

# Quadruple Helix Model Organisation and Tensions in Participatory Design Teams

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## ABSTRACT

Co-design projects often include multiple partners from diverse organisations in a Quadruple Helix model for innovation. While literature on co-design and participatory design (PD) projects often focus on how to co-design with end-users or citizens, our paper discusses collaboration issues among citizen, industrial, public and academic partners in a living lab-based co-design project. Through analysis of end-project interviews with these partners, we identify a number of tensions that were negotiated in the course of the project, and identify team management, collaboration and facilitation strategies for putting PD to work among this group of citizen, industrial, public and academic partners. We discuss the conflicting discourses of the Quadruple Helix model and the co-design approach to innovation as a possible reason for such tensions. We understand tensions in PD projects organized in a Quadruple Helix model for innovation as both unavoidable and in some cases even productive in driving forward innovative design.

## Author Keywords

Quadruple Helix, co-design, participatory design, living lab, tension, case study.

## ACM Classification Keywords

H.5 Information interfaces and presentation, H.5.m Miscellaneous.

## INTRODUCTION

Managing a diverse group of co-design project partners in a Quadruple Helix model [17] - a collaborative innovation organisation of academic, industrial, public and civic citizen partners with different agendas, values and methodological preferences - is a difficult facilitation process. It involves continuous listening to, understanding of, and negotiation of different expectations among all partners. In the Give&Take project case presented here, the long-term participatory engagements were established around setting up living lab

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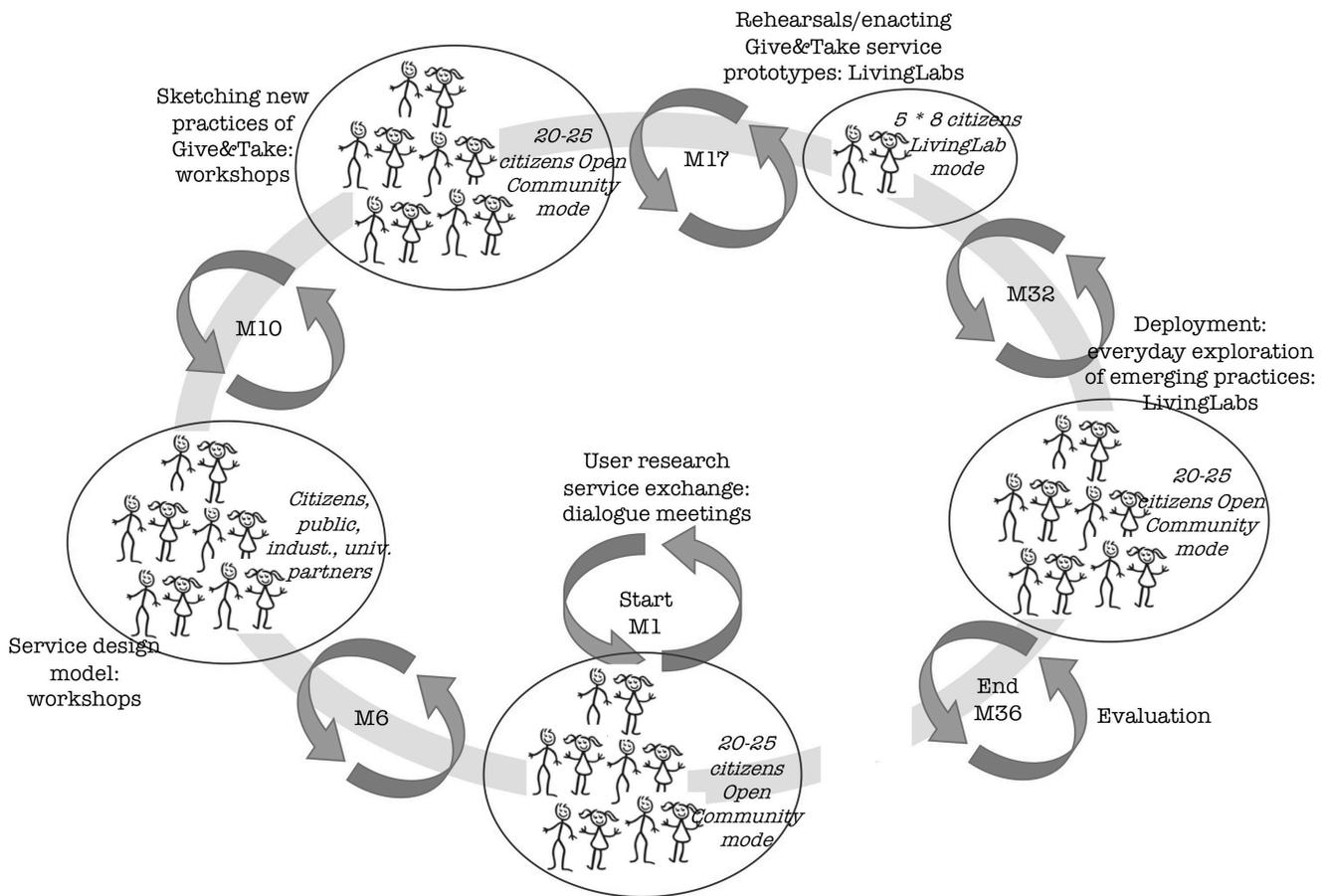
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environments to explore and design new forms of community participation and sharing in local communities for senior citizens (<http://givetake.eu/>).

Much research on managing or facilitating co-design and participatory design (PD) projects focusses on *identifying end-users' or citizens' values* embedded in co-design outcomes [24] or more specifically *identifying value sensitive stakeholder prompts* and *designer prompts* in a co-design process [25]. Another focus relates to *selection of and engagements with end-users or citizens'*, often denoted 'users' [22]. Rarely, however, do we expand this focus to include academic, industrial, and public partners in the project team. According to Ogonowski et al. [16], few studies deal with the challenges in building up and running a living lab, and the importance of team composition and process facilitation in co-design [22].

Studies of living labs as a co-design approach point to the complexities and difficulties of managing and facilitating living labs. Kanstrup [13] states that "empirical studies show that living labs are complex arrangements affected by hundreds of activities and decisions made by internal and external stakeholders" [10:3]. On the other hand, living labs offer a unique environment for exploratory collaboration between technology designers and civic participants, but these collaborations are far from the joyful and effortless image found in the existing living lab literature; rather, living labs are characterised by "high levels of frustration and conflicts of interests" [8:205].

In this paper, we turn the mirror on ourselves as academic partners and facilitators in a co-design project, called Give&Take, to reflect on how we in a Quadruple Helix Model organisation of academic, industrial, public and civic partners negotiated and evolved a shared understanding, or not, and how it influenced the co-design process. Based on five end-of-project reflective discussions (interviews) with contracted project partners, we identify some of the subsequent tensions that we experienced within the project partner constellation. The tensions that were negotiated in the course of the project are identified into four areas related to team management, collaboration, and facilitation strategies for putting PD to work among this group of citizen, industrial, public and academic partners. Based on areas of tension, we conclude the paper by pointing to six methodological insights and practical 'middle out' strategies to help other Quadruple Helix Model based projects.



**Figure 1: Co-design processes structuring the activities of the Give&Take project.**

These go towards creating awareness about different cultures of working, ensuring that software developers do not work from a conventional requirements specification model of design, and involving software developers directly in living lab activities. In doing so we understand tensions in Participatory Design (PD) projects as both unavoidable and potentially productive in driving innovative design forward.

### Project Context

The Give&Take project forming the case here was funded under the European Active and Assisted Living (AAL) program. The initial aim of the project was to “design service infrastructures for a good senior life by retaining knowledge, expertise and abilities of older people to perform unpaid work.” The technical infrastructure was meant to establish “a basis for end-user concepts for reciprocal exchange of services and facilitating networks for everyday activities among retired seniors and other citizens with capacity for volunteer work.” There was a strong requirement from the funder to deliver a solution that was near to market (3-5 year horizon). The 3-year long project was organised around a series of co-design events (see figure 1) engaging a total of around 200 citizens in two major European cities, Frederiksberg and Vienna, 2 industrial partners, 3 university partners and 1 public partner (see figure 2).

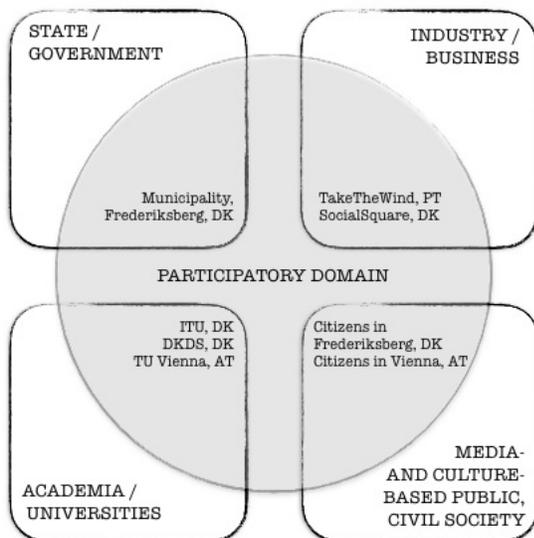
A key guiding principle was an understanding of older citizens as resourceful, necessary co-designers, with a strong and continued will to contribute to society [8]. Furthermore, we set an early commitment at proposal stage, agreed to by all project partners, to engage with our participants in living lab environments. The role of the living labs was for rehearsing new practices around our co-designed sharing concepts and technical platform in our participants’ everyday environment. These contexts ended up playing out in settings such as: in the park during a walk; in the cooking class in the middle of pans and pots; in a local Neighbourhood Centre; and in a Commonroom community with ceramics tools and materials.

### Funding Model and Quadruple Helix Organisation

We were reassured about the importance of our co-design and living lab approach by the introduction of *Open Innovation 2.0 (OI2)* [17] as a new paradigm being introduced in the AAL program about one year into our project. The idea of Open Innovation was first put forward by Chesbrough [5] suggesting an open innovation process in which enterprises do not innovate on their own, but engage in collaborative innovation processes. The European Digital Single Market adopted an Open Innovation strategy based on Chesbrough’s Open Innovation concept and the idea of a Triple Helix organisation of industrial, public and academic

partners. In 2013 Open Innovation 2.0 (OI2) was introduced based on a Quadruple Helix organisation adding citizens or people as the fourth Helix component, where “government, industry, academia and civil participants work together to co-create the future and drive structural changes far beyond the scope of what any one organization or person could do alone. This model encompasses also user-oriented innovation models to take full advantage of ideas’ cross-fertilization leading to experimentation and prototyping in real world setting.” [17]

This is how our living labs bring innovation processes into the real world setting and allow all partners, including citizens and volunteers, to experiment and design together (see figure 2). The IO2 paradigm does not talk about co-design and living labs. Instead it highlights the “principles of integrated collaboration, co-created shared value, cultivated innovation ecosystems, unleashed exponential technologies, and extraordinarily rapid adoption” [17].



**Figure 2: Quadruple Helix model organization with Give&Take partners.**

The Quadruple Helix organization itself does not necessarily ensure a citizen-driven design process. A citizen-centered Quadruple Helix organisation is characterized by an aim “to promote the empowerment of citizens and to assist citizens in their innovation activities” [1:72]. Arnkil et al [1] point out how a citizen-centered Quadruple Helix can have different degrees of user-involvement in the process, from user-testing to co-designers of products of services. In this spectrum, the Give&Take project is characterized by the citizens being co-designers of a community sharing service.

In the end, the project and its application of the Quadruple Helix model of innovation was evaluated by the funding agency as very successful. From the technical platform development side, the industry partners are committed to ongoing development of the platform and broader service into a market offering. From the citizen community

development side, it was very satisfying to see the intentions of some communities to continue beyond the life of the funded project and to see people step up to take on coordinator roles that facilitating (academic) designers had previously played. We also note though that some the communities did not evolve as quickly as others, recognising the time that is needed to seed, set-up and grow new communities.

From the project team side, we make use of our experiences engaging in such a Quadruple Helix organized project and reflect on how the collaborations played out in delivering on our co-design and living lab commitments.

### The Perspective of Contracted Project Partners

All of the contracted project partners (i.e. industrial, public and university partners) agree that the project was conducted in a collaborative and collegial spirit with good communication, supported also by an online shared space, and good inter-personal and inter-institutional relationships. However, looking back over the project, we also recognise that there were various emergent tensions that needed to be negotiated, particularly around the co-design and living lab engagements, and the pressure to have a final prototype close to market by the end of the project.

As background, industrial, public and university partners all contributed to the initial project proposal, and the project plans were discussed and agreed at the initial project meeting and during regular project meetings and skype calls throughout the project. Despite this, the practicalities of engagement for each partner, necessarily shaped by their role in the project and the philosophies that underpin this, resulted in a number of tensions. We find it useful to reflect on these tensions, and the internal processes, relationships and negotiations that took place during the project, in order to formulate strategies to putting PD to work in a complex Quadruple Helix setting.

### METHOD

Taking up the call to be reflective PD practitioners [9], the following discussions are based on five end-of-project reflective discussions (interviews), with contracted project partners representing academia (n=1), industry (n=3) and the municipality (n=1). Three of the interviews were conducted by one of the university co-investigators (with an industry partner, an academic partner and a municipality partner); one of the interviews was conducted by a university researcher, with a software developer from one of the industry partners; and the fifth interview, was conducted by three of the project academic investigators, with an industry partner.

While called interviews, they were held more as open reflective conversations, involving mutual reflection given our existing relationships and shared history. While only one academic partner was formally interviewed, the reflections of a further four people from academic partners were captured in the course of the reflective discussions. In broad structure, the project partner was asked to reflect on their

experiences, starting with initial understandings of the project aims/scope, and their role, and how this evolved over the course of the project. All interviews were audio recorded and transcribed. Drawing on a Thematic Analysis [3] approach, we repeatedly reviewed and discussed the transcripts to draw out common themes and to bring the narrative threads of the different partners together. This was complemented by our own reflexive perspectives as involved project partners.

### PRODUCTIVE TENSIONS IN QUADRUPLE HELIX MODEL ORGANISATION OF PD

Quadruple Helix Model-based PD projects are often characterized by the presence of conflicting values among different partners [1], [2], [19], but there is no uncontested account of the relation between design and conflicting values [25], [12]. In complex settings like Quadruple Helix-organised PD projects there is need for continuous negotiation of values among partners and participants [2], [19]. Grönvall et al [10] suggest the concept of *thinging* as fruitful for creating ‘productive agonistic spaces’ with a stronger attention towards the process of negotiating values. Based on the five interviews, we identify productive agonistic spaces in the Give&Take project as potentially productive tensions, which were negotiated among the contracted partners and citizens throughout the project.

### Creating a Software Product versus Creating Community Enabled by Software

The requirements of the funding scheme, and the different roles that different types of partners had to play in delivering on the project, inadvertently set up tensions between their own needs and project agendas. This played out as a tension between creating a software product versus creating new forms of civic engagement and community enabled by software.

The two industry partners were tasked with delivering a software platform that was close to market and an associated business plan. To do this they all said that they needed to have a good sense of the market, and were anxious to have a firm set of requirements early in the project against which to start product development. They also had allocated human resources from the start of the project to start development and had set interim deliverable commitments around building software, but, in the course of the project, they felt hampered by not having a clear set of requirements as often applied in more conventional software development project approaches [18].

The university partners, on the other hand, were focused on facilitating participatory relationships with citizens and organisations who might potentially engage with the platform, and on exploring and growing an understanding of the senior citizen communities and what an eventual Give&Take platform might look like. This was not so much about ‘understanding requirements’ but understanding people, contexts, values, and engaging citizens directly in this process. Drawing on PD traditions and our Give&Take

lab methodology handbook that was agreed on among the contracted partners, these explorations took the form of a number of dialogue meetings and workshops in both Frederiksberg and Vienna.

The municipality partner was curious about if and how a Give&Take service might help them deliver services to citizens. However they only had a fuzzy idea of what this service might involve and so found it difficult to engage the buy-in of other municipality groups at this stage.

In the discussions, all interviewees commented that it wasn’t until the Consortium Meeting 11 months into the project (called ‘the Coimbra meeting’) that a sense of the platform focus and purpose, and key user groups started to emerge. This was represented in what we called ‘the Onion Model’ of participation (see figure 3) and became a core anchor diagram for the project. Still the full sense of what the platform could be, and how it might be used, continued to emerge through iterative engagements with various living lab communities, seeing what they wanted to use the platform for as well as seeing what issues and problems they experienced with current versions. These insights were fed back to the developers for further development of the software platform. This meant that a sense of ‘requirements’ were continually emerging and evolving through these engagements.

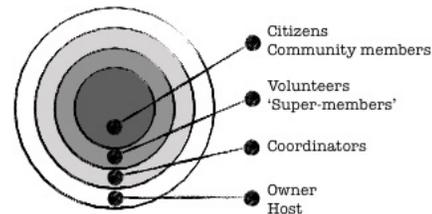


Figure 3: The Onion Model of participation

For the university researchers, this was a valuable process for allowing the emergence and rehearsal of new community practices; for one university partner in particular this had ‘political’ dimensions as well. The Give&Take project was seen as a way of creating new forms of relationships between municipalities and its citizens, challenging the municipalities to return to more of a ‘helping hand’ role. This was very much about infrastructuring [14] rather than prototyping per se, and about rehearsing new forms of service delivery as well as citizen/community practices.

For the industry partners, taking more of a prototyping focus, it was a frustrating process of never being quite sure what ‘requirements’ they were developing against. In hindsight one of the industry partners characterised the differences in ‘bottom up’ versus ‘top down’ terms; in retrospect they would have preferred first to go broad, talking to many different potential end users, decision makers and stakeholders, and doing more workshops before moving to focussed living labs. The key for them was first to identify where the market was which they didn’t feel happened soon enough in this project. This was in contrast to going deep

with a few selected groups and growing an emerging understanding and rehearsing new practices through living lab engagement, as happened in Give&Take.

This tension between industry and university partners became productive in the way that the more conventional software development industry partner revised their predominantly requirements specification-based development process towards an open and more modular development process, allowing citizens and the public partner to explore conceptual design sketches for a longer period of time, before the design was 'frozen'.

For the university partners the tension became productive in developing a better understanding of the underlying business model driving the industry partners and how to help the industry partners identify technology modules while still engaging in the co-design process; in the end this resulted in greater buy-in from all parties to the vision and realisation of the platform and, and for one of the university partners even establishing a drive and motivation towards engaging in future commercialisation of the platform.

#### **Different Conceptualisations of Living Lab**

Associated with the above is the tension of different partners in the team holding different conceptualisations of what is a living lab, but not realising that there was a difference; this difference only came into sharper focus in the process of reflecting back on the project and comparing how people spoke about it.

For the software developers, a living lab was primarily about testing ideas and prototypes. For the municipality partner, it was unclear in the beginning exactly what a living lab was and this made it difficult for them in their responsibility for recruiting citizens in Frederiksberg to explain what time commitment might be required and what participation might mean for both the citizens and the municipality staff. For two of the academic partners in Frederiksberg, a living lab was the mechanism through which people could be engaged in long-term forms of rehearsal of new forms of community participation. For the Vienna academic partner, their prior experience of living labs was more about co-design and evaluation of prototypes, while also trying to take on the community perspective.

This (among other reasons e.g., see later section on Differences between Frederiksberg and Vienna) made it difficult to align living lab activities in the two cities. While the living lab activities and insights served as input for designing the final Give&Take sharing concept and associated practices, they ended up providing insights on different levels and regarding different issues. As an example, a focus on exploring the concept through the evaluation of prototypes creates a stronger focus on digital literacy among participants and other usability perspectives, whereas a focus on rehearsal of practices moves the focus closer to contextualising the role of seniors, volunteers and professionals in a broader sharing community perspective.

This also points to a further two-way tension, where it can be hard to explore new forms of community when poor technology experiences get in the way, but it is hard to design a good technology platform if we don't understand what new forms of community it should be enabling.

The tensions that related to different conceptualisations of living labs among the different partners became productive in several ways. First of all, all project members became very aware of the methodological nuances of what is a living lab, and the extensive resources it takes to run living labs in users / citizens everyday life environments.

Further, it became a learning process for the partners with less or different experience in running a living lab based PD-project. Partners from Vienna visited Frederiksberg living lab events and vice versa to establish a common methodological foundation and identify common insights about community-based sharing in different cultures and contexts. There was also the recognition that at the same time insights about the technology platform itself were critical to the success of the community building process and as feedback to the industry partners. In the end, both living lab perspectives, the community and the platform, are all needed and mutually inform each other.

#### **The Unanticipated Work to Develop New Forms of Community**

The intense ways of working to support and grow living labs also entailed different kinds of additional unanticipated work from different partners. For the researchers, there was considerable time commitment to 'sell' the idea of Give&Take to potential community 'owners' and then to work with local 'coordinators' to develop and support the living labs. On the other hand, we also saw this as the researchers rehearsing and role-modelling the coordinator role for the community. Building on both points, this led to a focus for the third year of stepping back and handing over more of the organisation of a Give&Take service to the coordinator and supporting them in their role as part of enabling growth of their own capacity for Give&Take.

For the municipality partner, there was considerable work to identify potential participant groups, to talk to them and to get them to engage in the project. In an era of public care and health institutions being challenged with increasing demand for service provision with ever decreasing resources, participation in research and development projects is difficult. Then there was the work to recruit participants from within those groups. This required time and effort to build trust and to practically participate in meetings. While the municipality brings a certain authority to any request, they in fact had no formal power to require anyone to participate. Nonetheless, the nature of the relationship was helpful to varying degrees: a centre under the municipality was required to at least take seriously the request to become involved and to account for their response; it was in the interests of a community group who received funds from the municipality to at least discuss the issue; and smaller more

loosely-structured groups often had no formal structure, taking additional work to identify who to contact.

These difficulties were exacerbated in Vienna where an initial partner who had community links had to withdraw and there was no dedicated municipality to play such a role; it was then the researchers who had to approach individual community groups to persuade participation.

For the industry partners, much of this work was invisible and from their perspective, it took too long to set up the community groups with whom to collaborate, and from whom to derive requirements.

This tension related to mobilization and continued motivation of citizens and it became productive by becoming explicit through the municipality partner's repeated articulation of the difficulties of recruiting both citizens and health professionals. While both academic and industrial partners might have entered the project with a slightly naïve idea of what it takes to engage citizens and health professionals, all partners realized and acknowledged the challenges of coping with very limited resources in the public health and public services area; and the fact that it is often the same group of 'strong' senior citizens that is invited for numerous research or development projects. This is an important insight to bring into new projects in the public health sector.

#### **Aligning Expectations and Resources to Activities in the Living Labs**

Apart from obvious cultural differences between the traditions of the two countries where the living labs were set up, there were also interesting tensions between the contexts of citizens' communities across both sites that created important learning opportunities about different types of communities and about the role of a dedicated 'coordinator'.

In Frederiksberg, the municipality was a key partner in the project, with direct budget allocation to support both the main project member from the municipality as well as for paying for the time of municipality workers to participate in living labs and take on coordinator roles. Also, the groups were firmly embedded in service offerings from the municipality. And still there were the difficulties of setting up the new forms of community noted above.

In Vienna, there was no equivalent community or municipality resource as a member of the project team and there were no dedicated financial resources to support community coordinators helping with the project. The living labs in Vienna had to rely much more on volunteer efforts and grass-roots support at a practical level. For example, the social worker in the Neighbourhood Centre, despite her very positive support in principle of the project, had no time to actively drive the communities. The other Vienna communities also had no dedicated community-paid coordinator. On the basis of this lesson learnt, when we set up one of the final communities in Vienna, the final Commonroom ceramics group, we diverted project budget to

pay for the local coordinator to drive the engagement with our Give&Take platform.

Ethical considerations regarding using participants' time were already made in the initial Give&Take Ethical Handbook, but interestingly we never considered the difficulties of using health or community professionals' time. An important insight from this late project experience is to also consider use of professional participants' time and protect budget space for potential remuneration requests.

The tension related to the different organisations of recruitment of and coordination of communities in the two cities was primarily about misalignment of expectations of how fast the project was able to move forward in synch, where the project partners in Frederiksberg were annoyed with the pace of activities in Vienna, hindering a common sharing of experiences in order to move forward in the project, while project partners, communities and volunteers in Vienna felt stressed about the non-articulated expectations and the lack of dedicated community resources as available in Frederiksberg to engage and motivate citizen engagement and community building.

These tensions only became productive through explicit reflection during the later project period, and identifying the cause of the synch issues. It was not until the very last months of the project that budget allocation for a local coordinator was prioritised and argued for, since budget categories are relatively fixed and audited against initial requirements.

#### **DISCUSSION: TENSIONS BETWEEN FUNDING PROGRAM, QUADRUPLE HELIX AND CO-DESIGN**

At a more general level however, we can interpret many of these tensions within an overall tension inherent in the funding program aims and the Quadruple Helix model themselves.

The AAL program and associated funding model prescribes the Quadruple Helix organisation of projects and the innovation requirement of delivering a solution that is near to market. Together these affect the balance of partners in the model and prioritize the business partners (or those engaged in future commercialisation) - pushing towards having requirements specifications and digital prototypes ready as early as possible. However the Quadruple Helix, as opposed to its earlier Triple Helix model, now includes citizens but the commercialisation agenda needs are in effect prioritised over the citizens who need time to build/rehearse new practices/communities etc because of how such projects are evaluated.

We set up the Quadruple Helix model in our citizen-driven, living lab implementation so that we as (academic) designers could facilitate "*design by*" citizens, as suggested by Sanders & Stappers [20] (and in contrast to other approaches where designers "*design for*" their end-users and nowadays increasingly often "*design with*" them). In other words, we as (academic) designers would scaffold the design process of the parties distinguished in the Quadruple Helix. This means

that designers leave design choices up to other partners, e.g. they let these partners decide how to balance between values.

This has interesting implications for how the practices play out. Seravalli [21] stresses the importance of distinguishing between practices of collaboration and practices of co-design (which she denotes ‘co-production’). Practices of *collaboration* as expressed in an innovation model discourse focus primarily on exchange of information between actors (‘data-collection’). In contrast, the *co-design* discourse frames co-design as a way to bring together different kinds of competences and perspectives of citizens and other project participants and to share responsibilities. Co-design is partly overlapping with and supported by ideas and models coming from the innovation discourse, where users’ participation and collaboration across sectors have been discussed as approaches to support both technical as well as social innovation [4], [7], [23], [15]. Some of the models and methods developed within the innovation discourse have been directly transferred to the public sector projects, where ideas about Quadruple Helix and living labs are increasingly diffused. This was the case in our project.

Practices of *co-design* therefore are about participation on equal terms with shared responsibilities among participants who engage together in designing a possible solution to a specific challenge through mutual learning and generation of shared knowledge. It “is considered a way to experiment with and promote more democratic forms of governance (i.e. how decision are taken) that include a broader range of actors” [17:7].

As a co-design research community, we are committed to the value that a participatory and co-design approach offers for including the people and contexts to develop their own solutions in this way. There is also widespread recognition of the value of living labs as an approach to realise such engagement and to grow understandings of infrastructuring beyond just the technology itself. However, the rhetoric of such approaches and the practical reality of their realisation in complex Quadruple Helix contexts and through the collaborations of diverse project partners with different needs, perceptions/understandings, and timeframes, can be something different.

Priday & Pedell [19] suggest that we need to educate stakeholders as well as continuously manage different stakeholders’ expectations to create long term value between all participants in a participatory Quadruple Helix organised project. PD is not just outward facing towards citizens and people but inward facing and worth reflecting on how academic, industrial and public partners participate in the realisation of participatory processes in a Quadruple Helix organisation of a service innovation project and do so in way that can practically engage with both creating a product/service to take to market and genuinely engaging with citizens as co-designers. In our case, we only became aware of the need for the education and management expectation mentioned by [19] towards the end of the project,

and only through experiencing and reflecting on the tension from not having such processes in place.

Reflecting back on our case, and as just mentioned, the AAL program and associated funding model advise a Quadruple Helix organisation of projects and an innovation model requirement of delivering a solution that is near to market. It has definitely affected the balance of partners in the Give&Take project and can be seen as an underlying condition for most of the tensions that we experienced.

In accordance with the underlying AAL funding scheme we tried to prioritize the business partners (or those engaged in future commercialisation) pushing towards having requirements specifications (albeit more slowly than the commercial partners wanted) and digital prototypes ready as early as possible over the citizens who needed time to build/rehearse new practices/communities etc. But we were also committed to engaging the citizens and underestimated the time and effort required to do this in relation to the business partners’ needs for ‘requirements’.

We can also see that the Quadruple Helix model was to some degree unbalanced in the design of the project proposal, since citizens were only indirectly engaged in the project design through the public partner (municipality) of one city and dialogues with a range of interest organisations representing senior citizens.

#### **MOVING FORWARD**

Based on our experiences, we offer some reflections for moving forward at both funding and project levels.

First for funding bodies and about how Quadruple Helix models and co-design are interpreted and supported: we propose that funding bodies, who put forward funding schemes requiring near-to-market innovations, consider the inherent tension between this and the rhetoric of participation and user engagement, where there is real potential to jeopardize a genuine co-design approach. If we want to take seriously that end-users and citizens be offered a role as equal partners in an innovation process, we need to innovate on some *middle-out* strategies [4], with associated policy/rule changes in support, that allow both close-to-market and co-design agendas to be well served and also increasing the likelihood that the products that do make it to market will be the right products. To paraphrase Coiera [4], “the middle-out approach acknowledges that [researchers, government/industry partners and municipalities/community groups] all have different starting points, goals and resources”. A middle-out strategy therefore works both top-down, to understand the broader market and identify core technical components and enabling technical infrastructures/standards, and bottom-up, to foster community building through mutual engagement, and project phases are planned to ongoingly integrate top-down and bottom-up inputs, refining the project vision.

Second, and following from the above: we propose some methodological insights and practical strategies to facilitate

a middle-out process for future Quadruple Helix projects. These also go towards the education and expectation management mentioned by Priday & Pedell [19], helping future partners in participatory and co-design projects participate more effectively and be better aligned and balanced in a complex Quadruple Helix organisation:

- Identify and discuss potential ‘culture’ and value differences between different types of partners, and between different national or regional contexts as a key part of the foundational work for the project and the project kick-off meeting. Return to these discussions at each project meeting.
- Create awareness about different ways of working and find ways in which these can co-exist/co-work in productive ways at the beginning of the project. This includes clarifying different partners’ methodological expectations and temporal process needs.
- Explore possible ways of engaging both *top down* (understanding the market and gathering understanding from a broad range of participants so that the industry partners can start on some form of business plan and software building) as well as *bottom up* (establishing deep longer-term relationships with a small group of people who will be key to growing the understanding of what new forms of community are possible and who are able to rehearse new forms of engagement enabled by technology).
- In planning and designing a Quadruple Helix organized project where participatory approaches are used, start the software development resources and deliverables later in the project (or start the development role early but with different resources to more directly engage in meetings with stakeholders, alongside university and municipality partners, and to identify enabling infrastructures/standards as foundation for a future solution).
- Involve the industrial partners, in our case software developers, more directly in the living labs where feasible to provide a better understanding and acknowledgement of the importance of giving participants opportunities and time to formulate ideas and rehearse new practices in iterative cycles where understanding a problem takes place in parallel with designing and implementing a solution, and where they can also see directly how participants engage with their design ideas.
- Explicitly account for, and resource, the ‘hidden work’ to communicate the project goals, engage potential community partners and stakeholders, and own the day-to-day community building work with participants. This resourcing is in terms of both time in the project plan to build relationships, and budget to employ a dedicated community project partner.

## CONCLUSION

In summary, based on end-project reflective interviews with partners, we have identified four areas of tensions among academic, industrial and public partners in the Give&Take project. We described the ways in which they also served as potentially productive tensions, which through discussions and negotiations among partners in most cases became productive and contributed to strong project results.

We also characterise the project model of Give&Take as Quadruple Helix arrangement and identify that many of the tensions emerge from the different values and timescales in engaging with participants in a PD process that overall makes it misaligned with more traditional Triple Helix arrangements.

In reflecting on these broader lessons, we also propose a different middle-out way of proactively addressing the potential for these tensions and more effectively weaving the needs of all partners so that both good software solutions close to market can be built, with the confidence that these are good solutions that have been defined by the citizens themselves.

We hope that lessons learnt from the Give&Take project can act as an illustrative example on how the *Open Innovation 2.0* and the Quadruple Helix model can be better established in Europe as a sustainable and dialogue-based innovation approach building on civic engagement and the work within a team to make it work in a participatory design context by better understanding the diverging discourses of PD and Quadruple Helix.

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