

“The technology works fine, but...”

Barriers to involving older adults in co-design for digital health innovation: a structured case study reflection

Á.K. Bakk¹, P.T. Szabó¹, B. Pintérné Sosity¹, S. Chovanec¹, P. Lajkó², R.B. Vásárhelyi & L. Appel³

¹*Future Care Lab, Moholy-Nagy University of Art and Design, Zugligeti str 9–25, Budapest, Hungary* | ²*Semmelweis University, Budapest, Hungary* | ³*York University, Toronto, Canada*

¹bakk@mome.hu, ²lajko.patricia@semmelweis.hu, ³lappel16@yorku.ca

zenctuary.mome.hu

DOI: [10.54337/aau.icdvrat26.32](https://doi.org/10.54337/aau.icdvrat26.32)

Abstract

This paper examines the barriers to involving hospitalised older adults in co-design for digital health innovation. It draws on ZenctuaryVR+, a research project funded by the Hungarian National Research, Development and Innovation Office (NKFIH), in which a nature-based virtual reality (VR) application supporting the wellbeing of older adults in long-term hospital care is co-designed together with patients and healthcare professionals and will subsequently be evaluated in a longitudinal randomised controlled trial (RCT). Applying the Nonadoption, Abandonment, Scale-up, Spread and Sustainability (NASSS) framework (Greenhalgh et al., 2017), we deliberately treat co-design itself, rather than the VR system it produces, as the innovation under analysis. Across four domains (technology, adopter system, organisation, and wider context) we identify compounding complexity arising from grant-funding constraints, ethical approval processes, hospital institutional structures, and ageist imaginaries embedded in gerontechnology design. Offered as a structured case study reflection based on seven interviews, two observation sessions and three co-design workshops, the paper argues that co-design in this context is not simply difficult but structurally complex in ways that resist disaggregation, and it draws practical implications for participatory VR research with hospitalised older adults.

1. Introduction

ZenctuaryVR+ is a digital health research project funded by the Hungarian National Research, Development and Innovation Office (NKFIH) under the HU-rizont programme, in which a nature-based virtual reality (VR) application supporting the wellbeing of older adults in long-term hospital care is co-designed together with hospitalised patients and healthcare professionals, and will subsequently be evaluated in a longitudinal randomised controlled trial (RCT). In this short paper we use ZenctuaryVR+ as a case study to identify the barriers of involving hospitalised older adults in a co-design process for digital health innovation. Our motivation is to point out that the bottleneck to effective VR health technology is often not the technology itself but the

participatory design processes, or the lack of them, that determine whether a system reflects the actual needs, contexts of its intended users.

Our own position within the broader field of digital health innovation is a feminist posthuman one, drawing on what Manchester and Willatt (2024) describe as care-full co-design: an approach that attends to relationality, dependency and embodied vulnerability in design encounters, and that treats the affective and material conditions of participation as findings in their own right. Two further concepts structure our analysis. First, we understand digital health innovation as an *assemblage* (DeLanda, 2016): a heterogeneous whole in which policies, regulations, grant schemes, institutional routines, devices and contributors' motivations retain their autonomy while jointly producing effects that none of them produces alone (Lievevrouw et al., 2022). Second, we draw on Suchman's (2007) notion of *sociocultural configuration*, as developed for ageing and technology by Bischof and Jarke (2021), to describe how design processes configure people as particular kinds of users, joining together the imaginaries and the materialities of technology. Involving vulnerable groups in such assemblages is particularly challenging, as their position, capacities and motivations vary (Harrington et al., 2019); these two concepts allow us to trace that complexity systematically rather than treating it as anecdotal.

The common starting point of gerontechnology design, rooted in deficit imaginaries of frail ageing bodies, does little to engage with the complex network of factors that mediate experiences of ageing (Peine et al., 2021) such as multimorbidity, yet the RCT paradigm demands precisely this kind of reduction: specifiable, measurable outcomes derived from stabilised design decisions. In ZenctuaryVR+, the ambivalent relational dynamics of long-term hospital care, between older adult patients experiencing learned helplessness and the personnel responsible for their care, must be translated into design requirements for a VR and an RCT. This tension between the lived, relational and affective realities of institutional care and the procedural demands of clinical evaluation is aimed to be understood through feminist posthuman approach (Manchester & Willatt, 2024). We aim to avoid reinforcing the dependencies that one-sidedly designed technologies can create (Östlund et al., 2015), and instead to configure the user and the context of use together (Akrich, 1992).

2. Methodology: Identifying the barriers

This paper adopts a qualitative case study design centred on ZenctuaryVR+, in which co-design functions as both the methodological approach and the innovation under scrutiny. It is offered as a structured case study reflection: its contribution is analytic and cumulative without testing a hypothesis, providing a systematic way of describing the barriers encountered in a completed phase of work so that other teams undertaking participatory VR research with hospitalised older adults can anticipate them.

Our analysis draws on Greenhalgh et al.'s (2017) framework for theorising Nonadoption, Abandonment, and challenges to the Scale-up, Spread and Sustainability (NASSS) of health and care technologies. Before justifying this move, it is important to note that the conventional boundary between technology and methodology is less stable than it appears. Heidegger (1954/1977) argued that technology is not a category of object but a mode of revealing: a way of ordering and disclosing the world that shapes what can be seen, said and done within it. Co-design, understood this way, is technological: it discloses needs, configures who counts as a knower, and orders the

conditions of participation. Our analytic move is to treat co-design as the innovation whose implementability is in question. NASSS was developed for technology-supported health and care programmes, and its domains address not only material artefacts but the programmes, value propositions and institutional arrangements in which artefacts are embedded; Greenhalgh et al. (2017) apply the framework to complex interventions and programmes rather than to devices alone. Framing co-design as the unit of analysis therefore allows us to ask not only whether ZencuaryVR+ as a VR system can be implemented, but whether co-design as an innovation approach is itself implementable within the structural constraints of an acute hospital setting with older adults. When we refer to co-design as “the technology” in what follows, we use the term in this NASSS-specific analytic sense. NASSS is also suited to analysing the assemblage of actors, artefacts and institutional structures surrounding a programme, and the sociocultural configurations, including professional norms, power relations and cultural expectations, that determine whether an innovation can take root in a given context.

Data are drawn from semi-structured interviews with older adult participants, clinical staff and researchers (ethical approval no. BM/13742–3/2025) ; ethnographic observations of the clinical environment; and co-design workshops conducted in 2025 employing specifically designed generative tools and scenario-based prototyping, in which older adults participated as co-designers. Empirical data include seven interviews conducted between July and December 2025, field notes from two observation sessions and artefacts produced across three co-design workshops, each lasting approximately three hours. Analysis follows the four NASSS domains (technology, adopter system, organisation and wider context), classifying each as simple, complicated or complex, with particular attention to how complexity accumulates across domains simultaneously.

3. Results and discussion

3.1. The technology (co-design as the innovation under analysis)

While co-design was welcomed as the participatory logic supporting ZencuaryVR+, its implementation was structurally conditioned: the project could only begin after a positively evaluated grant proposal, and research ethical approval. These introduced procedural constraints that complicated the democratic ambitions of co-design as an approach. This reflects a broader pattern identified by Glasziou and Chalmers (2016), who argue that 85% of health research may be wasted precisely because stakeholders, including patients, are excluded from the earliest stages where research questions and designs are defined. Goldsmith et al. (2019) demonstrate that co-production within RCT contexts is possible but requires deliberate negotiation, particularly around eligibility criteria and analytic plans, where experiential knowledge must be subordinated, but combined with methodological requirements. Co-design methodology is well documented and its steps are in principle specifiable: in that sense it is manageable. What makes it unmanageable is not the method itself but the institutional context it surrounds. The RCT protocol defines the research design without co-design could shape it previously, while the ethics approval restricts who can be recruited, and grant timelines can also be limiting. Each of these is a property of this project’s specific institutional setting, which is in accordance with Blandford et al.’s (2018) conclusion according to which traditional trial methodologies can render a participatory process obsolete before evaluation is even complete. In the NASSS framing, co-design should start as ‘complicated’ and becomes ‘complex’, but these categories point to the accumulation of pressures, not a judgment about the method.

3.2. The adopter system

The adopter system in ZenctuaryVR+ involved hospitalised older adults as co-designers, health-care professionals who moved between roles as participants and facilitators, and researchers. In our project the actual gatekeeping role fell not to clinicians but to care workers responsible for physically transporting participants to the workshop space, a structural barrier Baines et al. (2022) identify as recurring in digital health co-design. This shaped, but at times supported, our participants' involvement. Most co-design methods assume stable participants, yet hospitalised older adults break these assumptions: because health status can change, consents require agreement at each encounter, while the wards define available time. This reflects on Minogue et al. (2018), as they argue that the absence of meaningful stakeholder involvement remains one of the primary factors of avoidable research waste. One participant missed one of the three workshops due to a medical intervention scheduled at short notice: this is the "unstable participant" problem which one cannot anticipate while planning the co-design protocol. Endter et al. (2021) also warns that publicly funded user-centred innovation often reproduces deficit-oriented, paternalistic images of ageing, configuring older adults as manageable testers mobilised for market goals rather than full co-decision-makers. Within our project participants came back with the support of care workers but also because of the community dimension of the sessions: image elicitation, painting and landscape building as group activities gave participation a sense of reward that was independent of the technology, consistent with what Sanders and Stappers (2014) argue that generative tools can do. In NASSS terms the adopter system is unambiguously complex: the three sub-groups moved between roles unpredictably, and the logistical, clinical and participatory dimensions of involvement were difficult to separate. Fluctuating health status did not significantly disrupt our work, but this was a matter of circumstance: the structural vulnerability is real and other projects working with this population should try to plan for it explicitly.

3.3. The organisation

The organisational domain is shaped by the hospital setting, which imposes institutional work rhythms, professional hierarchies and regulatory constraints that are in tension with the participatory logic of co-design. Ward logistics, ethics approval processes and the physical infrastructure of care each added layers, that required ongoing adaptation. For us, this was most tangible in the dependency on care workers to transport participants and the need to schedule workshops around clinical routines. These are reported here as structural features of acute care that any participatory project in a comparable setting will encounter. In assemblage terms (DeLanda, 2016), the ward routines, the ethics timeline and its inflexibility, and the care worker gatekeeping role each have their own institutional logic. These produce a systematic compression of participatory time. Manchester and Willatt (2024) identify this as a core problem for care-full co-design: the assemblages shaping the politics of design are not external obstacles but the medium in which the work takes place. In NASSS terms the organisational domain is complex rather than merely complicated: its constraints interacted with the adopter system and the regulatory context, generating unpredictability that no advance planning could overcome.

3.4. The wider context (and the expectations of a grant scheme)

The project is funded by a major grant which shaped the co-design process. Beside factors in 3.1., concern here is different: it is about who gets to define the research problem. Rip and Schot (2002) argue that involving end-users in the design of a funding application is important when designing new services with new technologies, yet in these the research questions and methodological framework are fixed before the project begins, so co-design can only work when little

shaping is possible. Health research co-design is structurally limiting (Slattery et al., 2020) and this is a property of the funding. In Bischof and Jarke's (2021) terms, the grant architecture is itself a sociocultural configuration, because it positions researchers and funders as the definers of the research problem and older adults as its objects, and it does this before any co-design encounter has taken place (Willatt et al., 2024). Similarly, Endter et al. (2021) point out that publicly funded innovation in ageing is routinely shaped by deficit imaginaries that frame older adults as a homogeneous group to be helped, which can be also applied to our project. To mitigate this, co-design workshops with healthcare professionals as a second end-user group were conducted in advance of the patient workshops (Bakk, 2024), ensuring that clinical constraints, therapeutic workflows as well as the professional expertise could have been embedded into the concept.

3.5. Implications for VR research with hospitalised older adults

The barriers identified above have direct consequences for VR research with this population. However less obviously, but our participants' engagement was driven primarily by the community dimension of the sessions and not necessarily by interest in VR itself, which suggests that the social setting may be as important for adoption as the application content (McLeod Daphnis et al., 2022). On the other hand, the low-tech generative tools used in the workshops (image elicitation, painting and landscape building) proved effective for eliciting design requirements for an immersive application and did not require participants to become expert in the technology, which can be a transferable practice for VR co-design with hospitalised older adults.

NASSS Domain	Key questions	ZenctuaryVR+ assessment	Classification
Technology (co-design as the innovation under analysis)	How well-defined and standardised is the technology? How adaptable is it to local contexts?	NKFIH HU-rizont grant constraints, with professional workshops conducted prior to patient workshops to embed clinical knowledge before fieldwork began.	Complex
Adopter system	Who are the users and what are their characteristics, motivations and relationships?	Three sub-groups: hospitalised older adults as co-designers, healthcare professionals moving between roles as participants and facilitators, and care workers as logistical gatekeepers controlling physical access to the workshop space. The same seven older women returned across all three workshops, driven primarily by the community dimension rather than interest in VR.	Complex
Organisation	How do organisational structures, resources enable implementation?	Acute hospital setting imposes rigid ward rhythms, professional hierarchies and resource constraints. Physical access to the designated workshop area depended on care worker availability, compressing session time and making longitudinal co-design structurally difficult.	Complex

Wider context	What institutional, societal and policy factors shape the programme?	NKFIH HU-rizont grant funding fixed the research design prior to implementation, leaving co-design to be tailored retrospectively. Ageist imaginaries in gerontechnology and the dominance of the RCT paradigm in Hungarian health research further marginalise experiential knowledge and participatory approaches.	Complex
---------------	--	--	---------

Table 1: NASSS Framework Applied to ZenctuaryVR+: Four Key Domains
Note: Classification follows partially Greenhalgh et al. (2017).

4. Conclusion

In our paper we contextualized ZenctuaryVR+ and its co-design process in an acute hospital setting with older adults. Across all four NASSS domains we found the same answer although not because any single barrier is not too great to be overcome, but because funding constraints, ethics limestones, hospital logistics and gerontechnology imaginaries pile up on each other. The practical implication could be interpreted simply, but our main objective is to point out that participatory processes need to be part of the grant application, because when a protocol is approved, it is hard to tune. Throughout our process we encountered several positive accidents and a strong partnership and support from our partner, however this cannot be considered as a reproducible process, and in similar research projects these structural conditions can cause various complexities. We offer this analysis as a resource for planning teams, so they can anticipate what they are getting into.

Acknowledgements

ZenctuaryVR+ project No. 2024-1.2.3-HU-RIZONT-2024-00103 is implemented with the support of the National Research, Development and Innovation Fund of the Ministry of Culture and Innovation, financed under the 2024-1.2.3-HU-RIZONT call for proposals.

References

Akrich, M. (1992). The De-Description of Technical Objects. In *Shaping Technology/Building Society*, edited by W. E. Bijker, and J. Law. Cambridge, MA: The MIT Press.

Baines, R., Bradwell, H., Edwards, K., Stanton, A., Harrington, K., Stevens, S., Bryce, C., Bhattarai, N., Devlin, A., Sutcliffe, A. & Slight, S. P. (2022). Meaningful patient and public involvement in digital health innovation, implementation and evaluation: A systematic review. *Health Expectations*, 25(4), 1232–1245.

Bakk, Á. K. (2024). Designing nature simulated VR application for hospitalized seniors. In I. Fajnerová, P. Gamito, D. J. Brown, E. Rosenlund Høeg & N. Shopland (Eds.), *Proceedings of the 15th International Conference on Disability, Virtual Reality and Associated Technologies (ICDVRAT 2024)*, pp. 163–167. Prague, Czech Republic, 3–6 September 2024. National Institute of Mental Health. ISBN: 978-80-87142-63-9.

Bischof, A. & Jarke, J. (2021). Configuring the older adult: How age and ageing are re-configured in gerontechnology design. In A. Peine, B. L. Marshall, W. Martin & L. Neven (Eds.), *Socio-gerontechnology: Interdisciplinary critical studies of ageing and technology* (pp. 197–212). Routledge.

Blandford, A., Gibbs, J., Newhouse, N., Perski, O., Singh, A. & Murray, E. (2018). Seven lessons for interdisciplinary research on interactive digital health interventions. *Digital Health*, 4, 1–13.

- DeLanda, M. (2016). *Assemblage theory*. Edinburgh University Press.
- Endter, C., Merkel, S. & Künemund, H. (2021). The configuration of older users as drivers of innovation in the design of digital technologies. *NOvation: Critical Studies of Innovation*, 3, 90–109.
- Glasziou, P. & Chalmers, I. (2016). Is 85% of health research really wasted? *BMJ Blogs*, 14 January. <https://blogs.bmj.com/bmj/2016/01/14/paul-glasziou-and-iain-chalmers-is-85-of-health-research-really-wasted/>
- Goldsmith, L. P., Morshead, R., McWilliam, C., Forbes, G., Ussher, M., Simpson, A., Luccock, M. & Gillard, S. (2019). Co-producing randomized controlled trials: How do we work together? *Frontiers in Sociology*, 4, 21.
- Greenhalgh, T., Wherton, J., Papoutsis, C., Lynch, J., Hughes, G., A'Court, C., Hinder, S., Fahy, N., Procter, R. & Shaw, S. (2017). Beyond adoption: A new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies. *Journal of Medical Internet Research*, 19(11), e367.
- Harrington, C., Erete, S. & Piper, A. M. (2019). Deconstructing community-based collaborative design: Towards more equitable participatory design engagements. *Proceedings of the ACM on Human-Computer Interaction*, 3(CSCW), Article 216.
- Heidegger, M. (1977). The question concerning technology (W. Lovitt, Trans.). In M. Heidegger, *The question concerning technology and other essays* (pp. 3–35). Harper & Row. (Original work published 1954)
- Lieievrouw, E., Marelli, L. & Van Hoyweghen, I. (2022). The Role of US Policymaking in the Emergence of a Digital Health Assemblage. *Science as Culture*, 31(1), 72–91. <https://doi.org/10.1080/09505431.2021.2025214>
- Manchester, H. & Willatt, A. M. (2024). Towards care-full co-design with older adults: A feminist posthuman praxis. *Journal of Aging Studies*, 70, 101250.
- McLeod Daphnis, S. I., Simpson, R., Accurso, M., Blicher, E., Emrich, M., Baryluk, O., Hsu, C. Y., Winchell, R. J., Czaja, S., Reid, M. C., Difede, J. & Won, A. S. (2022). Patient input on the design of a social virtual reality environment for hospitalized older adult trauma patients: Phase 1 of a usability, acceptability, and feasibility pilot study. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*.
- Minogue, V., Cooke, M., Donskoy, A. L., Vicary, P. & Wells, B. (2018). Patient and public involvement in reducing health and care research waste. *Research Involvement and Engagement*, 4, 5.
- Östlund, B., Olander, E., Jonsson, O. & Frennert, S. (2015). STS-inspired design to meet the challenges of modern ageing: Welfare technology as a tool to promote user driven innovations or another way to keep older users hostage? *Technological Forecasting and Social Change*, 93, 82–90.
- Peine, A., Marshall, B., Martin, W. & Neven, L. (Eds.). (2021). *Socio-gerontechnology: Interdisciplinary critical studies of ageing and technology*. Routledge.
- Rip, A. & Schot, J. (2002). Identifying loci for influencing the dynamics of technological development. In K. Sørensen & R. Williams (Eds.), *Shaping technology, guiding policy: Concepts, spaces and tools* (pp. 155–172). Edward Elgar.
- Sanders, E. B.-N. & Stappers, P. J. (2014). Probes, toolkits and prototypes: Three approaches to making in codesigning. *CoDesign*, 10(1), 5–14.
- Slattery, P., Saeri, A. K. & Bragge, P. (2020). Research co-design in health: A rapid overview of reviews. *Health Research Policy and Systems*, 18, 17.
- Suchman, L. (2007). *Human-machine reconfigurations: Plans and situated actions* (2nd ed.). Cambridge University Press.
- Willatt, A., Gray, S., Manchester, H., Foster, T. & Cater, K. (2024). An intersectional lifecourse lens and participatory methods as the foundations for co-designing with and for minoritised older adults. *Proceedings of the ACM on Human-Computer Interaction*, 8(CSCW1), 1–29. <https://doi.org/10.1145/3637295>