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DESIGNING FOR SUSTAINABILITY AND WELL-BEING: APPROACHES TO STAKEHOLDER ENGAGEMENT

Andrew WODEHOUSE[1], Laura MacLEAN[1], Sarah MORTON[2], Sarah BOWYER[3] and Josafinni PORTER CHAMBERS[1]
[1]University of Strathclyde, United Kingdom
[2]University of Edinburgh, United Kingdom
[3]NHS Highland, United Kingdom

ABSTRACT
This paper presents a game-based approach to represent diverse stakeholder requirements within human-centred design processes. This is considered with respect to the particular challenges of sustainability and well-being contexts where there are competing priorities that must be considered to achieve fair, equitable and responsible design outcomes. Typical human-centred design approaches are reviewed, outlining the necessity of contextualising the community of users present in any design context prior to undertaking primary research. This is then framed with respect to the sustainability agenda, where motivating positive action and connecting us to nature are essential for planetary and individual health. Barriers, including resistance to change, stakeholder expectations, communication barriers and resource constraints are then outlined. The benefits of a game-based approach in response to these are set out and illustrated through the design and development of a game entitled 'Mosaic Landscapes' that invites players to take on the role of co-planner in a healthcare estate. The challenge lies in making the most appropriate design choice for the selected scenario, whilst considering the physical boundary of the board and proximity to other landscape elements selected. The paper concludes by providing a framework for the connection of theory to practice in a game format that makes use of physical interaction to help individuals articulate their requirements in a vivid way. These have implications for the future delivery of human-centred design education in healthcare contexts and beyond.

Keywords: Human-centred design, health and well-being, stakeholder engagement, greenspace

1 INTRODUCTION
Extracting, understanding and characterising requirements of diverse stakeholder groups is a key challenge for human-centred design. This paper describes a game-based approach to facilitate this process using a case study in the design of greenspaces on healthcare sites. In doing so, it sets out new insights for stakeholder engagement in the design process, and points to how sustainability and well-being can be prioritised in requirements capture for design educators. Planning the development of greenspaces requires an understanding of synergies and trade-offs between human-nature interactions. To do so, we must understand the plurality of values, identities and capabilities of the beneficiaries that use such spaces. Improving engagement with natural outdoors spaces is important for conservation, cultural heritage, public health and well-being, and economics. By incorporating the views of disparate stakeholders, their varying requirements can be incorporated in the configuration of design solutions. The way in which these can be consolidated and integrated within human-centred design (HCD) process are outlined.

2 HCD AND DESIGN CREATIVITY
Engaging stakeholders in HCD is critical to create products and services that truly meet user needs. Indeed, the role of the human-centred designer has assumed significant facilitation dimensions in order that end users have meaningful and engaging roles in the design process. This process is, however, fraught with challenges and it is therefore critical in design education that we provide sufficient

awareness and training in how to identify, manage and maintain appropriate stakeholder input. This typically sits at the front end of any HCD process [1].

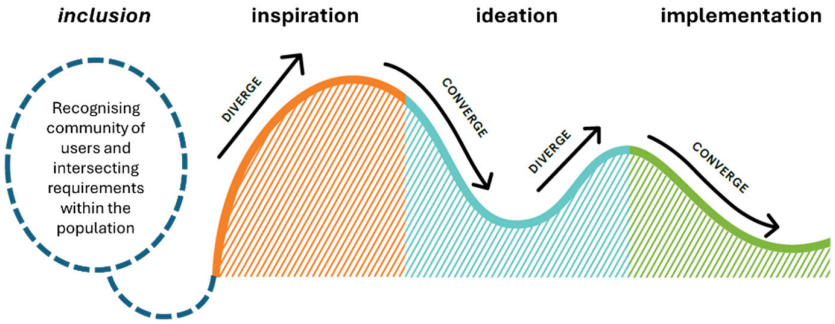

Figure 1. HCD process considering overall population for shared object, service or environment, after [1]

While it is essential to have awareness of user requirements, there is a danger that being overly focussed on a particular group can exclude the needs of other communities. This raises questions in terms of accessibility, equality and prioritisation of competing user requirements. Another critical concern is that in trying to address multiple, and often conflicting issues we arrive at needless complexity in designs that seek to address competing and overlapping requirements [2]. Before identifying, targeting and undertaking a 'deep dive' with a particular group through established HCD methods such as cultural probes, interviews and observation, it is necessary to understand the range of relevant stakeholders. This is particularly relevant in cases where different users make use of a shared space (e.g. public transport), or when a product is used in a shared setting (e.g. entry barriers). When designing for communal settings such as these, how is it possible to incorporate everyone's views and concerns, and to understand the dynamics that emerge when considering these together?

2.1 Sustainability, health and well-being

The degradation of the natural world and accompanying resource and climate challenges are now acknowledged as existential issues. The importance of recognising and supporting our personal role in the context of the wider environment has never been more important in motivating positive action [3]. Connecting to nature in this way has significant benefits for individuals as well as wider society: there are well-established therapeutic and health benefits in us spending time in nature [4]. Green prescribing is increasingly accepted as an approach that involves healthcare professionals recommending nature-based activities, such as gardening, walking, or participating in conservation projects, as part of a patient's treatment plan. This practice not only promotes individual health and well-being but also has significant potential to alleviate the burden on healthcare services [5]. Aside from the physical benefits of nature-based activities, mental health issues, including anxiety and depression, can be addressed. Spending time in nature has been shown to enhance mood, reduce stress levels, and promote mental resilience [6].

The individual and insulated nature of modern urban life has led to a significant dislocation from nature, requiring new remedies to reconnect us with the natural landscape and recognise our ecological responsibilities. While managed spaces such as bird reserves, safari parks, national parks etc. provide spaces which seek to bring people into accessible environments where they can learn about and enjoy nature [7], the land and estates surrounding hospitals and medical facilities is not commonly utilised for such purposes. These have the advantage of proximity for patients, visitors and staff connected to the healthcare facility, as well as the local residents. Together, these stakeholders form a community of users for whom the space must work.

This forms an archetypal human-centred design problem: how can designers extract and accommodate requirements from different stakeholders in formulating a specification and layout that meets the needs of a community of users? This paper will use this context to showcase a game-based mode of engagement that seeks to articulate user requirements in relation to nature and explain how this can be used by design educators who wish to provide students with co-research and co-design tools that can be

applied in similar human-centred design contexts where health, well-being and sustainability are prioritised.

2.2 Barriers to stakeholder engagement

From the perspective of community, barriers to stakeholder engagement in a health and well-being context include:

- There can be significant *resistance to change* in organisational and community cultures. This is particularly true of large organisations such as healthcare providers, and in relation to the protection of greenspaces. These require sensitive presentation of information and goals to secure appropriate engagement.
- The diversity of *stakeholder needs and expectations* can be complex. Healthcare greenspaces have at least four key stakeholder user groups, including patients, staff, visitors, and local residents, as well as others, such as funders and policy makers. Within each of these we can also expect significant diversity, competing priorities, and the capacity for conflict and compromises.
- In relation to these different groups, *communication barriers* can easily arise due to jargon, differing terminologies and variance in experience or understanding of HCD design principles and processes. Without due attention this can lead to misaligned goals and expectations, and frustration disengagement.
- The *resource constraints* that are evident in statutory healthcare services are at odds with the resource-intensive nature of HCD, which requires time, facilities and skilled personnel for effective delivery. This can lead to constrains and shortcuts that compromise the user research, iterative testing, and continuous engagement that are part of a quality HCD process.

2.3 Benefits of a game-based approach

A common criticism of HCD approaches is that it is difficult for truly disruptive and creative design work to exist within a user-focussed, co-design process, with a tendency to design for all, and a concentration on existing situations rather than new possibilities. Steve Jobs was famously sceptical of focus groups during its period of era-defining innovation, repeatedly invoking the Henry Ford quote that if he asked people what they want they would have said ‘a faster horse’ [8]. While co-design can help bring pragmatism and insight to generative design work, innovation can be stifled by a prioritisation of views and requirements of end users who may not be able to imagine new solutions, approaches or paradigms beyond what they typically experience. This is typically overcome by ensuring ideation approaches explore the widest possible solution space through generative methods.

This danger also exists in any approach to extracting stakeholder requirements, and it is necessary to provide participants with mechanisms that allow them to fully express their knowledge, experience and motivations. We have therefore adopted a game paradigm.

Games are considered integral aspects of all societies, with known examples of games dating back 3000 years [9]. In recent times, ‘serious games’ have emerged as an important aspect of the education and training market [10] with games that contain and reveal knowledge that is otherwise hidden from the player. These can be used to co-develop ideas, encouraging players to be innovative [11]. Serious games also provide space for players to unlearn to approach situations with divergent thinking. Unlearning through game play helps to relinquish previous mental models in a safe space to explore new ideas and as such are positive tools for sharing, learning and supporting knowledge exchange.

While serious games are not exclusively for amusement, there are factors that compile to make a successful game that players enjoy. Serious games are particularly successful at the *ideation* stage [11] as they have been found to unfreeze ideas and overcome initial challenges. Rules, with *turn taking*, communication rules and mutual goals are known to cut across power relations to create a level playing field to achieve shared objectives when games are played by diverse stakeholders. An important success factor is *avoiding negative consequences* as a result of the players low performance as these have been found to discourage players from interacting with the game resulting in a negative psychological effect. And *offering a challenge* has been found of significant importance in serious game methodology [9].

3 CASE STUDY

Design HOPES (Healthy Organisations in a Place-based Ecosystem, Scotland) is a transdisciplinary research cohort-project that exploits the potential of design-led thinking and making to innovate and tackle multifaceted health delivery challenges to meet urgent Net Zero goals for a sustainable health and

social care system [12]. The research aims to support green transitions for Scotland's National Health Service (NHS), which is tasked with sustaining the population's health. Given its significant land and estates (1,572 hectares, over half of which is trees, grass, scrub and agricultural land) around hospitals and treatment centres, there is an opportunity to enhance nature experiences around these to help foster public well-being while deepening ecological appreciation. This poses a challenge in balancing the often diverse and complex needs and requirements of patients, visitors, staff and potentially members of the local community in access and utilisation of such spaces.

The work reported here is part of the Design HOPES Sustainable Communities Theme, which is supporting a series of co-research and co-design activities in the regeneration of greenspace at Mountainhall Treatment Centre, located at an NHS hospital in Dumfries and Galloway, in the south of Scotland. Mountainhall have access to an adjoining 11-acre site that comprises a mix of woodland, grassland, brownfield which is currently functioning as an accessible greenspace for local residents and those connected with the treatment centre. However, the size and scope of the site means there is an opportunity to make the space more compelling while preserving its qualities as a refuge for nature and its biodiversity. Other organisations involved in the exploration of its use include Propagate, who specialise in local, community and sustainable food projects and have provided local organisation and facilitation expertise to Mountainhall, and the Stove Network, an arts initiative that uses creativity to inspire new community-led projects. Together, this team is seeking to not only help Mountainhall establish a plan for sensitive and high-quality proposal for the site, but to develop innovative means to help the community articulate their requirements in relation to nature, sustainability and well-being.

3.1 Implementation of game

The game not only allows for engaging interaction between participants but provides a mechanism to connect theory to tangible scenarios. As such, we conducted a literature review to determine the potential health and well-being benefits afforded by different landscape elements. The landscape elements selected for use in Mosaic Landscapes were derived from Roberts et al [14] review on green and blue space quality metrics. These quality metrics were translated into landscape elements by the research team. An initial list of 46 landscape elements were derived and subsequently reduced to 32 landscape elements included in the final game. These were abstracted into shapes, made using reclaimed wood, that participants could handle and place on the board. In tandem, a series of personas – fictional characters to represent different user types - were created across the four stakeholder groups (patients, visitors, staff and local residents) with sufficient detail to allow interpretation of their needs and wants.

The result is 'Mosaic Landscapes' (Figure 2), a game that invites players to take on the role of a 'landscape planner' where the challenge lies in making the design choice, they feel is most appropriate for their selected persona. This requires consideration of the physical boundary of the board and proximity to the other landscape elements selected by the players. The board is split into zones where each zone represents a further 5-minute walk from the hospital building. Players must consider which landscape elements would be most appropriate to be placed closest to the hospital building. Engaging with the game provides an opportunity for players to work together in the design of a featured representation of the grounds that accommodates multiple perspectives. The game is played as follows:

- 1. **Select a Persona Card**: Each player selects a card describing a fictional persona, such as a patient, staff member, or visitor, with specific needs and wants.
- 2. **Make a Design Choice**: Players choose a landscape element (e.g., orchard, walking paths, wildflower meadow) and place it at a space on the board where they feel it fits best for their persona.
- 3. **Collaborate**: Players discuss and, if they wish, modify landscape element positions according, considering factors such as proximity to the hospital building, accessibility, and biodiversity.
- 4. **Finalise and Reflect:** Once the board is filled, the players review their collective design, discussing how well it meets the needs of the personas. The implications can be considered more broadly, for example in this case the NHS in relation to its sustainability goals.

Figure 2. Game board as displayed in exhibition at the V&A Dundee

The game allows the theory of greenspace features and stakeholder personas to become visible. Feedback from preliminary engagement sessions and from the public through exhibition at the V&A Dundee, Scotland's design museum, has been positive, with inspiring conversations and new insights emerging amongst participants. Handling and visualising the pieces makes the challenges of implementing features tangible and increases cognitive and emotional engagement. The abstract geometry of pieces is suggestive but leaves room for individual interpretation, and the juxtapositions between pieces and profiles that arise through their placement leads to new dynamics in conversation and insights beyond the personas and features themselves. Stories evolve amongst players over time – they fill in the gaps for how these personas can use and interact with the spaces. The collective sculptural quality of the board when filled is satisfying for those assembling, and complex enough to invoke intrigue in onlookers; this suggests solutions. The game is made from repurposed science benches, and handling the wood, with its natural grains and textures invokes emotional connections to nature; understanding the material origin emphasises intellectual ideas of circularity.

4 LESSONS FOR DESIGN EDUCATION

HCD education can be enhanced by developing a deeper understanding of diverse stakeholder groups at the early stages of the design process and providing additional tools to support such explorations. The closest equivalent to an existing recognized design method for this purpose is stakeholder mapping. This is a strategic tool used to identify, categorise and analyse individuals, groups and organisations relevant to a particular context. While there is no fixed format to applying this technique, it generally involves listing the main actors and mapping and analysing the relationships that exist between them. There may be a degree of categorization or hierarchy in terms of relevance and influence on the design context, but it relies on noting and evolving insights across a visual distribution.

The game provides a more formalized and engaging approach to identify these relationships, and to generate more powerful narratives around how they can intersect. By understanding the unique needs and preferences of various users, designers can create more inclusive and effective solutions. A game-based approach allows students to simulate real-world scenarios, where they must balance competing requirements from different user groups. This interactive method fosters empathy, critical thinking, and problem-solving skills. It also encourages collaboration and creativity, as students navigate challenges and make decisions that impact the overall design. Ultimately, this approach prepares future designers to create user-centred products that cater to a wide range of needs.

While we have configured this approach as a board game, the basic premise of abstracting theory to physical artefacts and generating personas through which they are manipulated could be realised in many different forms. For example, cards or tiles can be used for features rather than wooden pieces, and the board can be any defined shape drawn on an appropriate surface. Similarly, personas can be formulated to a level of detail as appropriate for the context. The basic steps of establishing these are highlighted in Figure 3 and can be considered by educators in formulating their own exercises, workshops or assignments for students as a precursor to the more focussed ethnographic studies, interviews, co-design and similar methods typically applied downstream in the HCD process. There are also opportunities to re-format the game as an icebreaker or requirements setting exercise to help define the scope of a particular design problem.

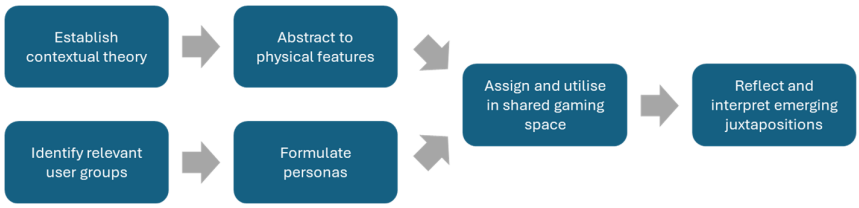

Figure 3. Process for stakeholder game development in HCD contexts

5 CONCLUSIONS

This paper has outlined a novel approach for designers who wish to improve awareness of stakeholder requirements in the preliminary stages of a human-centred design approach. As such, the research strongly aligns with the conference theme of 'Fostering Human-Centred Products and Services in Design' and has presented a game-based engagement method that can be adopted and modified by design educators in similar contexts where health and well-being outcomes are prioritised. Recognising and acknowledging often conflicting stakeholder requirements in human-centred design is essential but challenging. By understanding and addressing the diverse needs and expectations of those involved, overcoming communication barriers, managing resistance to change, and effectively integrating HCD into existing processes, organizations and designers can further enhance their design outcomes.

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