QA	Disconnected because of schedule	3	1	Mitigate
7	Project Manager	Functional Analysis 1	Incomplete/Wrong information in documents	3	5	Mitigate (cross-check)
8	Project Manager	Functional Analysis 2	Time management	5	3	Mitigate
9	Project Manager	Functional Analysis 3	Performance management	1	5	Mitigate
10	Project Manager	Technical Analysis 1	Incomplete/Wrong information from Functional Analysis	1	5	Mitigate (cross-check)
11	Project Manager	Technical Analysis 2	Time management	5	3	Mitigate
12	Project Manager	Technical Analysis 3	Performance management	1	5	Mitigate
13	Project Manager	Subject Matter Expertise	Time management (project overlap)	3	3	Mitigate
14	Project Manager	Legal	Legal issues	1	5	Mitigate (screening)
15	Project Manager	Finances	Payment issues	1	5	Accept
16	Project Manager	Talent 1	People leaving	1	3	Accept
17	Project Manager	Talent 2	People laid off	1	3	Mitigate
18	Project Manager	Staffing 1	Not enough people available	3	3	Mitigate (manage)
19	Project Manager	Staffing 2	People changing projects	3	1	Mitigate (manage)

Source: Authors

the same trend that Manager B mapped more risks than Manager A. She took the identified risks by Manager A and delineated them with more details. Although Manager B identified more possible risks, she had more of an internal locus of control, saying that it is a manager’s responsibility to mitigate certain risks (Table 6).

4.8 *Application of the Denica Method in Regular and in Times of Pandemic*

The worldwide outbreak of COVID-19 caused big disruptions for many organizations. Because DENICA was developed specifically to support tactical managers and their need for adaptability, it was interesting to document the changes since the start of the pandemic and see if DENICA was sufficiently able to accommodate and document them. With clients in a multitude of different locations and team members sometimes staffed on multiple projects, the organization was well accustomed to working remotely. Because of this, there were no changes to the big picture. Projects were continued and there could be no deviation from the quality of work. Because the organization tried to change as little as possible, there were no notable changes to the **primary constituents**, the **reason for being**, the **role-and-accountability diagram**, or even the **conditions of satisfaction**. We may say that there were core (kernel) components in the method that did not change and some peripheral components which witnessed notable changes.

Because of this new way of remote communication, there were changes in place in some of the **governing principles**. As mentioned before, there have been certain steps in the project process requiring in-person meetings. This is the clearest example of a governing principle that could not be upheld because of the global pandemic. Other principles such as frequent standups, water cooler discussions, and internal meetings, such as status updates or performance management sessions, were also subject to change. These meetings changed in scope, frequency, and communication channel. The approach for internal communications was changed to minimize risks and address uncertainty as much as possible to team members.

There were both new **information sensors** as well as changes to already existing sensors. Of course, the way of receiving information also changed. Where the bulk of information used to be gathered through meetings in person, everything changed to being discussed online. New sensors included a “COVID-19 update” by the upper management. Another new sensor was the follow-up of analysts who were not staffed on a particular project and were working on isolated tasks. It was important for the managers to keep in touch, communicate on work to be done, and check on their motivation. Another trend that came up during the interviews was a change in frequency of existing sensors. Internal status meetings were held daily to make sure everyone was on the same page. As for the **information emitters**, evidently, the way of receiving the information changed as well. Most new emitters were already in place before the crisis, but the focus shifted to particular events that could occur because of the pandemic.

A crisis situation like a global pandemic brings along a lot of **risks**. Both new risks and a greater probability of present risks could be observed. In extreme cases, projects could be terminated early or put on hold. Financial issues for customers could result in budget adjustments or payment issues. Both managers recognized an increased difficulty for establishing a relationship of trust with clients, without the possibility of in-person meetings. This results directly in an increased risk of not

receiving enough involvement or empowerment by client management. Mental well-being of staff could be affected by being stuck at home. This was managed as much as possible by keeping close contact with everyone (reflected in information sensors and information emitters). Performances fluctuated from person to person. Some workers saw a drop in output; others worked more. Lastly, one of the most obvious risks in a pandemic is that people tend to get sick more frequently being reflected in family logistics, home offices, etc. Both managers had staff that were infected with COVID-19.

4.9 Contextual Differences Between the Managers

The managers are in the same situation and populate the same role, having a helicopter view, which normally should result in similar systems. Nonetheless, they see and describe their situation differently sometimes. This makes it interesting to look at the different interpretations of the same system. Manager A works as a manager for the team, while Manager B is a senior manager. This could be a possible explanation why Manager B was more concerned with using in-house terminology. As a senior she is also more involved with upper management, making it possible for her to better portray the interactions surrounding that role. The same list with predetermined questions was used during the two interviews. But Manager A was interviewed before Manager B, so the researcher had the opportunity to ask Manager B for her opinion on things that Manager A had mentioned during her interview. The answers from Manager B are therefore at times more exhaustive.

4.10 Managerial Feedback on DENICA

Both Managers A and B liked the adaptability provided by the DENICA managerial method: the adaptability to different types of organizations and how easily the method is implemented through the established roadmap, but also adaptability to different situations in a certain case study, for example, how easily the changes since the start of the COVID-19 pandemic are documented throughout the different components. They also noted that DENICA's strength lies in its ability to show the informational flows in a system. Not exhibiting all kinds of flows that go through an organization, which would often be irrelevant, but really focusing on flows that are needed for achieving the "primary purpose".

Manager A was also of the opinion that the method focuses too much on the system, the information flows, and the delivery to the client. A matter that is underexposed, according to her, is the people aspect of being a manager. Both managers had a hard time making a distinction between the information sensors and emitters. Sensors were sometimes placed under emitters and vice versa. The information sensors include the "way of receiving" which is oral, written, or both.

This description felt insufficient. The information emitters, on the other hand, could carry a few more attributes (Petrevska Nechkoska, 2020).

5 Conceptualization of DENICA 2.0

5.1 Enhancing the Denica Method

The analysis was used as input to conceive additional components and improvements to the existing components of the Denica method. Afterward these new and improved components are consolidated with the original building blocks to create a new and improved managerial method—DENICA 2.0.

5.2 Additions to the Initial Managerial Method Denica

5.2.1 Distinction Between Information Sensors and Information Emitters

One of the problems encountered during the DENICA implementation was telling apart the differences between information sensors and information emitters. There were a great deal of information flows that were important for the manager and the system, but it was not always easy to place them in the right category. So, an attempt to make the difference between the two more intuitive was undertaken.

A useful concept to describe the way that information is distributed is through the concepts of information push and information pull (Cybenko, 1999). When a user requests and receives a specific kind of information, that is information pull. If the information is sent to anticipate the user's needs, or the information was not directly solicited, then we are speaking about information push. In this case, the information is mostly triggered by a contextualized event (Cheverst et al., 2002). In the DENICA method, the information sensors are clearly a pull mechanism. The tactical manager specifically needs this kind of information to get a good overview of the system, and actively requests it from the other roles in the system. While information emitters are more an example of information push. The tactical manager wants to be told certain things by the other roles in the system. The pull and push mechanisms are added to the components. Do not be confused by the positioning of the arrows. The information is going in the direction of the tactical manager in both cases. The pull arrow is positioned away from the tactical manager to stress that he or she takes the initiative to gather the information (Fig. 4).

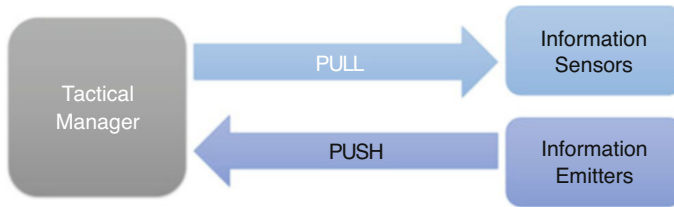


Fig. 4 Pull and push dynamics of information sensors and information emitters (Source: Authors)

5.2.2 Enhancement of Information Sensors Attributes

During the interviews, while identifying the information sensors and emitters, we ran into a limitation of how these components were documented. For information sensors, the attribute “way of receiving” divides the different sensors into being either “event-driven” or “on-demand” as well as mentioning if they are received in an oral or written way. The respondents acknowledged the benefit of documenting this information but found the current way rather confusing. The most tangible examples are in meetings with supporting notes and presentations. Is it oral or written? How to document the difference? It would be useful to enhance the sensors to get more detailed information.

The original “way of receiving” column for information sensors can be split up into two separate columns since it entails two types of metadata, those types being how the information is triggered and how it is received. The first new column “trigger” states if the information is gathered event-driven or on-demand. The original column “way of receiving” now states the actual form of communication that is used. Whether the channel is oral, written, or both is still mentioned. The qualitative/quantitative aspect denotes whether the expected information content is a description, sentence, explanation, or a quantitative indicator which has its logical connection to the system of roles and accountabilities, and its primary purpose (Table 7).

5.2.3 Enhancement of Information Emitters Attributes and Conjugation with Risks

Another thing which was discussed during the feedback part of the interviews was the information emitters. The respondents felt like the emitters conveyed less information than the other components. Information sensors possess extra attributes such as way of receiving, qualitative/quantitative, and frequency. Risk management makes mention of probability, impact, and approach. Information emitters, on the other hand, only mention who is the emitter and what type of information should be disclosed. So, it seemed like there was room for expansion.

An important objective of the information emitters is to make managers aware of possible risks in a timely manner. During the case study, it became clear that a large

Table 7 Enhancement of information sensors

Interaction	Interested	Sensor	Type of Information	Trigger	Way of Receiving	Qualitative / Quantitative	Frequency
1	Project Manager	Client Management 1	Workshop	Event-driven	Presentation (Oral/Written)	Both	Per meeting
2	Project Manager	Client Management 2	Status meeting (Scope)	Event-driven	Meeting (Oral/Written)	Both	Weekly
3	Project Manager	Client Management 3	Status meeting (Financials)	Event-driven	Meeting (Oral/Written)	Both	Weekly
4	Project Manager	Engagement & QA 1	Support/Advice on project	On-demand	Conversation (Oral/Written)	Qualitative	Ad hoc
5	Project Manager	Engagement & QA 2	Early warning signs of risks	Event-driven	Conversation (Oral/Written)	Qualitative	Ad hoc
6	Project Manager	Engagement & QA 3	Financial overview	Event-driven	Meeting (Oral/Written)	Quantitative	Monthly
7	Project Manager	Functional Analysis 1	Internal status meeting	On-demand	Meeting (Oral)	Both	Weekly
8	Project Manager	Functional Analysis 2	Project input (functional)	Event-driven	Conversation (Oral)	Qualitative	Ad hoc
9	Project Manager	Functional Analysis 3	Performance management	On-demand	Conversation (Oral)	Qualitative	Bi-weekly
10	Project Manager	Functional Analysis 4	Early warning signs of risks	Event-driven	Conversation (Oral)	Qualitative	Ad hoc
11	Project Manager	Technical Analysis 1	Internal status meeting	On-demand	Meeting (Oral)	Both	Weekly
12	Project Manager	Technical Analysis 2	Project input (technical)	On-demand	Conversation (Oral)	Qualitative	Ad hoc
13	Project Manager	Technical Analysis 3	Performance management	On-demand	Meeting (Oral)	Qualitative	Bi-weekly
14	Project Manager	Technical Analysis 4	Early warning signs of risks	Event-driven	Conversation (Oral)	Qualitative	Ad hoc
15	Project Manager	Subject Matter Expertise 1	Status meeting	On-demand	Meeting (Oral)	Both	Weekly
16	Project Manager	Subject Matter Expertise 2	Project input	On-demand	Conversation (Oral/Written)	Qualitative	Ad hoc
17	Project Manager	Subject Matter Expertise 3	Early warning signs of risks	Event-driven	Conversation (Oral)	Qualitative	Ad hoc
18	Project Manager	Staffing	Staffing update	Event-driven	Mailing (Written)	Both	Ad hoc

Source: Authors

Table 8 Enhancement of information emitters

Interaction	Interested	Emitter	Type of Information	Connotation	Linked to Risk?
1	Project Management	Client Management 1	Expectations	+	Change In Scope
2	Project Management	Client Management 2	Satisfaction	+	No
3	Project Management	Client Management 3	Issues	-	No
4	Project Management	Client Management 4	Progress	+	Insufficient Involvement
5	Project Management	Engagement & QA 1	Client satisfaction	+	No
6	Project Management	Engagement & QA 2	Political discussion at client	-	Change In Scope
7	Project Management	Functional Analysis 1	Personal issues	-	Performance Management
8	Project Management	Functional Analysis 2	Not being able to meet assignments	-	Time Management
9	Project Management	Functional Analysis 3	Satisfaction	+	No
10	Project Management	Technical Analysis 1	Personal issues	-	Performance Management
11	Project Management	Technical Analysis 2	Not being able to meet assignments	-	Time Management
12	Project Management	Technical Analysis 3	Satisfaction	+	No
13	Project Management	Technical Analysis 4	Issues with the system	-	Performance Management
14	Project Management	Subject Matter Expertise 1	Personal issues	-	Performance Management
15	Project Management	Subject Matter Expertise 2	Not being able to meet assignments	-	Time Management
16	Project Management	Subject Matter Expertise 3	Satisfaction	+	No
17	Project Management	Subject Matter Expertise 4	Political discussion at Client	-	Change In Scope
18	Project Management	Finances	Financial risks	-	Payment Issues
19	Project Management	Talent	Personnel changes	-	Not Enough People Available
20	Project Management	Staffing	Team changes	-	People Changing Projects

Source: Authors

part of the emitters dealt with information linked to the risks that were listed in the risk management component. Evidence suggests that when information concerning risks is presented in a clear and understandable format, people's understanding and perception of that risk goes up (Ahmed et al., 2012). Thus, it makes sense to link information that could have an impact on an identified risk to the corresponding risk. Next to a possible link to a risk, a connotation (+/-) was added, to give insight if the information emitter may contain positive content with regard to the primary purpose or role accountability, or negative—giving the manager an idea of the type of information that could be emitted. All information sensors, information emitters, and risks are actually different aspects of the same story—what the manager needs to know to sustain the system (Table 8).

Table 9 The new component “People Management”

Team member	Name	Role in system	Experience	Leadership style	Domain
1	Olga A	Subject Matter Expertise	6	Delegating	Trade expert
2	Mirko B	Functional Analysis	3	Supporting	Technical expert
3	Naila C	Functional Analysis	2	Coaching	Trade expert
4	Anthony D	Technical Analysis	9	Delegating	Technical expert
5	Giovanni E	Technical Analysis	0	Directing	Technical expert

Source: Authors

5.2.4 Introducing a Fifth Visual Component: People Management

Even though the Denica method was originally designed to address exactly that—the people and resources management, reconfiguration, and adaptation, one of the biggest critiques of the practitioners was that DENICA did not focus enough on the people aspect of being a manager. The method maps out the different roles in the R&A diagram. What the graph of the managerial system, i.e., the system diagram of roles and accountabilities, does not do is depict who exactly populates these roles. The respondents felt like this was missing and should be added. The composition of a team has a big impact on that team’s dynamic and its performance (Bell, 2007), so it is of great importance for a manager to have a clear and complete image of who is part of his or her team, and which role they populate, along with many other relevant details on request.

A “people management” component was created to provide the manager with an overview of the team they are working with (Santa & Poels, 2019). Following attributes are documented: the team member’s name, the role the person populates in the system, years of experience, situational leadership that suits the team member best, and room for additional necessary information. These attributes were selected since they all have a big impact on the way a manager needs to interact with his or her team (Table 9).

5.3 The Artifact DENICA 2.0

The additions and improvements that were conceived with the input and feedback of the respondents are consolidated and merged together with the already existing components of DENICA. This results in a new and improved managerial method—DENICA 2.0.

The generic implementation roadmap, which was already part of the original method, is kept. According to the respondents this was one of DENICA’s strong suit, providing managers with a straightforward and easy-to-use guide to implement the method. The roadmap includes following steps:

1. Identification of the primary constituents.
2. Clarification of the reason for being and levels of desired effects.
3. Framing of the governing principles.
4. Designing the role-and-accountability system diagram around the primary purpose.
5. Setting up the initial conditions of satisfaction.
6. Addressing managerial and informational needs through the heads-up displays and the commitment protocol.
7. Continuous performance of the Sense–Interpret–Decide–Act (SIDA) Loop and effectuating adaptability to changes through the R&A diagram.

The components of the DENICA 2.0 method are visualized in Fig. 5 and described as follows:

1. A system of roles and accountabilities, designed according to the sense-and-respond framework principles:
 - (a) Having in mind the purpose, the end, and the reason for being.
 - (b) Visualizing the role-and-accountability diagram.
 - (c) Specifying conditions of satisfaction for every negotiated outcome accountable for.

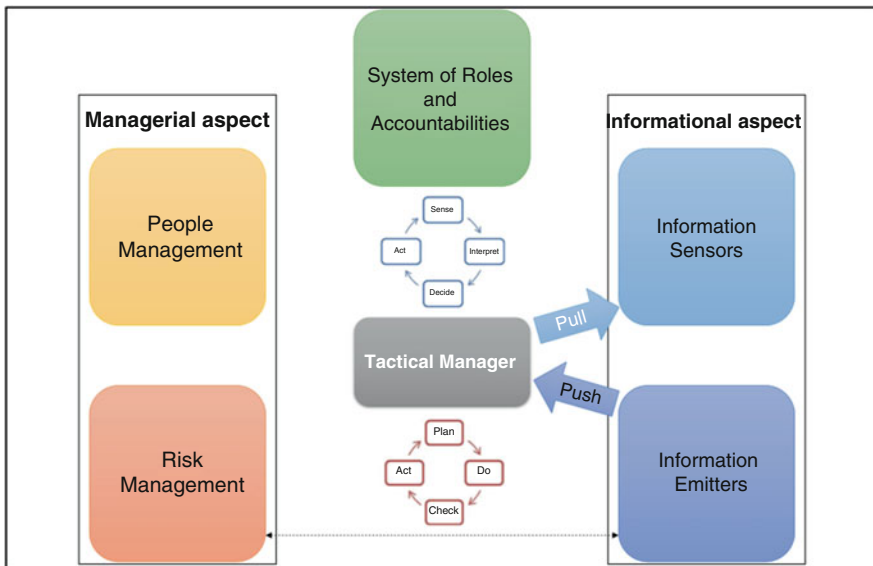


Fig. 5 New DENICA 2.0 (the Denica managerial method with recommendations added) (Source: Authors)

2. People management (new explicit aspect of the visualization, previously it was more implicit).

- (a) Visualizing the people that populate the different roles around the system designer—the tactical manager.
- (b) Stating the necessary attributes for people management:

Team member's name.

The role the person populates in the system.

Years of experience.

Situational leadership that suits team member best (directing, coaching, supporting, delegating).

Additional necessary information (domain, capabilities, cost, etc.)

3. Risk management (along with risk positioning and information flows).

- (a) Visualizing the risks per role, around the role of the system designer but to some extent also around all other roles too.
- (b) Stating the necessary attributes for risk management:

Interested party (usually the tactical manager for his or her system, but also any other role for his or her outcome's respective system).

Sensor, the actual role or entity or business process or general place where the tactical manager needs to point the "radar" to in order to receive that signal.

Risk type (experience of management, lack of knowledge for cross-checking, etc.)

Probability to happen (1 [low]–5 [high]).

Impact on the business (1 [low]–5 [high]).

Risk management approach (accept, avoid, transfer, mitigate, contingency plans).

4. Information sensors—specific information that the tactical manager requests from other roles to have an overview of his or her system (regardless of current supply of reports):

- (a) Visualizing the information sensors per role and accountability, around the role of the system designer—the tactical manager.
- (b) Stating the necessary attributes of the information sensors.

Interested party (usually the tactical manager for his or her system, but also any other role for her outcome's respective system).

The entity where the tactical manager places the information sensor.

The type of information to be obtained (progress feedback, results, issues, etc.)

The type of trigger for requesting the information (on-demand or event-driven).

The way of obtaining information (meeting, presentation, conversation, etc.)

Type of content (qualitative or quantitative information).

Frequency of obtaining the information (hourly, daily, monthly, quarterly, etc.)

5. Information emitters—what the tactical manager would like to have been told by the other roles in order to be aware in a timely manner of possible issues disturbing the agreed outcomes.

- (a) Visualizing the information emitters per role, around the role of the system designer—the tactical manager.

- (b) Stating the necessary attributes of the information emitters:

- Interested party (usually the tactical manager for his or her system, but also any other role for his or her outcome's respective system).

- Emitter (the role that should emit the specific information).

- Type of information (expectations, personal issues, not recording logs, etc.)

- Connotation of the information (positive or negative sentiment).

- Possible link to corresponding risk.

6. Continuous performance of the Sense–Interpret–Decide–Act (SIDA) Loop and effectuating adaptability to changes through the R&A diagram and Plan–Do–Check–Act (PDCA) Loop for improvements. The pull and push mechanism is made more explicit!

The new people management component is added to the existing framework together with the visualization of the pull and push dynamics. The tactical manager is added in the center, surrounded by all the components of his or her system. This stresses the fact that the manager is the focal point of the method.

A visual divide is made to showcase where the managerial and informational aspects of DENICA are positioned. The system of roles and accountabilities is moved upward to oversee all the other components. The R&A diagram is not only part of the managerial needs; it also lays the groundwork for the manager's informational needs. Since it is part of both aspects, the two sides of a coin, it does not make sense to include it in either, giving it a rather central place in the framework.

People management is added to the managerial aspect, together with risk management. There are no changes made to the informational components, but arrows are added to establish who is taking the initiative of providing the necessary information. The tactical manager is responsible for setting up his information sensors in the right places. Information emitters are in charge of getting the information to the manager when a specific trigger or event occurs. Lastly, the linkage

that was made between the information emitters and risk management is also included.

As the Denica 2.0 is introduced, it provides a substantiation foundation for shaping the Tactical Management Information System in its proper outlook, as continued in the headings further on, in this chapter.

6 Tactical Management Information System (TMIS): From Concept to Prototype

User requirements are statements, in a natural language, of what services the system is expected to provide to system users and the constraints under which it must operate (Sommerville, 2011). These user requirements, guiding our conceptual work, are gathered through an extensive literature study, seminars, and analysis of the findings of research (Petrevska Nechkoska, 2020). Documenting the user requirements is essential for the further design of the prototype. It is used to verify if the designer has a good comprehension of what the software tool should provide. In addition, these user requirements are used as a foundation for the documentation of the system requirements, which are in turn used for the development of the managerial cockpit.

Software requirements are expanded versions of the user requirements and are used by software engineers as the starting point for the system design; they define what is to be implemented and are a more detailed description of the software system's functions (Sommerville, 2011). The software requirements specification can be seen in Table 10. The software requirements are mapped to the user requirements with the help of the number coding from Table 11.

At this point, the user requirements were specified based on an extensive literature study and analysis of previous research. Different crucial concepts for the design of software such as MIS, SA, and BI have been discussed. The user requirements were transformed into software requirements based on this knowledge. The software required for the development and the given input has been discussed. This means that all the necessary requirements needed to start the modeling of the software tool are fulfilled. Figure 6 shows the first version of the prototype. This is the result of many design choices which implement all the software requirements to the best of the designer's knowledge. The prototype will be explained by splitting the dashboard into different components and discussing the individual compartments in more detail.

The first big compartment of the dashboard is the **system of roles and accountabilities (1)**. Because of its importance, it takes a central position in the overall software and the dashboard is designed such that it is always visible. This should allow the middle manager to always have a big view picture and improve the understanding of how the different roles are related to each other. The choice has

Table 10 User requirements specification

User requirements specification	
Complex adaptive systems	
1	The software should provide options for managing people
2	The software should improve communication between entities
3	The software should be based on simple rules
4	The software should be able to create and maintain moderately dense connections
Environment of middle manager	
5	The software should provide an overview of the current situation
6	The software should facilitate the perception of the elements with respect to time and space
7	The software should include external signals
8	The software should be able to handle the dynamic environment
9	The software should be accompanied with clear user guidelines
10	The software should provide the user with right-time information for specific decisions
11	The software should facilitate executing a risk analysis
Analysis of previous research	
12	The software should be designed for the middle manager, taking their perspective
13	The software should enable continuous business-information system alignment on a personal level by incorporating both managerial and MIS elements fully and complementary to each other
14	The software should take systems perspective and provide managed system design around a purpose and at a level of roles, enabling their pursuit and accomplishment
15	Simplicity of use is key for the software tool
16	The software should enable dynamic multifaceted context capture

Source: Authors

been made to use a graphical representation, since this is the better option for the identification of relationships, as seen in the concept exploration.

In this network, the roles are represented by the different nodes and the accountabilities are represented by the edges between the nodes. The names of the roles are abbreviated for the purpose of readability and placed inside the node. However, when clicking on a node, the full name is displayed in the **filter function (5)** for selecting roles. In addition, the selected node will turn green to highlight which node has been selected by the user (Fig. 7).

The primary purpose in the system of roles and accountabilities, which is the most important goal where every role in the system works toward, is an edge displayed in orange, annotated with the beginning of the primary purpose in text. The customer and provider roles, receive and deliver the primary purpose, respectively, are also colored orange. **The legend (4)** shows a description of the color codes used in the system of roles and accountabilities. The dashboard is also supported with some **guidelines (3)**, such that the user instantly knows how to work with the dashboard.

The system of roles and accountabilities can be expanded by the **option bar (7)**, which has two options to choose from: either “the roles-and-accountabilities diagram” option which results in displaying the diagram from Fig. 6 or choosing the “all data points” option which results in displaying the system seen in Fig. 8.

Table 11 Software requirements specification and mapping with the user requirements

Software requirements specification	
2, 3, 4, 5, 6, 12, 14, 16	The user shall always be able to see a system of roles and accountabilities
12, 14	The system should be designed around a primary purpose
6, 14, 16	The system should have options to show more or less data
15, 16	The system should be provided with flexibility with the help of zooming functions and moving graph functions
6, 10, 14, 16	The system should be able to take different viewpoints, showing only relevant information based on the selected role
6, 10, 14, 16	The user should have an option to decide which information is shown
1, 2, 5, 10, 14	The user should be able to request information about entities/people
2, 5, 7, 10, 11	The user should be able to request information about risks
2, 4, 5, 7, 10, 11, 14	The user should be able to request information about information sensors
2, 4, 5, 7, 10, 11, 14	The user should be able to request information about information emitters
2, 5, 10, 12, 14	The user should be able to request information about predetermined conditions
4, 8, 10, 13	The software tool should be able to handle dynamic data updating from the input
4, 8, 12	The software tool should allow for self-design of the user
8	The software tool should be equipped with filter functions to see limited information
6	The software tool shall use graphical forms to represent relationships and networks
6	The software tool shall use tabular forms to represent exact values and qualitative data
6	The software tool shall use visual features to improve user cognition such as intuitive color coding
9, 15	The software tool should be annotated with text indicating what the function is of each option
3, 9, 15	The software tool should be supported with clear guidelines
9, 15	The software tool should be supported with a legend
3, 8	The software tool should be easily adjustable

Source: Authors

This network represents all the roles involved in the project and how they are connected. In the roles-and-accountabilities diagram, the edges only represent the predetermined outcomes and the respective conditions of satisfaction. While in the network with all the data points, edges can be conditions of satisfaction, signals from information sensors, signals from information emitters, or risk signals.

At first glance, the system can be overwhelming due to so many connections. Although it quickly shows the user which roles have many connections with each other. The “all data points” network is mainly created to be used in combination with the **connected nodes switch (8)**. When switching this option on, it will only show

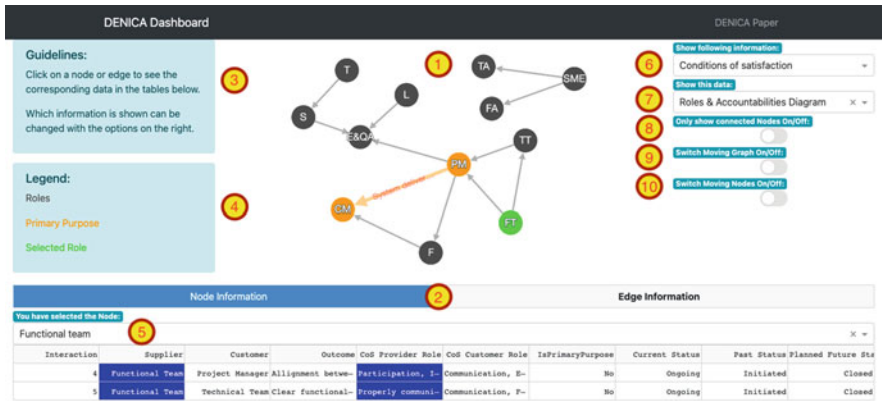


Fig. 6 First version of the prototype (Source: Authors)

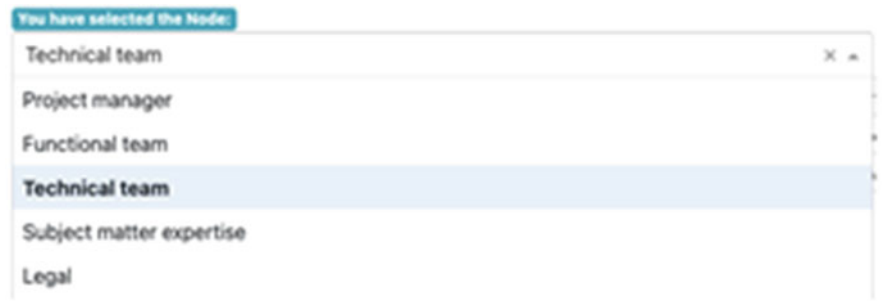


Fig. 7 Filter function for selecting roles (Source: Authors)

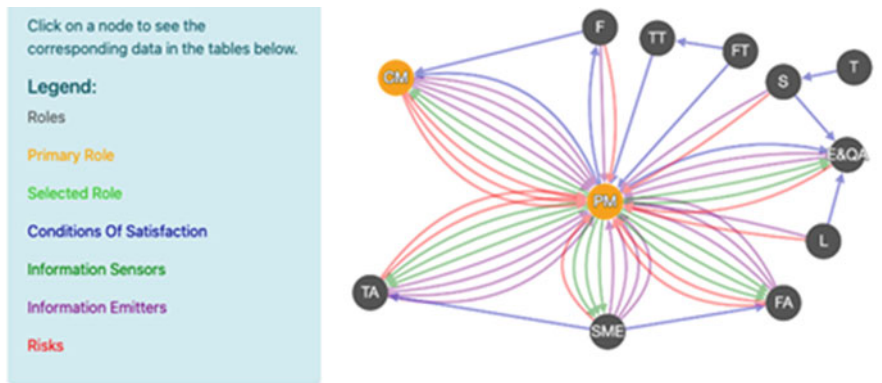


Fig. 8 Network with option: “all data points” (Source: Authors)

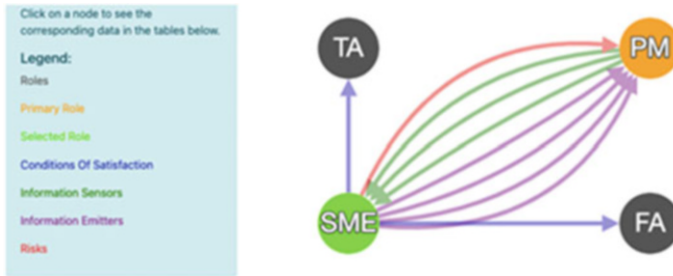


Fig. 9 System showing only the connected nodes (Source: Authors)

the connections with the selected node, providing great insight into the relations and responsibilities of the selected role. An example is shown in Fig. 9 based on the case study; the user directly notices that the subject matter expertise has relations to three other roles: technical analysis, project management, and functional analysis. The user also notices that the relation is much stronger with project management due to the many connections between them compared to the sole condition of satisfaction with both the technical analysis and the functional analysis. In addition, it is clear that the relation between subject matter expertise and project management is mainly information based: the SME has to inform the PM about one risk signal and has to emit information in case of four events/triggers and the PM has to request the SME about three different information sensors. And lastly, this example shows that SME and PM do not work together on a predetermined outcome, since there is no condition of satisfaction connection between them.

The network can be adjusted with the help of two switch buttons. **Button (9)** can be switched on if the user wants to move the network around or if the user wants to switch on the ability to zoom in or out. **Button (10)** can be switched on if the user wants to move the individual nodes; the edges between the nodes will be moved automatically. These buttons provide flexibility to the user; they can be used to give a better overview for a specific situation or to take a closer look. In addition, the user can organize the network as they require for a specific situation and take a screenshot to be used in a meeting or presentation.

The second big compartment of the dashboard are the **tables with information (2)**. As seen in the concept exploration, for analyzing exact values, qualitative data, and making an overall judgment, it is advised to use the tabular representation. These tables are highly interactive, such that the user is able to receive the right information at the right time. The user can request information by selecting the role they want information about in the **dropdown function (5)**; the selected role will directly light up green in the system of roles (1) such that the relation with other roles is also clear. Or the user can simply click on a node to see the corresponding information about the role or click on an edge between two roles, such that only information is displayed where both roles are involved. In addition, the user can specify which type of information they would like to receive by choosing one of the following

You have selected the role:

Interaction	Supplier	Customer	Outcome	Coll Provider Role	Coll Customer Role	InfPrimaryPurpose	Current Status	Past Status	Planned Future Sta
5	Project Manager	Finance	Timely and accurate	Complete billing	Billing tool, Up	No	Ongoing	Initiated	Closed
10	Finance	Client Management	Shared Financials	Resolving in a	Correct and time-	No	Ongoing	Initiated	Closed

Fig. 10 Conditions of satisfaction for the finances role (Source: Authors)

options: “conditions of satisfaction,” “risk,” “people,” “information sensors,” “information emitters,” from the **dropdown function (6)**.

Figure 10 shows the tabular representation of the **conditions of satisfaction** for the finances role based on data gathered in the case study. Colors have been used to improve the user’s cognition. If the selected role is the supplier role of the outcome, it will be represented by the neutral color blue. The corresponding condition of satisfaction to fulfill the predetermined outcome will be colored blue as well, such that the user directly notices which information applies to the selected role. On the other hand, if the selected role is the customer role, it will be represented by the neutral color purple as well as the respective condition of satisfaction. The other variables (columns) apply to both the supplier and customer role; therefore, there is no color coding required to link the information to the specific role.

The choice has been made to keep the tables as compact as possible, such that the user is able to find the information they are looking for as fast as possible. Consequently, long pieces of information will be compacted to fit in the table. However, when the user has found the information that he needs, they can **hover** over the piece of information to receive the full text (Fig. 11).

Figure 29 shows the example of viewing the edge information between the project manager and the client management. Only information will be displayed that involves both roles. This example also showcases the visual representation of the **primary purpose**. The outcome which is the primary purpose of the project will be colored orange, which is the same color used for the representation of the primary purpose in the system of roles and accountabilities (Fig. 12).

Fig. 11 Hovering over table to read full information (Source: Authors)

Alignment between requirements and system capabilities		
Project Manager	Alignment between	ler Role
Technical Team	Clear functional-	Participation, I- Properly communi-

You have selected the edge:

Between Project Manager and Client Management

Interaction	Supplier	Customer	Outcome	Coll Provider Role	Coll Customer Role	InfPrimaryPurpose	Current Status	Past Status	Planned Future Sta
5	Project Manager	Client Management	System delivery	Implemented and	Information used	No	Initiated	Not initiated	Ongoing

Fig. 12 Accountability (edge) information and primary purpose (Source: Authors)

You have selected the Node: Project manager

Interaction	Interested	Sender	Risk	Probability	Impact on Business	Approach
1	Project Manager	Client Management	Change in scope	+	+	Accept / Decline
2	Project Manager	Client Management	Not enough engagement	-	-	Contingency plans
3	Project Manager	Client Management	Insufficient involvement	-	-	Contingency plans
4	Project Manager	Functional Analysis Incomplete/Wrong Informa-				Mitigate (cross-check)

Fig. 13 Example of intuitive meaningful color usage (Source: Authors)

You have selected the Node: Functional analysis

Team Member	Name	Role In System	Experience	Leadership Style	Domain
2	Walter B	Functional Analysis	3	Supporting	Technical Support
3	Walter C	Functional Analysis	2	Coaching	Trade Support

Fig. 14 Example of the people management for the functional analysis role (Source: Authors)

An important part of the dashboard is to create immediate SA for the user. Therefore, certain pieces of important information are represented in intuitive meaningful colors. A great example of this is displayed in Fig. 30. The user has requested information about **risk management** for the project manager. The user can immediately make sense of the situation by assessing which pieces of information are important by looking at the colors. The variables “Probability” and “Impact on Business” are colored green for respectively low probability of occurring and low impact on the business when occurring, orange for medium probability and impact, and red for high probability and impact (Fig. 13).

The tabular representation of the **people management** data is used to gain deeper insights into the entities who populate the roles. It is also frequently used to populate the roles with diverse people for specific outcomes based on their skill set, experience, and other characteristics. Another frequent use of the “People” table is when the user knows he has to receive or deliver information to a certain role, then he looks up which entity they can best contact within the role (Fig. 14).

The **information emitters** table displays data for the selected role, about which party must be informed when a specific trigger/event happens, to be aware in a timely manner of possible issues disturbing the agreed outcomes. The user is immediately aware if the information is positive or negative by looking at the color of the connotation variable. The variable makes use of the intuitive meaningful colors green, red, and orange to, respectively, indicate positive, negative, or neutral signals (Fig. 15).

You have selected the Node: Client management

Interaction	Interested	Emitter	Information	Connotation	Linked to risk?
1	Project Manager	Client Management	Expectations	+	Change In Scope
2	Project Manager	Client Management	Satisfaction	+	No
3	Project Manager	Client Management	Issues	-	No
4	Project Manager	Client Management	Progress	+	Insufficient Involvement

Fig. 15 Example of the information emitters for the client management role (Source: Authors)

You have selected the role: Functional analysis

Interaction	Interested	Sensor	Information	Trigger	Way of receiving	Data Type	Frequency
5	Project Manager	Functional Analysis	Internal status meet-	On demand	Oral	Both	Weekly
6	Project Manager	Functional Analysis	Project input (Funct-	On demand	Oral/Written	Qualitative	Ad hoc
7	Project Manager	Functional Analysis	Performance manage-	On demand	Oral	Qualitative	Bi-weekly

Fig. 16 Example of the information sensors for the functional analysis role (Source: Authors)

Interested	Sensor	Information	Trigger	Way of receiving	Data Type	Frequency
Middle Manager	Human Resource Man-	Employee Performan-	On demand	Oral/written	Both	ad hoc

Fig. 17 Information sensor scenario 1 (Source: Authors)

The **information sensors** table displays data for the selected role, about which party is interested in certain information and at which sensor they can request this information. Additional variables are available depending on the specific project. This table is frequently used by the interested role to find which sensor is able to provide information needed for a certain decision and how they can request this information, if it is not event-driven. Frequently, these sensors are what the middle manager would need to have as information to have an overview of his system (Fig. 16).

Two scenarios are given to demonstrate how actual information such as performance management data can be retrieved by the middle manager. In the first scenario, the middle manager needs performance data on a new employee to populate a role as a temporary replacement for an employee on sick leave. The managerial cockpit shows that the middle manager can request this information from the human resource manager in an oral or written manner (Fig. 17).

The second scenario is situated in a large company which uses traditional business intelligence tools and an ERP system in combination with the managerial cockpit. The middle manager needs to know the duration for some process which needs to be revised because it is too long. The managerial cockpit shows that the middle manager has to request input from the operational manager and is able to retrieve information about processes in the ERP system under the Process Data section (Fig. 18).

It is important to keep in mind that the managerial cockpit is an intermediary layer between the manager and the operational BI. It consists of the managerial system and relevant aspects (people, risks, etc.) and serves as a portal which can be connected to various incoming data.

Interested	Sensor	Information	ERP	Trigger	Way of receiving	Data Type	Frequency
Middle Manager	Operational Mana-	Process Informat-	Process Data	On demand	Written	Quantitative	ad hoc

Fig. 18 Information sensor scenario 2 (Source: Authors)

7 Competitive Advantage in Tactics

“The DENICA artifact is a complete functional method intended for people that need to steer others or themselves in accomplishing outcomes. Of course, it has issues that can be worked on, to make things easier and simpler to use” (Petrevska Nechkoska, 2020). For a long time, middle managers have been using methods designed for strategic or operational management, which they tried to adapt to fit the tasks of tactical management. Our research has shown that middle managers need methods designed for their characteristics such as provision for adaptability and context capture.

Implementing and utilizing the DENICA artifact can provide a competitive advantage in tactics. The managerial cockpit was developed to leverage the competitive advantages which can be achieved by using the DENICA artifact. The dashboard supports the DENICA artifact by amplifying the cognition of the user, improving the communication among stakeholders, and saving time and effort. These advantages lead to the manager being able to deal with the complex and dynamic environment in a more effective manner, focusing on managing and facilitating comprehensive and non-overwhelming data and reports.

The DENICA artifact is designed to support the user in achieving goals by creating a good SA and managing what is given through time. The managerial cockpit can **amplify the cognition** of the middle manager by providing a helicopter view over their situation. The visual representation of the system of roles and accountabilities, which is directly linked to the tabular representation of the data, is one of the biggest advantages of using the managerial cockpit. The option to look at the big picture, while being able to look at different viewpoints to investigate data in detail, greatly supports the user in creating SA. In addition, the user can map their own information requirements needed for specific projects and change them frequently. In this way, the user is provided with a lot of flexibility needed to compete in a complex dynamic environment. The DENICA 2.0 managerial method does a great job in supporting the practitioner in managing what is given to achieve what is expected based on the complex environment of the user. The managerial cockpit tries to improve the effectiveness of this process by utilizing visual features. The use of concepts such as intuitive color coding or representing data in certain ways can improve the cognition of the user even further. The managerial cockpit facilitates the decision-making process because the user can make certain connections or assess the situation much faster.

An important element of the DENICA 2.0 artifact is to **improve the communication** among the middle manager and other stakeholders. It is crucial for the middle manager to be able to communicate the mission/vision, governing principles, expected goals, accountabilities, and so on. If this communication is not clear, the stakeholders would not be able to accomplish the goals. In addition, the communication must be clear and relevant; the different stakeholders must know when and what information must be communicated. This advantage has not been tested to the full extent since the managerial cockpit was validated by a single user instead of

having a case study where the interaction between stakeholders and the user could be investigated. However, the benefits which could be obtained by utilizing the managerial cockpit are made clear in a couple of scenarios.

Scenario 1 between the middle manager and the top manager: The middle manager can use the managerial cockpit as a visual reporting tool in meetings with the top manager to discuss the current status and future events. For example, the managerial cockpit can show that there is a need to hire a new employee because a certain role has too many tasks and responsibilities for the number of entities populating that specific role. In this case, the managerial cockpit can be used by the middle manager to show the top manager the reasoning behind the request of hiring a new employee.

Scenario 2 between the middle manager and an external party such as the customer: By simply screenshotting the dashboard, the user can easily communicate the progress or status of the project to the customer. The user is able to customize the managerial cockpit by only showing relations between certain nodes or deleting irrelevant or confidential columns and rows. This is a big improvement compared to showing Excel sheets, which could still contain confidential and irrelevant information or by having to make customized presentations for each new meeting.

Scenario 3 between the middle manager and an internal role: The managerial cockpit supports the DENICA artifact on the one hand, clearly stating which role has to communicate which information to whom and when. And on the other hand, facilitating the visual representation of the network of roles and accountabilities and the tabular representation of the data. This facilitates the communication of what is expected from a certain role or communicating to a team what the primary purpose is and how everyone has to work together to achieve it.

Before the development of the managerial cockpit, the practitioners of the DENICA managerial method were offered an Excel Workbook with four worksheets for each core component. The visualization of the graphs was done by the user or in beta versions of different software packages that deal with social network analysis. This becomes **very time-consuming** for the practitioner, especially when more projects need to be involved or when things have to be shared with other stakeholders. The managerial cockpit provides simple and straightforward tool support which can produce easy drawings of the diagrams, and is able to easily maintain the information sensors, emitters, and risks in a dynamic sense.

7.1 Limitations and Further Research

The DENICA 2.0 managerial method and the managerial cockpit go hand in hand. Therefore, it was important for the designer to validate the model based on user feedback from a middle manager with experience and knowledge of the DENICA artifact. It was planned to receive validation from the middle managers, who had been involved in case studies to validate the DENICA artifact. Although this feedback was crucial for the improvement of the managerial cockpit, it would be

very valuable to conduct a real-life case study in which middle managers use the DENICA 2.0 managerial method along with the managerial cockpit to gain deeper insights.

A limitation of the current dashboard design is the dependence on Excel for the user. In an ideal situation, the dashboard would be supported by a database management system. Instead of storing the data in an Excel sheet, the user would be able to add their new data to the dashboard interface and it would be stored and updated automatically. In this case, the user would not have to be in touch with other software besides the dashboard interface itself. Future work is already in place to plug the managerial cockpit to operational business intelligence systems.

The current dashboard is specially designed for desktop use, this is sufficient for the purpose of this chapter, although, in the mobile world of today, it could be interesting to make the dashboard functional on a mobile application. This would imply making the managerial cockpit a standalone and online application. This could be done by upgrading the used software to Dash Enterprise, which allows for building and deploying Dash apps in an organization.

8 Conclusion

This research tries to contribute to the ongoing effort of shedding more light on the tactical managerial function and the MIS supporting this level. By implementing the original Denica method as a case study at a big Belgian firm, we were able to not only validate it, but also conceptualize an enhanced “Denica 2.0” method expanded with a Tactical Management Information System prototype. This research is situated at a crossroads, where it is both able to help managers with carrying out tasks in a complex, tactical context and stimulate the academic field in its efforts to further study tactical management as a concept.

Tactical management connects the operational to the strategic level in organizations; thus, it has a big impact on different stakeholders on several levels. The different kinds of stakeholders were engaged as much as possible in this research. The Denica artifact was not only implemented and validated by middle/tactical managers; it was also validated by a strategic manager. The connection between a tactical and strategic manager is of the utmost importance, to both managers their respective systems. That is the reason why the strategic manager was involved, to enhance the informational and managerial flows in both ways.

The TMIS prototype was designed to not only support the tactical manager, but all kinds of roles in the hierarchy of an organization. Therefore, research and input was gathered of several different stakeholders, such as operational and strategic management, although the most important input remained tactical management. The prototype supports the user in achieving goals by creating a good SA and managing what is given through time. In addition, the dashboard supports the DENICA artifact by amplifying the cognition of the user, improving the communication among stakeholders, and saving time and effort.

Denica was implemented, tested, and validated at a Belgian firm. The case study provided us with some interesting and relevant insights. However, all of those insights are to be traced back to managers of one specific team in a big organization in the consulting sector, which is a rather narrow scope. It would be interesting to implement the Denica method at other types of organizations in other industries, to see if this would bring other observations.

Because this research originated during COVID times, it was conducted entirely remote. This did not withhold us from reaching useful results, but being able to meet with the respondents in person might have had a positive impact on the interviews and thus the remainder of the study as well.

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PDIA in the Balkans: The Western Balkans Alumni Association (WBAA) as Positive Deviance



EU Enlargement and Regional Cohesion

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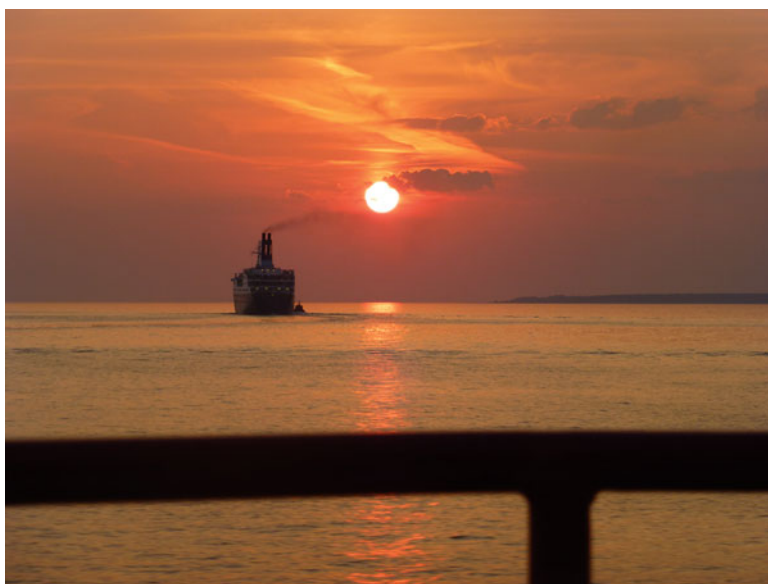


Photo by Vladimir Petrovski

Real-life analogy. Is it a sunrise or sunset? Is it the small boat next to the big one, seeking for shelter and support or is it both of them passing on the Tallinn–Helsinki route? . . . Is that a good route? Is it someone from a distance behind fences observing a nice journey? Should one swim to get there? Is the viewer in a better boat? And what is a better life? The sunrise/sunset is pretty from here too! Travel is good! Round trip tickets are good too! Home is where the heart is, and beauty is in the eye of the beholder. . .

Abstract This chapter aims to portray why and how WBAA, as an organism, organization, entity, agent, actor, network, . . . produces emergent effects as a regional entity is a Positive Deviance, as recognized in theory, and more specifically within the Problem Driven Iterative Adaptation by Harvard’s Center for International Development. Positive Deviance is one of the core principles in the PDIA strategy—by “creating (and protecting) environments within and across organizations that encourage experimentation and positive deviance.” First we will briefly

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elaborate on PDIA and its concepts and describe and encode the distinctiveness of WBAA arguing why and how it is a positive deviance for our Balkans. The expected outcome: to inspire leaders, institutions, CSOs, citizens, academia, . . . to take the regional approach, moves beyond the silos of a country/domain, has functional bridges with developed countries (for knowhow, funding, coopetition, alignment), and shows “how” coopetition within Western Balkans is to be done. If volunteers can do it, others can surely follow.

Graphical Abstract



1 Introduction

Positive deviance can be defined as: ideas that have already been acted upon (in the change context of WB), thus being possible, and that yield positive results (solving the problem) but are not the norm (hence the notion of deviance). Finding these positive deviants, celebrating them, codifying them, and broadly diffusing the core principles of their success are crucial (Andrews et al., 2017; Samji et al., 2018).

This chapter aims to portray a unique setting for the PDIA (Problem Driven Iterative Adaptation) approach in the domain of higher education systems in the Balkans. PDIA is a strategy for addressing complex issues, introduced to the world by the Harvard’s Center for International Development and its taskforce, in multidisciplinary collaborative teams across the globe, via programs, online courses, and other modalities for facilitating implementation. By analyzing a regional

association—WBAA, that transcends differences and aims to unify WB¹ youth we are analyzing specific approach in addressing higher education and societal problems in Western Balkans and whether, and furthermore how it is a positive deviance which can be diffused as practice to be followed. Why its members, structure, mission, and actions pave a proper foundation for making a positive difference, and how that aligns with PDIA, being effectuated through the WBAA research team but also radiating through the association as a whole, will be elaborated here. WBAA is a regional association of alumni who have spent part of their studies abroad, as well as academic staff on exchange, funded by EU education and training programs such as Erasmus+ and the Marie Skłodowska-Curie actions. With its mission set to establish a strong union of alumni coming from the Western Balkans in order to advocate for modernization and improve the quality of higher education in the region and empower young people of the Western Balkans on their academic and career development toward successful employment (Regional Cooperation Council, 2021), the hard work on the foundations of the association has been paved by teams of volunteers working as national representatives for couple of years, reaching a first General Assembly in March of 2019.² It enlists around a thousand active members but grows as new young intellectuals with mobility complete their international experience and join the association, even though the onboarding process is not very straightforward.

By codifying the WBAA as positive deviance and showcasing its mechanisms and effects, we hope to inspire the dissemination and diffusion of its approach, so that all WB benefits from its existence, learnings, and potentials. This is our tactic.

2 Methodology

This work is a qualitative analysis of a specific case study and evaluation of whether and how it fits a certain concept of “positive deviance” according to the Problem Driven Iterative Adaptation as strategy for complex issues. The engaged co-authors (researchers, practitioners as WBAA alumni) have been conducting ethnographic research since they have been actively involved in the inception, setting up and trailblazing for the Western Balkans Alumni Association. Some are in the role of heads of teams and the others in the role of Regional Board Representatives, some are active members and/or project coordinators since the association inception to this day forward. To convey this research, we have obtained primary data from activities (including Rules, Regulations, co-creation activities among the members, the Tracer study, the projects and activities) and secondary data from reports. Triangulation of

¹Albania, Bosnia & Herzegovina, Kosovo*, Montenegro, North Macedonia, Serbia. *This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ opinion on the Kosovo declaration of independence.

²<https://www.western-balkans-alumni.eu>.

the impressions, analysis, and findings has been done with other members of the association in various roles and representatives of the governing bodies.

The chapter describes profiling and evaluation of a “positive deviance” to the case of Western Balkans Alumni Association (WBAA), within the framework of Problem Driven Iterative Adaptation (PDIA) as set by Harvard University’s Center for International Development. The first author in this chapter has participated in the PDIA online semester course and later on in the activities of the PDIA Global Community of Practice, building competence to be applied in contextual challenges. PDIA steps followed in this chapter are intended to set the scene and enable the deeper focus of profiling and showcasing a positive deviance in the case of Western Balkans Alumni Association.

2.1 PDIA

With the intention to outline and then facilitate and navigate the implementation of a strategy for complex problems, the Center for International Development at Harvard University sustains the Building State Capability (BSC) program and team,³ researching strategies and tactics to build the capability of public organizations to implement policies and programs. Via diverse approaches—books,⁴ toolkits,⁵ repository of publications,⁶ online courses,⁷ executive programs,⁸ alumni network and global community of practice, blogs,⁹ and podcasts,¹⁰ they are facilitating emergence via PDIA in theory and action,¹¹ as visible in diverse projects across the globe.¹²

One of the domain-specific projects of the BSC is the “Understanding Educational Systems” through the RISE program,¹³ while the project applying PDIA in the Balkans is the “Implementation of growth strategy in Albania”¹⁴ (PDIA in Western Balkans conveyed by the Growth Lab Team-Albania).

³<https://bsc.cid.harvard.edu>.

⁴<https://bsc.cid.harvard.edu/building-state-capability-evidence-analysis-action>.

⁵<https://bsc.cid.harvard.edu/PDIAtoolkit> (Building State Capability and PDIA toolkit).

⁶<https://bsc.cid.harvard.edu/publications>.

⁷<https://bsc.cid.harvard.edu/online-course>.

⁸<https://bsc.cid.harvard.edu/ipp>.

⁹<https://buildingstatecapability.com>.

¹⁰<https://bsc.cid.harvard.edu/podcasts>.

¹¹<https://bsc.cid.harvard.edu/pdia-in-action>.

¹²<https://bsc.cid.harvard.edu/projects>.

¹³<https://riseprogramme.org/systems-thinking/learning-crisis>.

¹⁴<https://albania.growthlab.cid.harvard.edu/people/ermal-fraseri> and <https://albania.growthlab.cid.harvard.edu>.

PDIA focuses on problems (not solutions) and helps build the capability of organizations to uncover, execute, and implement strategy, tactics, operations in local contexts.¹⁵ That means best practices copy-pasted in a different context, brought as ready solutions, are much less likely to be uptaken by the citizens in the region than the ones developed via co-creation among positive deviance carriers, best practices, local contextual factors and with inclusion of bottom-up flows of problems, ideas, solutions, actions. In other words, by enabling us to construct and deconstruct problems with local capacity as well as global best practices, as well as experiment, adapt and learn iteratively, the structured process helps countries face their challenges and build capacity and ability throughout addressing them.

“PDIA rests on four principles:

1. *Local solutions for local problems*—Transitioning from promoting predetermined solutions to allowing the local nomination, articulation, and prioritization of concrete problems to be solved.
2. *Pushing PDIA positive deviance*—Creating (and protecting) environments within and across organizations that encourage experimentation and positive deviance.
3. *Try, Learn, Iterate, Adapt*—Promoting active experiential (and experimental) learning with evidence-driven feedback built into regular management that allows for real-time adaptation.
4. *Scale through diffusion*—Engaging multiple agents across sectors and organizations to ensure reforms are viable, legitimate and relevant.” (Ref. Toolkit, and website¹⁶).

Complementary to the main principles, the PDIA process flows from (1) initial problem analysis, (2) identification of action steps, (3) taking of action, (4) check-ins, (5) sustaining of authority and legitimacy with checkpoints whether the problem has been solved (if yes—diffusion and scaling are recommended, if no—the loop continues), and (6) adaptation and iteration to another level/stage (Samji et al., 2018).

2.2 Positive Deviance

We are defining the concept of positive deviance in order to be able to identify whether our subject of interest—the Western Balkans Alumni Association is actually a positive deviance which can be pushed, as suggested in the guidelines of the PDIA.

Positive deviance is defined by the PDIA authors as: “ideas that have already been acted upon (in the change context of WB), thus being possible, and that yield positive results (solving the problem) but are not the norm (hence the notion of

¹⁵<https://bsc.cid.harvard.edu/about>.

¹⁶<https://bsc.cid.harvard.edu/about>.

deviance). Finding these positive deviants, celebrating them, codifying them, and broadly diffusing the core principles of their success is crucial” (Andrews et al., 2017; Samji et al., 2018).

In literature, the notion of positive deviance and the dynamic of positive deviation have distinctive characteristics. There are different approaches to pinpointing what a positive deviance is, as intentional “behavior that significantly departs from the norms of a referent group in honorable ways,” such as in (Spreitzer & Sonenschein, 2004):

- Statistical approach.
- Supra conformity approach.
- Reactive approach.
- Normative approach.

The authors enlist the Positive Deviance within a typology of several categories, differentiating Corporate Social Responsibility, Whistle-blowing, and Organizational Citizenship Behavior, where the substantial departure from norms is the case for the positive deviance.

Due to these definitions and positioning, we are using the following characteristics to pinpoint, position, and argument for a positive deviance (Herington, Fliert, 2018):

- Intention (voluntary, not imposed, found within oneself/ves)
- Departure from norms
- Of an honorable nature

Within the potential design space suggested within the steps, to get ideas for solutions from, in a diagram with *Existing practices*, *Latent practices* and *External best practices*, PDIA situates Positive Deviance (finding, celebrating, codifying, and diffusing) in the top right quadrant of the solution design space because it denotes:

- ideas that are already being acted upon in the change context (meaning they are possible),
- they are yielding positive results (meaning they have technically correct mechanisms and approach), and
- they are not the norm (meaning they showcase how things can be done successfully, but are practiced by only a small portion or within parts but not overall in a region, context, domain) (Samji et al., 2018).

In this chapter, we will make the attempt to follow the PDIA steps in positioning of the problem and analyzing WBAA to portray whether and (if yes—how) it is a positive deviance, to be able to argue it ought to be coded, celebrated, and diffused for embetterment of the Western Balkans higher education systems and co-evolution as a region in general.

3 The Local Context of the Balkans as a Region

It is very hard to set up, let alone activate and sustain potentials among (even within) regions, including, but not limited to, the EU and Western Balkans (WB).

If we start to think about all the *things that divide us* as humans, but in this case, as citizens of Western Balkans countries—Albania,¹⁷ Bosnia & Herzegovina,¹⁸ Kosovo*,¹⁹ Montenegro,²⁰ North Macedonia,²¹ Serbia²²—the list is burdensome:

- languages,
- religions,
- political parties,
- backgrounds,
- traditions and beliefs,
- feeling of undergone injustice,
- wars,
- aspirations,
- developmental stages,
- political systems,
- geographic traits,
- borders (both physical and invisible ones),
- mindset,
- family backgrounds and so on.

Hence, the choice of PDIA as strategy for complexity in this region has its diverse challenges—on one side contextual (both internal and external), and on the other—the complexity of the addressed problem(s). The deterioration of the higher educational systems across Western Balkans' countries and as a region has structural issues (Brajkovic, 2016), number of new private universities on insatiable grounds and loss of strength and quality in existing, even in traditional universities across the region, and even with the explicit or implicit direction toward the European Union (Cvejić, Babović, 2014) and the developed systems (Brankovic et al., 2014; Zgaga et al., 2013) (UNDP, 2021). The situation a decade ago, after the turbulent recent history, has not improved (Temple, 2013) reaching a bubble (Karanovic et al., 2015) of overproduction of degree students with reduced quality and market-place

¹⁷<https://atlas.cid.harvard.edu/countries/4> and https://ec.europa.eu/neighbourhood-enlargement/albania-report-2021_en.

¹⁸<https://atlas.cid.harvard.edu/countries/26> and https://ec.europa.eu/neighbourhood-enlargement/bosnia-and-herzegovina-report-2021_en.

¹⁹https://ec.europa.eu/neighbourhood-enlargement/kosovo-report-2021_en.

²⁰https://ec.europa.eu/neighbourhood-enlargement/montenegro-report-2021_en.

²¹<https://atlas.cid.harvard.edu/countries/140> and https://ec.europa.eu/neighbourhood-enlargement/north-macedonia-report-2021_en.

²²<https://atlas.cid.harvard.edu/countries/201> and https://ec.europa.eu/neighbourhood-enlargement/serbia-report-2021_en.

behavior of stakeholders and institutions, which, in order to survive, have to emphasize number before quality. Analysis and reports state that “working-age population (15–64 years) continued to shrink in most Western Balkan countries in 2019—a trend driven by population aging and continued outward migration, with overall working-age population dropping 6% in the past decade and over 2% in the last couple of years (based on Labor Force Survey data (LFS)) (WBG, WIIW, 2020).

The list of differences that divide Western Balkans countries and citizens can be complemented with *what we have in common—problems*:

- Devastated systems
- Political polarization and predomination
- Youth unemployment
- Brain drain and outward migration
- Low developmental stage
- Very small in size (land, population) if taken individually
- Necessity to collaborate with developed and “larger” countries/unions
- Never-ending transition and reform
- General state of apathy, lost values, frustration, disappointment, lack of self-confidence, pessimism, low tolerance, nationalism, inactivity, . . .
- Practical and hands-on solutions due to lack of facilities and willingness of practitioners
- Educational systems are not modernized, lacking the innovation in teaching methods, lack of school-to-work transition and opening new private for profit universities resulting in overflow of universities and diminishing quality of higher education

Politically and before all, emotionally, it may be too early to work on overcoming differences and unifying toward common goals as a region, to embrace diversity and emerge from it (Omic et al., 2021).²³ The memories of the wars and disagreements, and on how all issues have been mishandled (Bugajski et al., 2010)²⁴ are still fresh with the families of the loved ones. The global political and environmental setting is not favorable either, as one of the main effects being migration (Markovic, 2018) (Cvejić, Babović, 2014). But these two cons provide the pros—how else if not together.

Potential past collaborations, alliances, capacity-building-consortia, partnerships²⁵ have been discontinued with devastating socio-economical, political, ethical, and environmental decay for WB. This condition has left at least one generation completely lost in transition, another one in the winds of the early configuration chaos, threatening to erase or paralyze the current two generations of youth choosing

²³<https://www.eurac.edu/en/institutes-centers/institute-for-minority-rights/news-events/webinar-series-diversity-matters>.

²⁴<http://aei.pitt.edu/7383/2/7383.pdf>.

²⁵<https://www.eurac.edu/en/blogs/mobile-people-and-diverse-societies/exploring-perceptions-and-opinions-of-young-migrants>.

the “flight” instead of “fight” the battle of education and planting the seeds in their present for their future (Japelj Pavešić et al., 2022) (Djordjevic, 2021). What sustained were individual student/staff mobilities toward EU—Higher Education Institutions and few, hardly earned positive deviances of group cooperation.

The whole area of the Western Balkans has a heap of challenges on the road to EU integration (Miran et al., 2019). Leading countries in this are Serbia and Montenegro (both countries opened the negotiations in 2012), North Macedonia started the negotiation process in 2020 as well as Albania. Bosnia and Herzegovina and Kosovo* remain the only countries in Western Balkans who are not potential candidates.²⁶

Within the categories of existing good practices, latent practices, and external best practices, we can enlist several. Regional cooperation and cohesion²⁷ are the direction, so alongside WBAA, we can enlist RYCO,²⁸ Western Balkans Fund,²⁹ the Regional Cooperation Council.³⁰ the IPA³¹ programmes, Young European Ambassadors (YEA),³² Erasmus Mundus and Erasmus + actions,^{33,34} as well as a number of project consortia and CSO networks that have been acting across the region and with relations with EU and the world. Regional cooperation has continued especially in science and technology in the frame of some EU funded projects such as COST Actions, by interconnecting researchers, SMEs, public institutions, and organizations. All Western Balkans countries have joined the COST (European Cooperation in Science and Technology) program, starting with Serbia and Bosnia and Herzegovina in 1991, North Macedonia in 2002, followed by Montenegro in 2015, and Albania and Kosovo* in 2018.³⁵ The numbers of participants from Western Balkans involved in COST Actions have steadily increased and several projects and activities (short-term scientific missions, training schools, meetings, virtual networking support) focus on complex problems to be addressed within the region and beyond, ranging from agricultural research and knowledge transfer in WB countries to capacity building in forest policy and governance, connecting

²⁶ https://ec.europa.eu/neighbourhood-enlargement/index_en and https://ec.europa.eu/neighbourhood-enlargement/enlargement-policy/strategy-and-reports_en—to be used here and in references.

²⁷ <https://www.eurac.edu/en/blogs/mobile-people-and-diverse-societies/exploring-perceptions-and-opinions-of-young-migrants>.

²⁸ <https://www.rycowb.org>.

²⁹ <http://westernbalkansfund.org>.

³⁰ <https://www.rcc.int>.

³¹ https://ec.europa.eu/neighbourhood-enlargement/enlargement-policy/overview-instrument-pre-accession-assistance/multi-country-financial-assistance-under-ipa-ii_en.

³² <https://euneighbourseast.eu/young-european-ambassadors/>.

³³ <https://ec.europa.eu/assets/eac/erasmus-plus/factsheets/regional/westernbalkans-regional-erasmusplus-2020.pdf>.

³⁴ <https://ec.europa.eu/assets/eac/erasmus-plus/factsheets/regional/erasmusplus-regional-westbalkans2017.pdf>.

³⁵ <https://www.cost.eu/uploads/2020/05/COST-relations-to-the-Western-Balkan-Countries-1.pdf>.

theory and practical issues of migration and religious diversity, and remaking eastern borders in Europe.³⁶ This diverse, multidisciplinary, multi-country cooperation through innovation and research aims to facilitate solid and swift integration of research communities into the European Research Area, which can be a powerful potential tool to expedite Western Balkans integration in the European Union³⁷ (Bartlett, Uvalić, 2018).

New Approaches and Strategies for Sustainable Development in Western Balkans—There have been fragmented stories, improvements in meeting some environmental, social, or economic needs, but often in ways that cause other problems. Policy makers often overlook traditional approaches to “sustainable development.” *Sustainable development* means that important structural changes are needed to manage economic, social, and environmental affairs. *Strategies* for sustainable development are about making and implementing choices, in a realistic, effective, and lasting way. Many countries have tried to plan their way out of problems in a technocratic manner, producing comprehensive, one-off national plans. Examples include National Conservation Strategies and Environmental Action Plans. Successful approaches set priorities and establish long-term vision; promote convergence between existing plans, ownership and are built on appropriate participation. Many strategies have failed to address the deep economic, social, and institutional changes so far.

The *strategy for sustainable development* is: “A coordinated set of continuously improving processes of analysis, debate, capacity-strengthening, planning and investment, which integrates the economic, social and environmental objectives of society, seeking trade offs where this is not possible.”

The set of principles encompasses a set of desirable processes and outcomes to emphasize local ownership, effective participation, and high-level commitment. In practice, the strategy should bring together the government, civil society, and the private sector to create a vision tactically. It identifies the integration between approaches or provides a framework for making choices where integration is not possible. A sustainable development strategy may be viewed as a system comprising the following components:

- Regular multi-stakeholder for negotiation at national and decentralized levels.
- A shared vision and set of broad strategic objectives.
- A set of mechanisms that can adapt to change (information system; communication capabilities; analytical processes; international engagement; and coordinated means for policy integration, budgeting, monitoring).

³⁶<https://www.cost.eu/cost-is-a-must-agricultural-research-and-knowledge-transfer-in-western-balkan-countries/>, <https://www.cost.eu/actions/TN1401/>, <https://www.cost.eu/actions/IS0803/#tabs+Name:Description>, <https://www.cost.eu/actions/CA20107/#tabs+Name:Description>, <https://www.cost.eu/actions/CA19135/#tabs+Name:Description>, <https://www.cost.eu/cost-actions/what-are-cost-actions/>.

³⁷<https://wbif.eu/news-details/european-commission-launches-32-billion-investment-package-western-balkans?fbclid=IwAR15MgKCsyZUBeF1Sn5USD-chbzC82B0nVThGye0Ssc6GbH7M6Qns4HaW8g>.

Western Balkan countries leading to massive brain drain and systems devastation (ETF, 2021; Bartlett, Uvalić, 2018).³⁸

Through the *PDIA stages* problem construction and deconstruction analysis helped reach awareness that our *main entry points* where we have significant authority, ability, and acceptance—predominantly by the WBAA constituents (across WB and EU) and HEI system country partners, have been the *societal and technological aspects*; as well as *economical and environmental aspects*.

It is understandable that across so many diverse contexts, *complications* are in sight. Yet, *choosing to act regionally* as a starting and ending point needs to be explained.

Which are the *key components* that lead to proper positioning of WBAA for further effectiveness, synergy, and emergence? How to *overcome “the big stuck”* faced on an individual country level? Which are the *local agents and entire ecosystem stakeholders* from the region, from the European Union that needed to be *engaged, activated, and held accountable*? The abilities were with little doubts, because of the high quality profile body of alumni educated and successful across the globe, that represented the initial acceptance mechanism too.

We could outline at least two to answer the “*how*” to achieve regional collaboration and improvement, bridged with the developed European Union: *meritocracy and voluntarism*. The first one, merits, for regaining trust that we know the way forward and we are sufficiently competent, capable, networked, collaborative, and hardworking to sustain it; and the voluntarism—denoting motivation, actions, and deeds coming from the heart, regaining trust in fraudulent image and representation of the Western Balkans to the world. We could continue with few more strategic choices—political agnosticism, level of the region instead of individual countries, approach on systemic stakeholder and individual level, bottom-up, top-down, lateral flow of ideas, projects, facilitation, authorization, and awareness of high-level EU and accession countries policy makers.

5 The Case of the Western Balkans Alumni Association (WBAA)

To argument why WBAA is selected to be analyzed as positive deviance, we are checking the characteristics it needs to have according to the general items to assess a case for being a positive deviance (Spreitzer, Sonenschein, 2004; Herington, Fliers, 2018):

- Intention (voluntary, not imposed, found within oneself/ves)
- Departure from norms
- Of an honorable nature

³⁸<https://wiiw.ac.at/migration-and-human-capital-in-the-western-balkans-pj-237.html>.

On principles of meritocracy, respecting differences but unifying upon mutual goals, voluntarism, activism, professional support, inclusiveness, open-mindedness, honesty, integrity, trust, apolitical win-win mentality, WBAA members act collaboratively, spreading empowerment, avoiding silos—through board of national representatives, functional teams for research and academic development, projects, communication & IT, career development, internal affairs since the beginning till 2021. Entitled WBAA teams 2.0, there has been restructured situation where the research team sustained, due to its importance and positive results, while the three other teams are quality mobility/student exchange within higher education,³⁹ Higher Education Reform & Equal access to higher education,⁴⁰ Transition from higher education to labor market and professional life,⁴¹ and Research.⁴² WBAA is facilitated by community management and EC. In this section, we are codifying the WBAA as a living organism, while in the next one, we are tracing the behavior and effects.

5.1 Profile and Timeline

In the official profile of the WBAA, the association is described as follows:⁴³

The Western Balkans Alumni Association (WBAA) is a regional association of alumni from Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, Kosovo,⁴⁴ and Serbia, who pursued international learning mobility in an Erasmus + Programme Country.

Officially launched in March 2018 (on a Confluence meeting in Ohrid), WBAA was born from the EU's Western Balkans Platform on Education and Training in 2014, where the Ministers of Education of the six Western Balkan countries agreed on the need to establish a regional network of alumni which was followed by an event organized by EC gathering of the related community (Erasmus+ alumni, students, teachers, representatives of youth organizations and National Erasmus+ Offices from the WB) at the conference "*Balkan Connexion: Dialogue on a Western Balkan Alumni Association (WB RAA)*" in Podgorica, Montenegro on

³⁹<https://www.western-balkans-alumni.eu/teams/quality-mobility-student-exchange-within-higher-education/>.

⁴⁰<https://www.western-balkans-alumni.eu/teams/higher-education-reform-equal-access-to-higher-education/>.

⁴¹<https://www.western-balkans-alumni.eu/teams/transition-2/>.

⁴²<https://www.western-balkans-alumni.eu/teams/research/>.

⁴³<https://education.ec.europa.eu/sites/default/files/document-library-docs/update-western-balkans-alumni-association.pdf>, <https://www.western-balkans-alumni.eu/category/wbaa-projects/>, <https://www.western-balkans-alumni.eu/tracer-study/>, https://www.western-balkans-alumni.eu/about/Rules_and_Regulations.

⁴⁴This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ opinion on the Kosovo declaration of independence.

3–4 November, 2016 where the “WESTERN BALKAN REGIONAL ALUMNI ASSOCIATION” was proposed as a project. Since its inception, WBAA has come a long way!

WBAA organized its first General Assembly in March 2019 in Tirana, Albania for all WBAA members, and also recently in March 2021 the second General Assembly took place. Since the beginning WBAA supports its members to implement WBAA projects which have a budget for material costs, while the expertise, competence, and effort are voluntary, mainly by the members.

Today, the association brings together many relevant actors in the Western Balkans to make sure that the young people’s voices in the region are heard loud and clear. During sessions and various formats organized by WBAA members for WBAA members on a regular basis, experts from different departments, professional fields, and regions are invited to provide important information about mobility programs, professional training, organizational structures, etc. The timeline is presented on Fig. 2.



Fig. 2 Timeline of WBAA progress

5.2 Objectives

WBAA's Objectives:

- *Establishing* a strong union of alumni from the Western Balkans
- *Promoting* mobility opportunities in Europe and beyond
- *Sharing* experience by supporting and mentoring students
- *Increasing* employability through the exchange of best practice, experience, and contacts
- *Empowering* and inspiring young people to achieve their goals
- *Contributing* to the modernization of higher education systems back home
- *Liaising* with other alumni associations in the EU and beyond

5.2.1 Aims and Goals of WBAA

The aim of the WBAA is to strengthen a union of alumni coming from the Western Balkan countries in order to advocate for modernization, improve the quality of higher education in the region and empower young people of the Western Balkans on their academic and career development toward successful employment.

More concretely, the WBAA aims to

1. Unify alumni within countries and across WB region
2. Exchange and share knowledge, experiences, contacts among WB alumni within a multinational and intercultural association
3. Enhance communication and cooperation with decision makers, representatives of higher education institutions (HEIs), governments, as well as with other institutions and organizations
4. Help the modernization efforts of WB Higher Education (HE) systems
5. Strengthen the links between Higher Education (HE) and the labor market to ease school-to-work transition and increase employability
6. Foster students mobility in WB and empower students to engage in mobility programs (including comfortable transition prior to and after the mobility period through different online and offline activities)
7. Promote HE and the importance of intercultural dialogue, learning, and mobility experiences. These objectives should be achieved by (inter alia and not exhaustive):
 - Deepening regional exchange and collaboration in the field of HE and beyond, by increasing the contacts between participants from EU funded projects and other EU Alumni Associations, WBAA alumni and local communities
 - Promoting and facilitating mutual mobility flows: between the Western Balkans and the European Union as well as within the Western Balkans
 - Involving and motivating young people into programs, projects, workshops, panel discussions, and other activities focused on raising awareness of the Western Balkans students' needs

- Building up the membership of the WBAA and expanding with new individuals and partners
- Advocating and promoting policy actions and activities that improve the quality of higher education and research capacities in the Western Balkans region
- Assisting national modernization efforts in the area of higher education
- Supporting new research initiatives and evidence-gathering of higher education reforms
- Cooperating with all relevant institutions (regional, but also international, national, and local) in achieving the goals of development and modernization of higher education in the Western Balkans by following the most successful European practices regarding higher education
- Supporting networking and cooperation between WB and EU universities as well as cooperation within the Western Balkans
- Advocating for changes to regulations, actions, and/or activities which could improve the situation of students from the region

In our opinion, the momentum of having critical mass of WB young intellectuals with professional/personal crossroads for development has been achieved—Western Balkans Alumni Association (WBAA) has been established in 2018, as regional association of alumni who have spent part of their studies abroad, funded by EU education & training programmes, born from the EU's WB Platform on Education and Training in 2014 (Ministers of Education of the six WB countries agreed on the need to establish a regional network of alumni). Action steps have been taken so that WBAA brings together all relevant actors to ensure young people's voices in the region are heard loud and clear, aiming to establish a strong union of alumni to advocate for modernization, improved higher education quality, empowered on their academic and career development toward successful employment.

5.3 *Governance for Enabling Regional co-creation*

In complex external/internal environments, broad stakeholder setting is necessary for value co-creation. Sustaining authority and legitimacy through inclusion of students, professors, researchers, staff, employees, volunteers from EU/WB is complemented with diverse geographic/structural setup:

- *European Commission support*: Directorate General for Education, Youth, Sport and Culture, and.
- *Professional Community Management* for the network(s): Service Provider, Germany.
- *Center(s) of excellence*: Ghent University Belgium, MIS Department, IHS Institute for Higher Education Studies, Austria (as examples, but each member has own similar links to EHEA), and long list of all host and home universities that built the alumni capacity and vice versa.

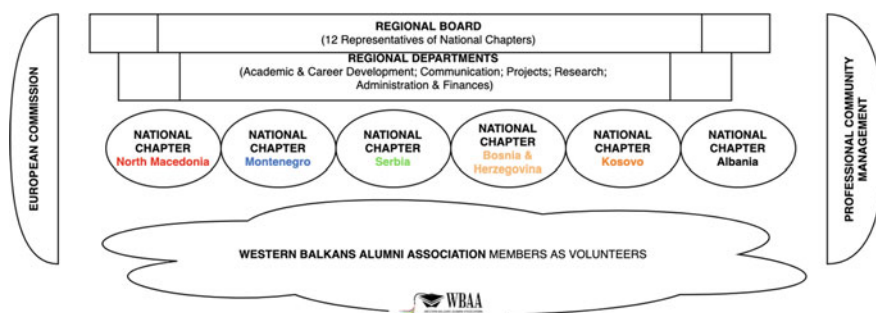


Fig. 3 Governance WBAA 1.0

- *WBAA Regional alumni network:* Bosnia & Herzegovina, Montenegro, Serbia, North Macedonia, Kosovo*, Albania.
- *WB-HEI system stakeholders:* WB Universities, Institutes, NGOs, Government, Institutions, Ministries of Education, National Agencies and Erasmus+ offices, Secretariats for European Affairs, Local Offices of European Union Delegations in the WB, Funding Bodies, Embassies, Other HEI initiatives/Consortia/Alliances, Businesses, Citizens, ...

The setup of the WBAA structure is essential to be able to carry out activities and iterate, having proper authority, acceptance, and abilities, maybe the most important aspect of PDIA that guarantees a path to success. It *facilitates top-down, bottom-up, and lateral communication and collaboration of empowered agents*—working out difficult, but very appropriate mechanisms for effective engagement and for PDIA iterations that lead to success. The images below (Figs. 3 and 4) show the components, while functional bridges exist among each and every one of them in all directions, as initial setup and updated one.

6 Focused Analysis: Pushing WBAA as Positive Deviance

How is the *positive deviance carried out in action*? How is WBAA activity addressing the societal and technological, as well as environmental and economical problems as detected in the Ishikawa diagram? What is the behavior of this special organism?

As we are contemplating these chapters, complementary to the coronavirus deadliness, there are wars across the globe. And many of these co-authors are children of previous wars, continuously reinventing themselves in the role of co-creators, while the horrors of war and death are vivid reminiscence of humanity's co-destruction.

This analysis attempts to codify and point out the “how” of WBAA in improving the deteriorated higher education systems across Western Balkans.

Fig. 4 Governance WBAA 2.0



6.1 *Multimodal, Multidisciplinary Activities on Individual and Collective Level with Regional and Functional Connotation*

WBAA alumni engage in multimodal, multidisciplinary activities on individual, group and toward systemic level. To reflect the specific entry points in the fishbone diagram, regarding societal, economical, environmental, and technological aspects we know we can address. Predominantly, the PDIA as strategy for complexity, combined with tactics for complexity has been carried out through the research team, but continuously, the effects encompassed the entire association, through the links in place. Crawling the design space has been a remarkable journey on its own—sky is the limit, and with such abundant resources and intriguing limitations, creativity thrives and solutions are found. Even when stumbling on the path of applicability for the different contexts and achievement of the regional note, still, the search and fit process is a remarkable learning experience, for all.

How is this being achieved:

- The *virtual exchange* is WBAA's ally. We have perfected the world's "free" offerings: virtual teams, online collaboration, blended learning, online social & professional platforms, free online courses, MOOCs, MOOTs, aggregators, free online collaborative tools—cloud drives/docs/forms, free e-learning platform Moodle, information sharing for projects/employments/internships/funding calls, . . .
- WBAA members (and collaborators) are *learning by doing*. Opportunities generated through internal funding for regional (multilateral and local) projects are a showcase of competent, honest, and creative ways to build internal/external capacity—workshops, sport activities, seminars, webinars, video tutorials, in person/virtual coaching, mentoring, advice, environmental activism, . . . We are activating our individual entry points and trust built with mentors, peers through individual co-supervision of thesis, internships, exchanges, double degrees, and other modalities facing the toughest entry point(s) at systemic level. Creativity and motivation at their most beautiful expression.
- The *projects and activities are on local, national, multilateral and most importantly—regional level*.⁴⁵ Especially the research team concept, but also all others, starts to see the emergence and even the sort of competitive advantage to utilize the regional aspect, to increase acceptance and effects.
- The potential of such a network is amazing. Complexity theory suggests that complex adaptive systems agents need empowerment in their roles, moderately dense connections, and governing principles on how to behave—to result in emergent effects. The *most abundant repository of knowledge, skills, competences, and networks exists among WBAA members* and their peers, as educated intellectuals and global citizens. If one thinks of all diverse profiles, professions, experiences, and affiliations are in one place, it would be striking of how diverse human resource, human capital, and social equity we have and can put in action—and so we do act!

Activism before the pandemic—succeeding the extensive engagement of WBAA initial organizers (since 2014 onward) to initiate, set up, and kick-off the association, there have been some official projects which also took place during 2018 and 2019,⁴⁶ the years before the pandemic. Each of them built capabilities on local, multi-country (Multi-Country Western Balkans Youth Window under Erasmus, 2020), and regional level, as in Fig. 5. The data has been obtained in a research project for this purpose, carried out by Gavriloska (2021) under mentorship of the head of the research team, Petrevska Nechkoska Renata.

Activism during the pandemic—one of the indicators of high engagement and effective outreach of WBAA volunteers on regional level is during the hardship of

⁴⁵ <https://www.western-balkans-alumni.eu/projects/call-for-project-ideas/>.

⁴⁶ <https://www.western-balkans-alumni.eu/projects/wbaa-projects-2019/>.

Western Balkans countries involved in the WBAA activities before the pandemic

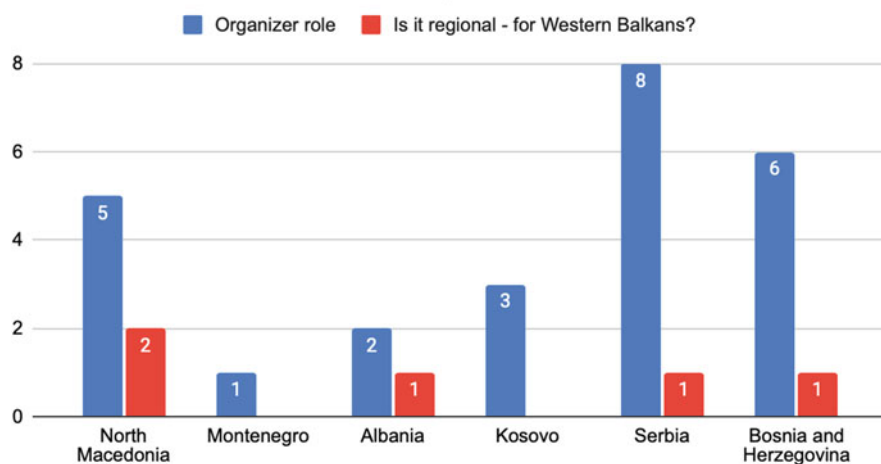


Fig. 5 Organizer countries and regional projects from WBAA before the pandemic (up to 2019)

the coronavirus pandemic in 2020⁴⁷ and 2021.⁴⁸ In the appendix, there is an inventory of all activities conveyed by WBAA members during the 2 years, showcasing remarkable sustained engagement, primarily with impact on broader public, youth, and WB citizens. Data shows that out of the analyzed 24 months, at least 21 months of activities (629 days of work) have been noted, which means almost constant voluntary engagement across WBAA. Here are some aspects, more can be drawn upon same data analysis (Fig. 6):

It is visible that every organizer within WBAA has the ambition to make regional activity, and almost never within only a single country—at least 3 neighboring countries or including Western Balkans as a whole (red columns) (Fig. 7). This denotes the capability within WBAA members to engage and achieve collaboration as a regional network, which is one of the arguments for its profiling as “positive deviance.” Especially since the outreach of all activities is very general for all WB youth (Fig. 8).

It is visible that in the first year of the pandemic, 2020, there are many scattered activities which the most active members have organized to showcase (Fig. 9), set the scene, track the road for virtual engagement. While in 2021, most of the activities fall within the WBAA projects, meaning WBAA members really network and regionalize to produce emergent effects as a region, as a co-creative collaboration force across Western Balkans (Fig. 10).

⁴⁷ <https://www.western-balkans-alumni.eu/projects/wbaa-projects-2020/>.

⁴⁸ <https://www.western-balkans-alumni.eu/projects/wbaa-projects-2021/>.

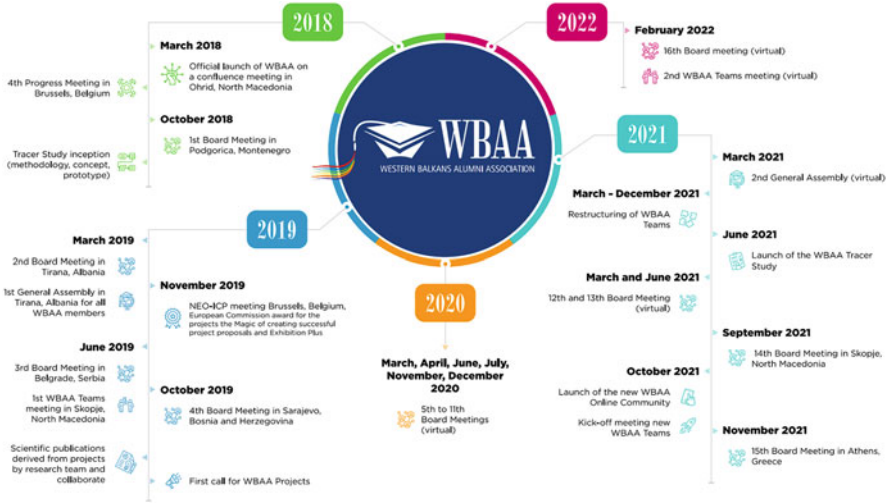


Fig. 6 Modalities of WBAA activities during the pandemic of 2020–2021

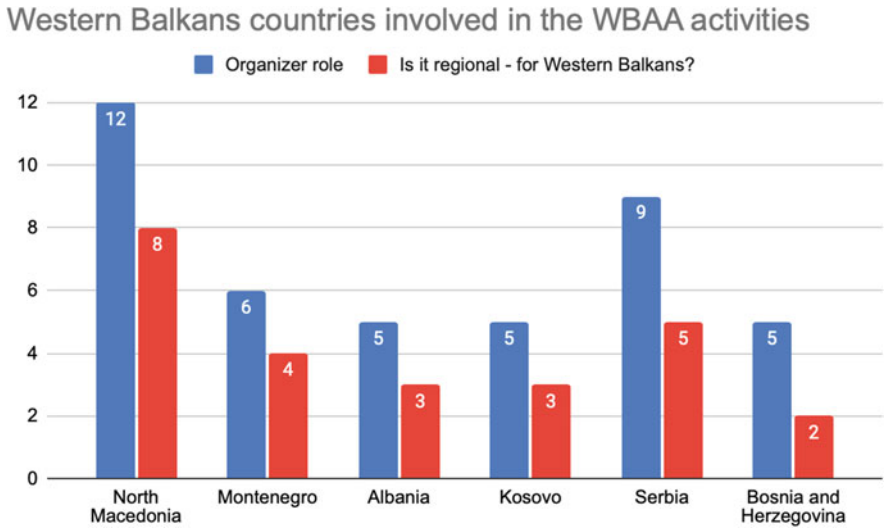


Fig. 7 Organizer countries and regional projects from WBAA during the pandemic (2020–2021)

One of the most complex and durable undertakings of the WBAA and its Research team has been the co-creation and realization of the *Tracer study*. It has been facilitated by the European Commission, DG EAC, Institute for Advanced Studies Vienna, Austria and the brightest members of the WBAA Regional Board

Activities per number of participants (incl. organizers) - outreach

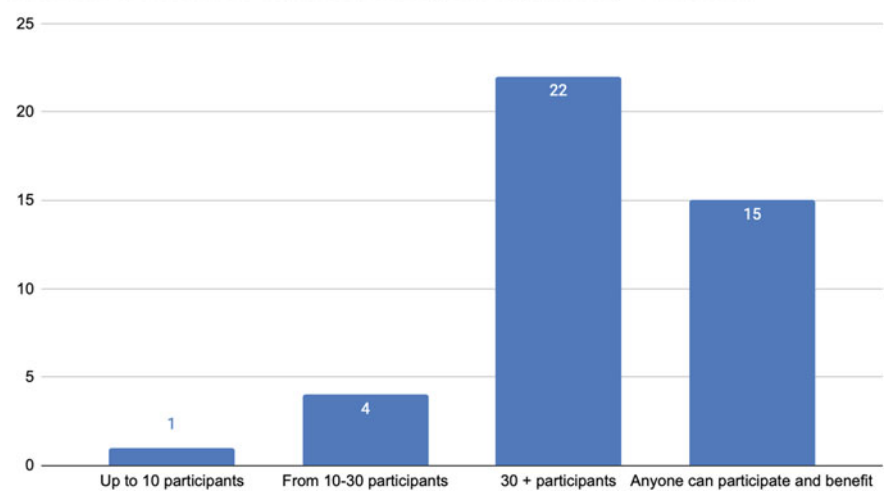


Fig. 8 WBAA activities' outreach in number of participants and availability to the WB youth in general

WBAA activities during 2020 (in days)

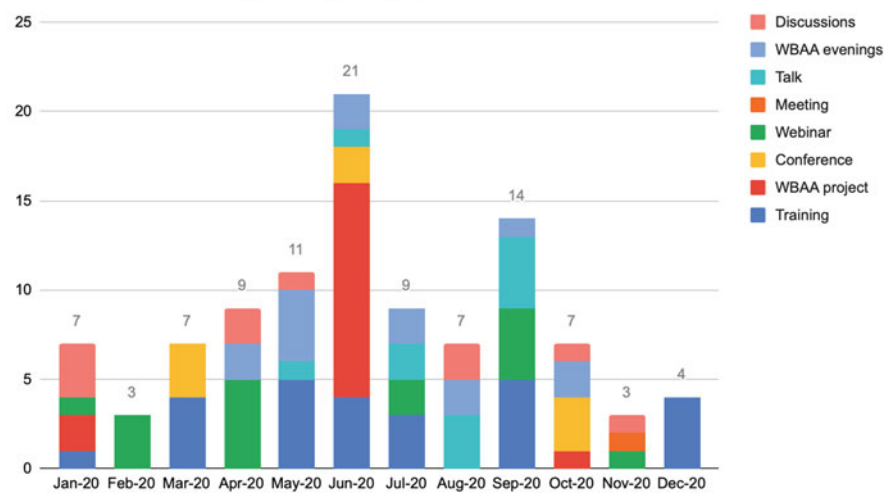


Fig. 9 WBAA activities during 2020

representatives and Research team head and collaborates, throughout 2018–2022.⁴⁹ The WBAA tracer study aims to gather alumni relevant perceptions, opinions,

⁴⁹https://www.western-balkans-alumni.eu/wp-content/uploads/2021/05/WBAA-tracer_study-may19.pdf.

WBAA Activities during 2021 (in days)

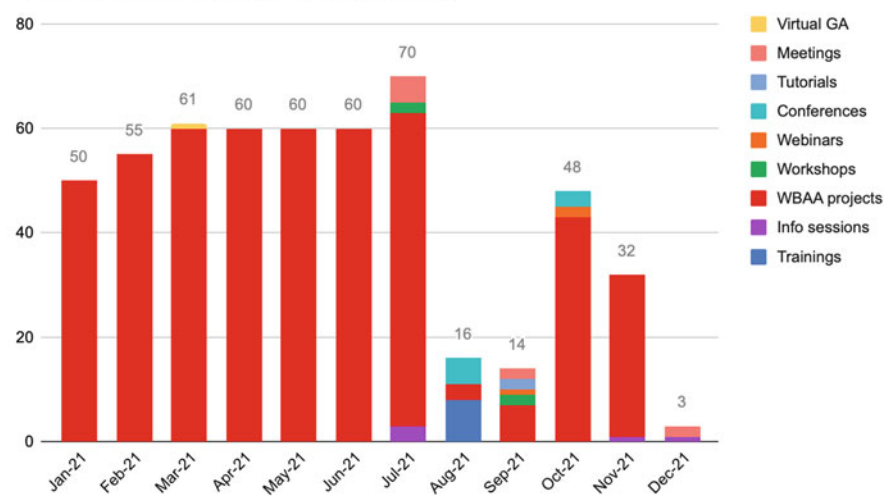


Fig. 10 WBAA activities during 2021

experiences, knowledge, memories, pathways, and ideas to contribute to the academic landscape and economies of the Western Balkan countries. This study’s purpose is to support the improvement of the academic and economic aspects of various institutions by collecting qualitative and quantitative data and reliable information from the students and staff who had an exchange experience, as well as enable the evidence-based evaluation and policy advice of higher education systems as a whole. Eligible participants are alumni from the Western Balkan countries (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, Kosovo*, and Serbia)—who have spent part of their studies outside the Western Balkans in one of the Erasmus+ Programme Countries, either as an EU or non-EU country scholar or as a self-funded individual. In the Tracer Study methodology, the main research instrument is the Questionnaire with close-ended, pre-coded, and open-ended questions, approx. 20 min duration on average. The Questionnaire design process aims to meet the purpose of the study, and to answer the research questions. The data will be analyzed and presented disaggregated per country and mobility program with the possibility of further analysis taking into account gender, age, and other demographics. The tracer study has expected Outputs Report and papers which ultimately have the ambition to support Western Balkans data-driven actions, decisions, and policy making. The timeline of activities for the Tracer Study, conveyed as co-creation throughout its entire lifecycle, incorporates (Fig. 11):

- Drafting the methodology
- Workshops on purpose and design
- Content preparation
- Alpha version testing



Fig. 11 WBAA Tracer study objectives

- Beta version testing
- Marketing campaign
- Go Live
- Result analysis report
- Dissemination to HEI systems and stakeholders across Western Balkans, EU, and globally
- Conference and journal papers, research, implementations and publications
- Data-driven policy advice, institutional setting, system development
- Opening of the anonymized data for public use

The tracer study has been motivating the alumni to engage in it, so that the real potential is mapped. Its invite has been entitled Bring back your experience—let us trace our UNI space!, addressing all WB alumni (not just WBAA members): “YOU, as the ones who have experienced both education systems (WB and EU) are the ones who can make functional bridges and provide constructive material for making a positive change bottom-up, top-down and lateral, via your own example and through our strong network, to the relevant stakeholders, for our future generations! Voice your experience and ideas from your stay abroad in a competent manner and help contribute to the academic landscape and economies of your country and our Western Balkans! Shape pathways toward improvement, innovation, change and excellence. Include your opinions as building blocks of your country’s higher education system: If not now—when? If not us—who? Relive through memories a time when you were happy and felt like a fulfilled student and/or professor.”⁵⁰

⁵⁰<https://www.western-balkans-alumni.eu/bring-back-your-experience-wbaa-tracer-study-2021/>.

On the side of collaboration within WBAA projects and activities resulting with *scientific publications (in conferences, journals)*, tracing the aspects of multi-country, multi-profile, multi-domains, and co-creation in general, we could enlist (but are not limited to) the following:

- The very first one from the head of research team and collaborates: *Multi Creation—participatory learning approach for business—academia collaboration* (Petrevska Nechkoska et al., 2019) (approach extended in depth in Chapter “MultiCREATION: Multi-Stakeholder Problem-Driven Approach”)
- *Gamification and blended learning in vocational training and coaching in short courses* (Petrevska Nechkoska et al., 2019)
- *Engaging Economics and Traffic Engineering Students in Community Issues using the Multicreation Approach* (Petrevska Nechkoska et al., 2021) and *Multi creation* – Participatory learning approach for business – Academia collaboration (Petrevska Nechkoska, Angeloska-Dichovska, 2020)
- *Evaluation of the online learning process during the COVID-19 pandemic period toward better future approaches of higher education perspectives on the Balkans* (Vrenozi et al., 2020)

6.2 Intellectual Rebellion

Bringing out the best examples, good practices, enabling creativity, freedom of ideas, reconfiguration and facilitation of inclusiveness have given the WBAA members strength to raise their voice, stand up for their beliefs, fight right in the real-life arena with the tools of a global citizen and intellectual. Numerous examples of actions that denoted constructive criticism and *intellectual rebellion* for better systems and better processes have been recorded, and more to come. The principle being followed is to criticize, evaluate, and assess in order to activate and involve solutions. The notion that you are part of something worthwhile in such a disintegrated environment helps extensively.

However, gaining broader stakeholder collaboration, making bridges, and increasing acceptance need to be done through increased awareness, input, positive discrimination, engagement, needed from all partners if willing to co-evolve together. First and foremost—determination, dedication, perception of interchangeable mutually beneficial collaboration among all EU/WB stakeholders.

The WB-HEI landscape has diverse examples of non-functional HEI systems—for which *context-appropriate-best-practices* and a lot of *strategic/tactical/operational work* is needed to reconfigure.

Building functional bridges every step of the way is in the WBAA members DNA—and through the internal projects that iterated three times by now, through the external dissemination to high-level policy makers, WBAA increases its

authority, acceptance, and ability to make a positive difference threefold: on regional, local, and WB<>EU level.

We still have *far-fetched wishes*: *Dedicated funding* and *open access science* are just two prerogatives we enlist as scarce. Few funding schemes, such as COST-action incorporate geographical and developmental requirements to involve WB region. German Federal Ministry of Education and Research under the Federal Government's Strategy for the Internationalization introduced (Bridge2ERA)—funding program for “Integration of the Central, Eastern and South Eastern European Region in the European Research Area” for cooperation between German institutions and (academic/business) partners in these countries, for drafting joint proposals.

But, the competitive arena is the same for big players and for WB—supporting innovation. We try to “advertise” a new focus to “*innovation in context*”—having an abundance of problems in WB challenging all educational/research disciplines. We are introducing Harvard's Centre for International Development Problem Driven Iterative Adaptation strategy for complexity, the Denica method for tactical management in complexity practiced in the Research team and beyond, and diverse operational approaches, to ensure individual/group affirmative actions can result in systemic positive change.

WBAA is contributing to reconciliation of the youth in the WB by creating a community where all WB work together with respect and no prejudice—one of the *next big endeavors* is a tracer study to map all the WB alumni and their whereabouts, capabilities as massive competent resource motivated to improve the future by acting in the present.

Our expansion of authority and acceptance, to result with enhancement of ability, will happen when we strengthen the stakeholder partnerships across the region—with ministries, delegations of EU, embassies, ... and have at least one regional consortium being granted funding for conferences or joint WB degrees, where even developed countries' students would be attracted to be educated on WB context specific competitive advantages and innovation-in-context. But that is something to *aim for in the next iterations*, and to elaborate in next articles.

For years, individual personalities, knowledge, and skills each one represented, acted on this European Commission's “baby project” *to activate each other's potentials and engagement following true compass*. Nowadays, network effects have *emerged* with increasing power. We invest all our intellectual capabilities and use given free/granted resources—however, to sustain significant improvement, the mechanisms in place need many more partners, collaborators, and friends acting in the same direction. And to conclude with the unwritten ingredients that complement PDIA efforts for WBAA to achieve its difficult, but reachable regional effects: *motivating, helping, and inspiring each other!*

7 Conclusions

The aim of this paper was to portray and explain how the Western Balkans Alumni Association positively contributes to the WB region and thus represents a Positive Deviance. Throughout the article the authors argued that WBAA not only contributed to positive results across the region but it also brought people together voluntarily united over the same mission. The region of Western Balkans and its six* countries are facing many similar challenges, which brought people closer together. Indeed, regardless of the political polarization and devastated systems, WBAA members managed to overcome differences and misunderstandings and rather focused on the same goal of improving the living and in particular education standards in their respective countries.

With engagement of its most active members, WBAA managed to organize a set of activities, seminars, and trainings which contributed to improvement of participants' soft skills, knowledge on various topics (from project writing to mental health), brought them closer to European values and ideas, and contributed to the widening of their network of regional contacts. Overall, the positive impact that WBAA had can be measured through the increase in members' engagement in their communities over time, as well as their employability and joint projects undertaken.

Bearing in mind that the region faces the outward migration, WBAA managed to keep people somehow connected to their local communities and fellow citizens, and encouraged the idea of giving back to the community they decided to leave. Finally, through its active collaboration with the six respective governments and the European Union, WBAA is working on improving the higher education systems in the region, so as to ensure a better future not only for its members, but for all of the WB citizens.

If you carefully analyze problems in the region, which all regional states share, and look into WBAA activities and engagement of its members, you can notice a steady growing number of those interested in contributing on a voluntary basis to the efforts of building more sustainable and successful communities. That fact speaks of WBAA's influence and itself as a positive deviance.

PDIA guidelines for positive deviance (Andrews et al., 2017; Samji et al., 2018) checked:

- *ideas that are already being acted upon in the change context* (meaning they are possible)—yes, WBAA exists and acts both preparatory and officially for number of years,
- *they are yielding positive results* (meaning they have technically correct mechanisms and approach)—yes, the visibility and impact of the WBAA and its members are substantial, as described below,
- *they are not the norm* (meaning they showcase how things can be done successfully, but are practiced by only a small portion or within parts but not overall in a region, context, domain)—true, because the region is still acting as segmented, separate countries or via bilateral relations, while the bridges with the developed world are different and scarce.

Some of the identified limitations and challenges during the WBAA projects management are: i) complexity of project activities financing deal; ii) set of contracts that must be negotiated by all the parties; iii) dealing with project-related-tax and legal issues, different in the six countries and with the European Union countries as funding bodies, iv) constantly changing EC and SP responsible persons resulting with handovers and loss of information, and v) attention to deadlines.

As a nice but hard to achieve idea of regional, including functional ecosystems, the WBAA story is a positive one. Learning from its roadmap, governance, voluntary activism, and impact may help WB governments and citizens on how to co-create every step of a way of improvement. As some of the social media posts about WBAA-nian projects would say: “This is how Western Balkans collaborates perfectly—and voluntarily!”

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



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 brainstorm’, 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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Photo by Vladimir Petrovski

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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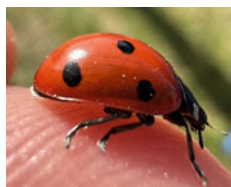
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Abstract Since its burst in early 2020, the Covid-19 pandemic has deeply affected every aspect of daily life, from international trade and travelling to restrictions on an individual level, becoming a complex multi-level and highly multi-faceted problem. 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:

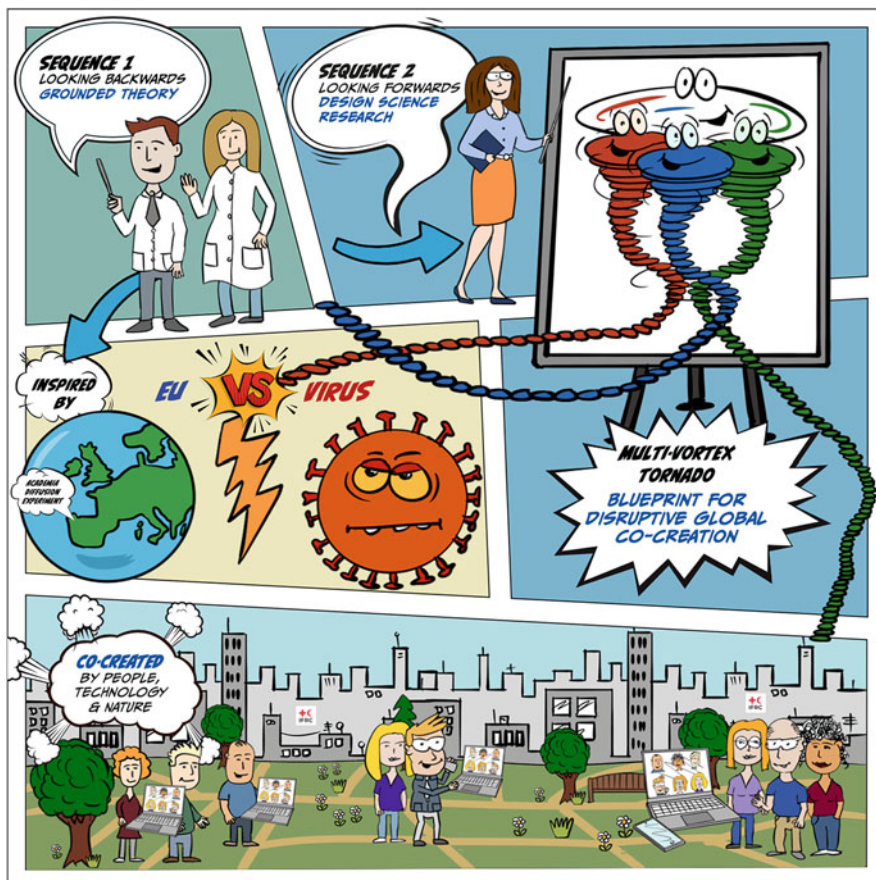
'We are learning

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 experiment⁶) 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/eisma/newsletter-archives/22323>, <https://eic.eisma.eu/challenges/>.

⁴<https://euvsvirus.live/launchathon/>, <https://eic.eisma.eu/community/articles/euvsvirus-launchathon-innovation-comes-collaboration>.

⁵<https://www.linkedin.com/groups/8928483/>.

⁶One 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 matchathons⁸ 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>.

⁸Matchathon 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 potency.

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>.

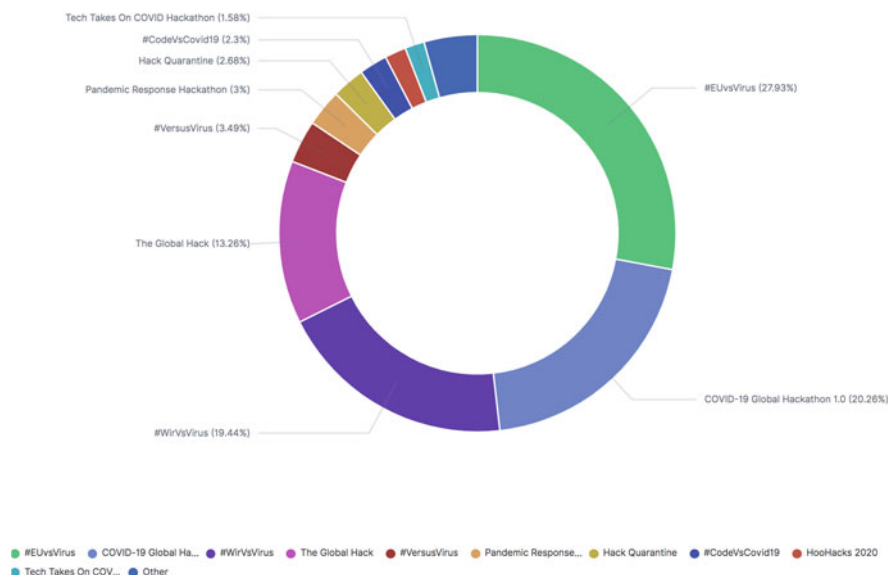


Fig. 1 Relevance of the EUvsVirus among the hackathons during the pandemic (<https://slackcommunity.com/events/details/slack-berlin-presents-european-covid-19-special/>)

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; Schmidhuber 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

¹⁰https://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; Schmidhuber 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>.

¹⁷OECD 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.pdf, accessed 11 Dec 2021.

¹⁸https://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-Solving¹⁹

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 world²¹ 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.

¹⁹Good 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).

²⁰The collective mind concept has been long time used.

²¹http://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>.

²⁴Non-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

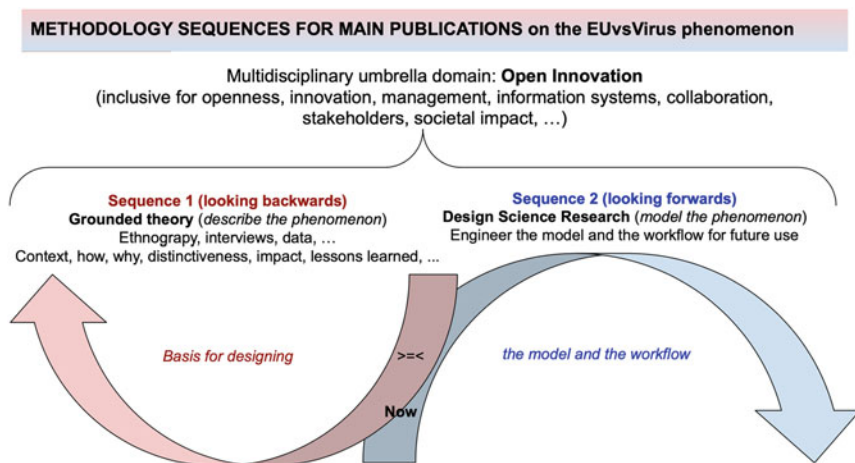


Fig. 2 Methodology sequences on describing and modelling EUvsVirus

Experiment information and communication setting (all-in-one Google Drive, web-portal³⁷) 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 (Glaser & 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-portal³⁸ especially dedicated to onboarding and alignment within the ADE.

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

What should it look like?

Quintuple helices (University, Industry, Government, Civil Society, Environment)

Viewed from above:



Viewed from the side

multi-vortex/helix megatornado

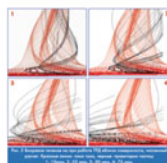


Fig. 3 Heuristics used early in the research as impressions on what EUvsVirus felt and looked like

What is the story?

We try to support the formation of the helices with diverse data. Intended novelties:

1) Fit within the theory:

Describe the 5 helices, prove connectors
Portray bridges, alignment & enablers (yellow)
 (via people in multiple roles & via technology)



2) **Describe the DNA that forms each vortex:**

managerial, technological, organisational?? (need help with these aspects)



3) Point out **triggers** that punctuate the equilibrium

4) Uncover influencers that pressure the DNA to form **mutations**

5) State the **preconditions where & when innovation happens** - the **windspeed in the tornado**, figuratively speaking

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 EUvsVirus phenomenon:

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

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:

³⁹Briscoe, 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.

Matrix for data reasoning - Academia Diffusion Experiment				
4 dimensions (which need to be addressed by all means)				
Guiding principles for semi-structured interviews/ethnography and all other data capture approaches				
The general intention: 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) All through the lens of to-be-able-to-describe the Quintuple or N-helix (University, Industry, Government, Civil Society, Environment, ...) model, mechanisms, dynamics, synergy, emergence and novelty in co-creation and opportunity	Dimension 1:			Demographic data & profiling
	VIEWPOINT			
	Personal Group Community	Technological	Organisational (incl. Managerial)	Dimension 2: EXPERIENCE
	Ecosystem development - components and mechanisms			
	Was EUvsVirus distinctive? Why and how?			
	MULTI-, CO-, OPEN- aspects			
Dimension 3: PERCEPTION	Opportunity discovery & development			
	Creativity, improvisation, testing, rapid prototyping			
	Creation and growth possibilities			
	Co-creation magic			
	Purpose & Impact			
Horrible/Regular/EXCEPTIONAL aspects in the EUvsVirus hack/matchathon				
The connection of the phenomenon with the individual future. Are you still holding on to the thread stretched out by EUvsVirus? Or lost it?				
4) 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 freedom to operate, threats, proper outcomes Governance structure and Organisational dynamics, empowerment, accountability, trust, curiosity, passion, freedom				
CIMO logic				
Context (lockdown; virtual and digital connectivity; roles undertaken) - Interventions/Actions - Mechanisms (incl. enablers & barriers) - Outcomes				
Dimension 4:				
TIMELINE of the phenomenon (calendar and chronogramme, milestones & stages-incl. Intuiting, Interpreting, Integrating, Institutionalising-as iterative processes happening at different stages)				
Please try to capture all possible from each subject so that we can portray the distinctiveness & effectiveness, and to be able to point out the preconditions and actors that set the scene to co-create value, and where and how innovation happens				
Sincere gratitude from the CO-DREAMERS				

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

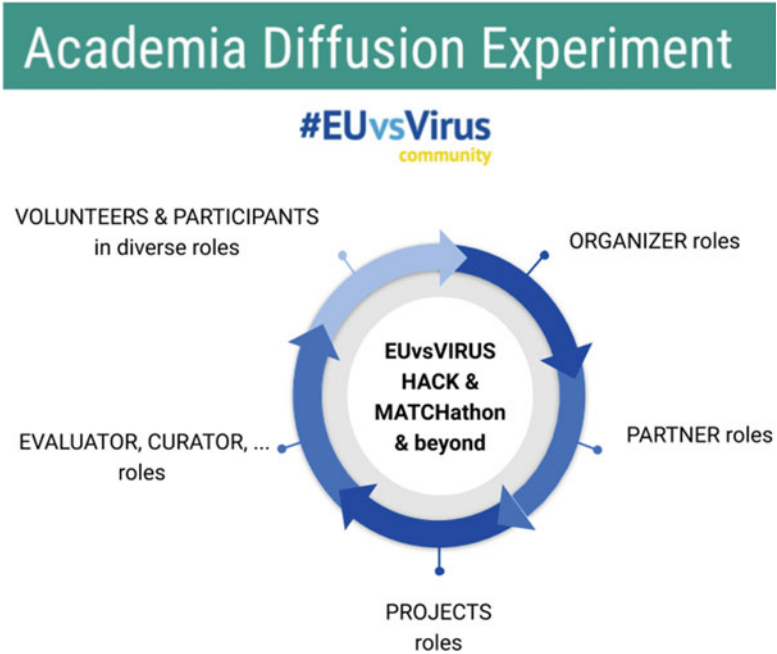


Fig. 8 Main categories of roles within the researched phenomenon of EUvsVirus

ID Role	INVENTORY	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, Games, ALL
	OF ROLES OF EUVS VIRUS (HACKATHON, MATCHATHON, EIC COVID PLATFORM, COMMUNITY)			
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.

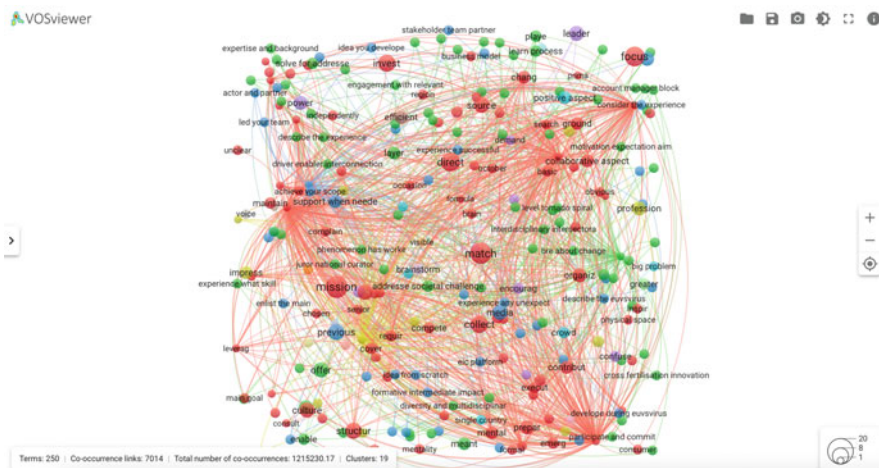


Fig. 10 Main concepts and their co-locations observed in the ethnographic statements and interviews (visualisation generated using nocodefunctions (https://nocodefunctions.com/topics/topic_extraction_tool.html?sessionId=e39e8716dcd8405e24d8bc558c43) and vosviewer (<https://www.vosviewer.com>))

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.

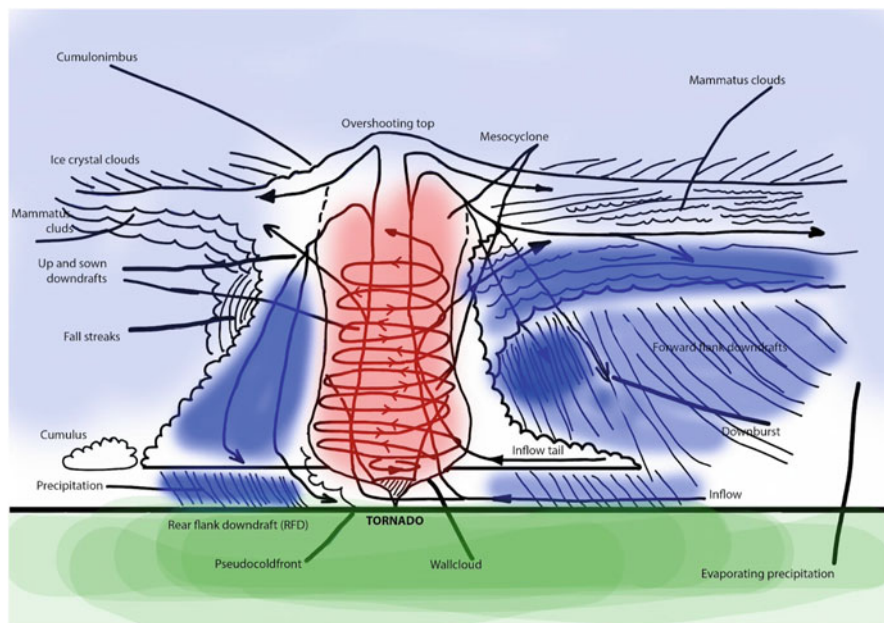


Fig. 11 Overall view of tornado elements and evolution from inception to termination

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).

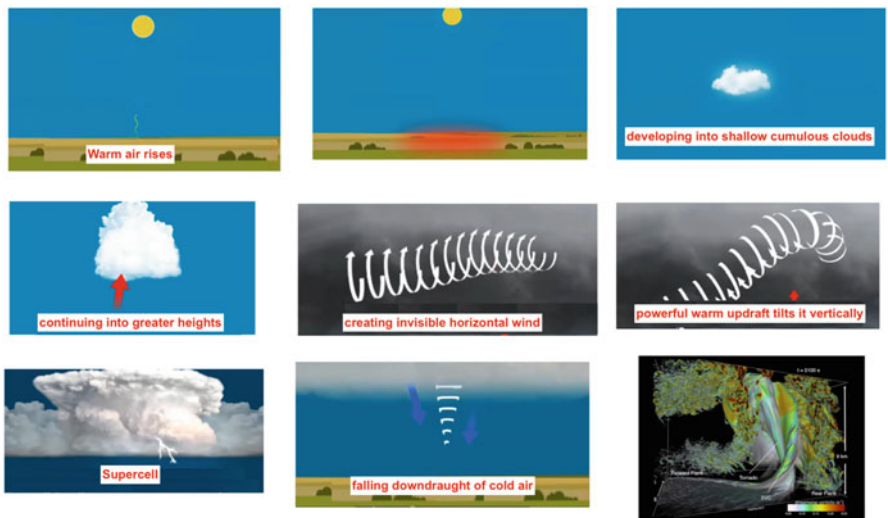


Fig. 12 Stages of tornado formation, as basis for the analogy

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 lockdown 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 updrafts 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. Tornadoes 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 downdrafts 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

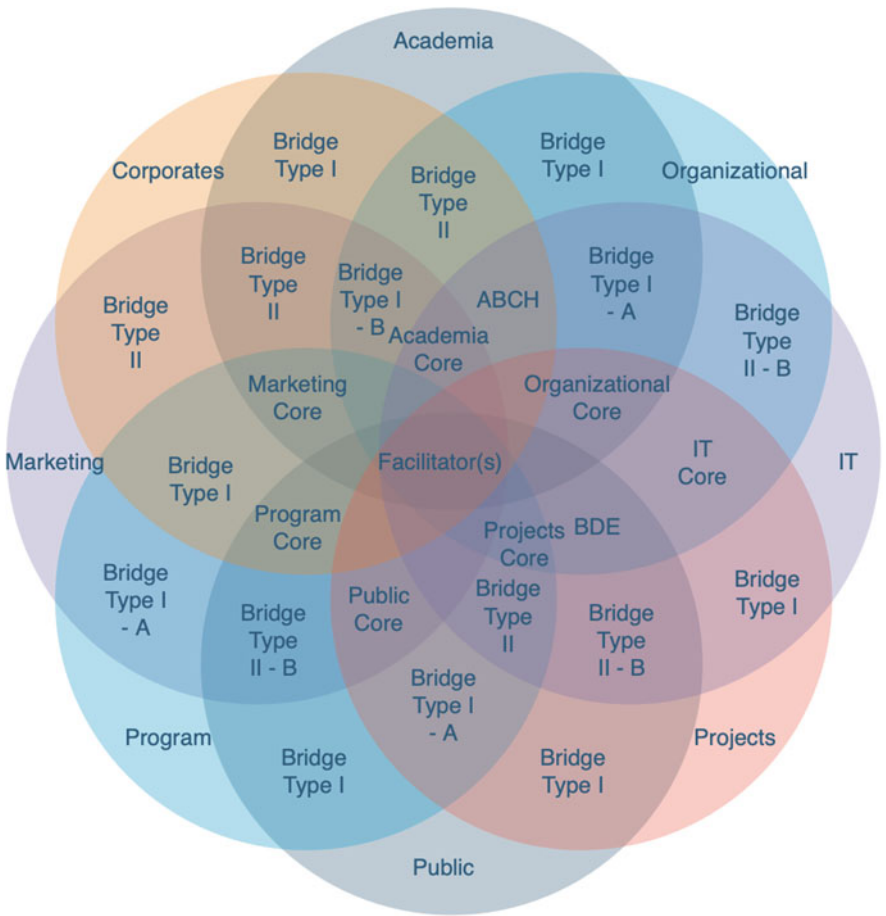
- Grow and stretch the funnel and expand to cover more ground! (EUvsVirus: keep everyone willing, onboarded, and in the game!)
- Showcase the exemplary vortex and dance with the multiple vortices, sometimes conjoining sometimes separating, by all means existing and merging.
- Enable platforms, answer 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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The endeavour to produce applicable knowledge on how to co-create value together spinned off from EUvsVirus in the shape of Academia Diffusion Experiment, throughout 2+ years, and it was made possible by the co-authors and contributors under one name—co-dreamers: Sincere gratitude for the various forms of engagement and contribution to Alexandra Nothnagel, Victor Suturin, Gabriella Marcelja, Borislav Kostadinov, Steffen Farny, Colin Keogh, Karin Huber-Heim, Shivam Dhawan, Peter Minea, Cassie (Jiaxin) Li, Alberto Peralta, Nikolaos Stergiannis, Natasa Kurucki, Jorge Cánovas Montoya, Isidro Laso Ballesteros, Hila Lifshitz-Assaf and the European Commissioner for Innovation, Research, Culture, Education and Youth—Mariya Gabriel.

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/1FkxI72SBCKlFYISunbEQhvhIXspXImBn?usp=sharing>

LINK TO FORM FOR SIGNATURE IN PDF HERE:
<https://drive.google.com/file/d/1hIKyF7QFKOxDz511fPk2WG8MvERpQ9By/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 EUVS VIRUS 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?

Research Question 1: Hackathon Experiment

- 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 matchathon? *(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-lements: 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 multidisciplinary 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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