VISUALISING OUR FUTURE PUBLIC REALM

Definition - art and mobility design

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1. INTRODUCTION

In the discovery phase, we reviewed the role of digital tools in supporting community-scale urban design and retrofit projects that promote the green transition.

We considered the needs and challenges of various stakeholders. We highlighted the overlapping nature of different scientific models of urban sustainability. We suggested the underlying needs could be delivered through project missions that address social challenges (cultural equality, health, and inclusion), ecological challenges (resilience and restorative environments), and economic and technical challenges (service-orientation, circular economics, and net-zero goals)

We reviewed best practices in design patterns and approaches that contribute to green transitions at the neighbourhood level, including sustainable streetscapes, low traffic neighbourhoods, and emphasised the importance of integrating mobility and service design approaches within building and urban design to create more sustainable, equitable, and vibrant communities.

We investigated the range of tools used by designers and researchers from online citizen assemblies to urban design games and parametric modelling tools.

Finally, we proposed a framework for a future participatory design "game" that used digital tools to help architects and communities create a collaborative approach to their future neighbourhoods through a combination of mission led ambitions, science-based models, systemic approaches to decision making, visioning and facilitation by architects and designers, and the creative application of game theory to issues of collaboration, competition and conflict resolution.

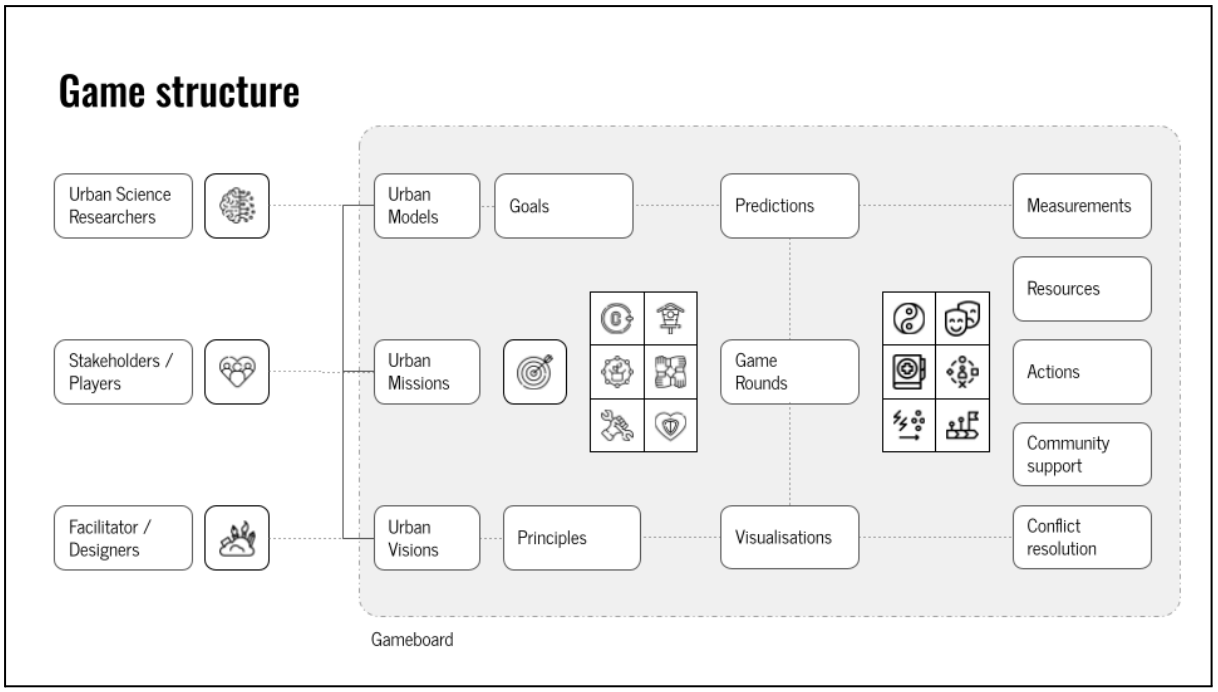


Fig 1: Game structure for participatory sustainable community design

This report takes this work forward by reflecting on co-design workshops with colleagues at Aalto University and Tampere University as well as interviews with architectural partners and colleagues, where we aimed to define the direction of the VOF digital tool and develop a ‘design brief’ to support development and testing through a workshop at the RCA’s battersea campus in September 2023.

The original intent of this definition phase was to learn together about our impacts, the things we can change and risks from the future; to consider how this understanding changes the principles, values and objectives for architects, urban and transport planners; to reflect on the opportunities and challenges associated with the experience of urban service and mobility design; to share knowledge about the benefits of sustainable transport and placemaking; to identify the key ingredients for a successful ‘design led mobility and service’ platform and to develop a more detailed ‘brief’ for digital platform prototyping. This aims to

lead to the first outlines for prototype testing and further development of the digital platform through a design course that supports issues like ‘future mapping, networks, visualisation and modelling’.

2. FINNISH DISCOVERY AND DEFINITION WORKSHOPS

In parallel with RCA's research, colleagues in Finland have researched the role of digital tools from an architectural design research perspective. They concluded their research by identifying an alternative challenge space based on the following criteria.

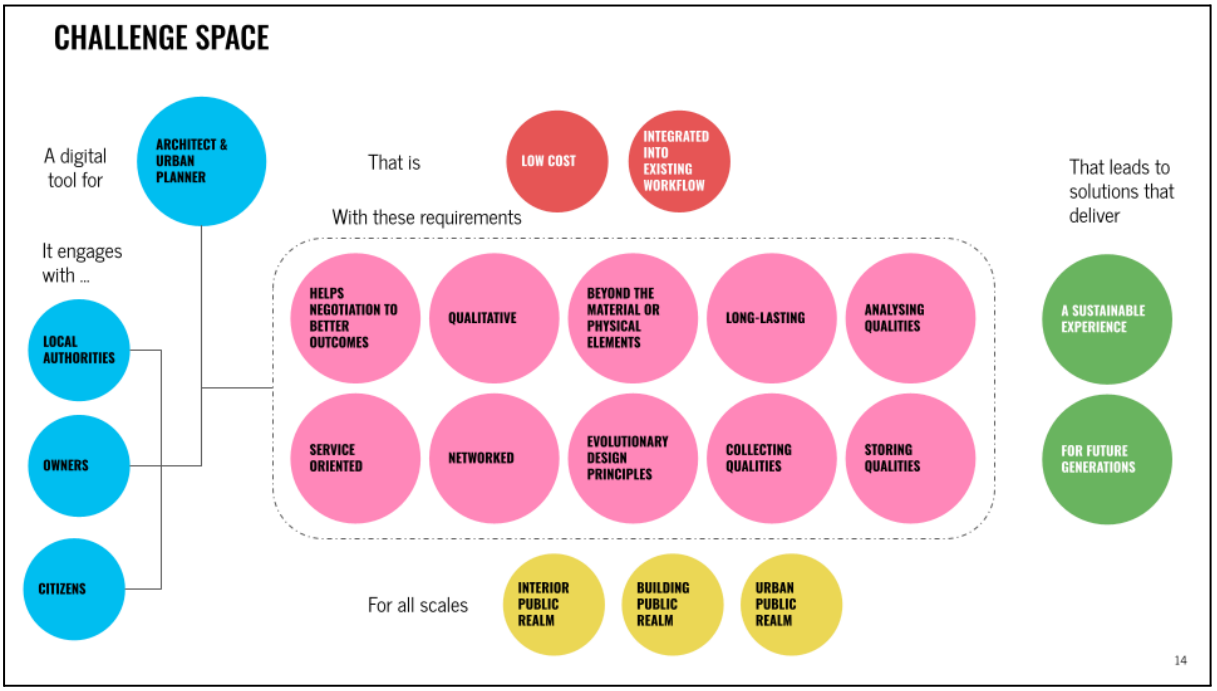


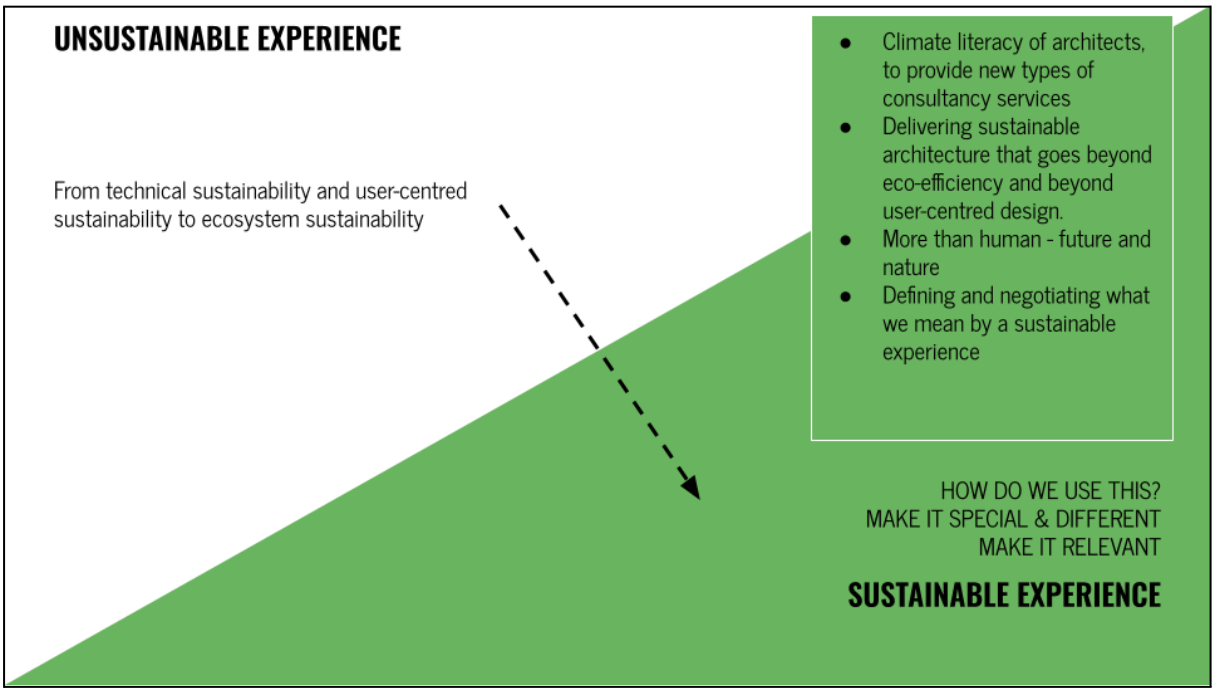
Fig 2: VOF Challenge space

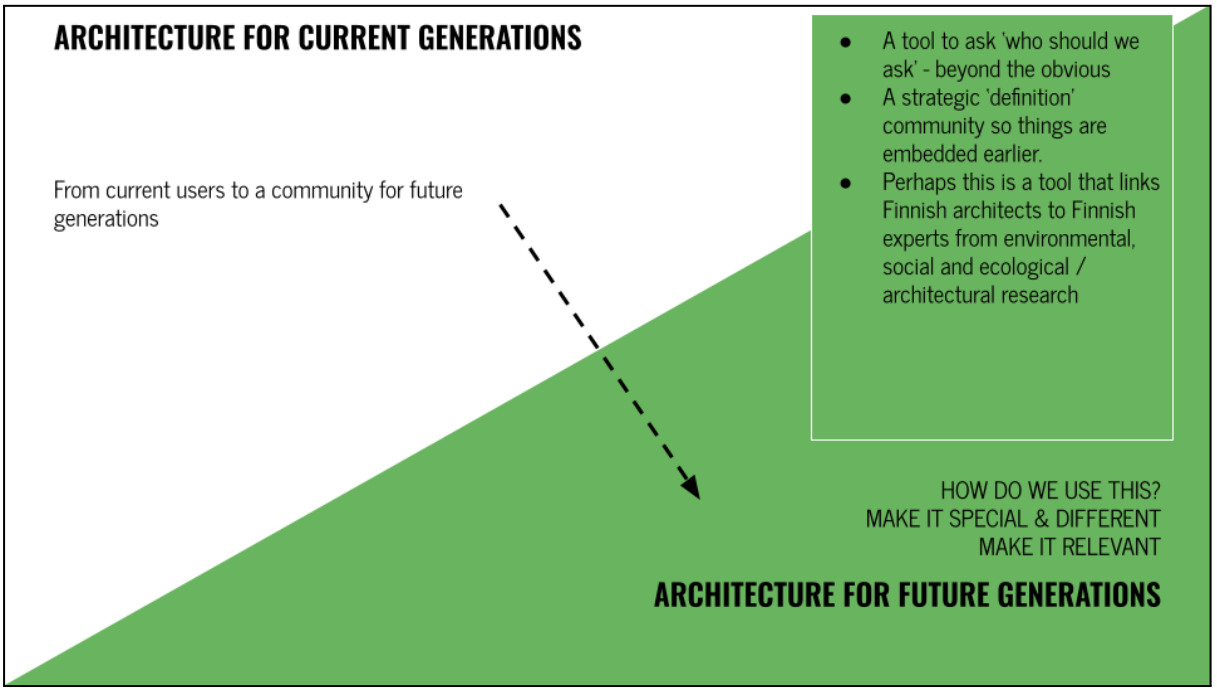
> The digital tool is for architects and urban planners, potentially engaging with local authorities, landowners and citizens. It needs to be 'low cost' and 'integrated into existing workflows', suitable for a range of scales of public realm projects. It needs to help teams negotiate better outcomes, should focus on the qualitative elements of architectural design, support a service oriented and networked approach to design, go beyond the material or physical elements of architecture, support evolutionary principles, be long lasting and support the collection, analysis and storage of 'architectural qualities' that together support sustainable experiences for future generations.

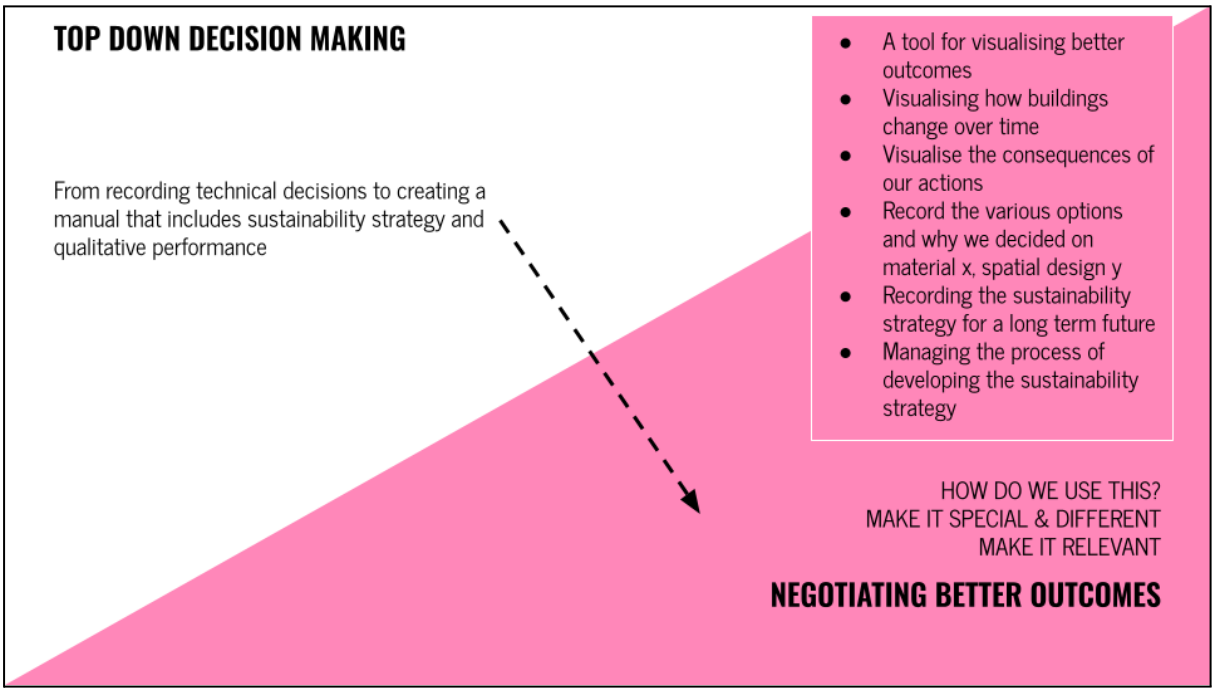
Fig 3: Revised challenge description based on feedback from architectural research

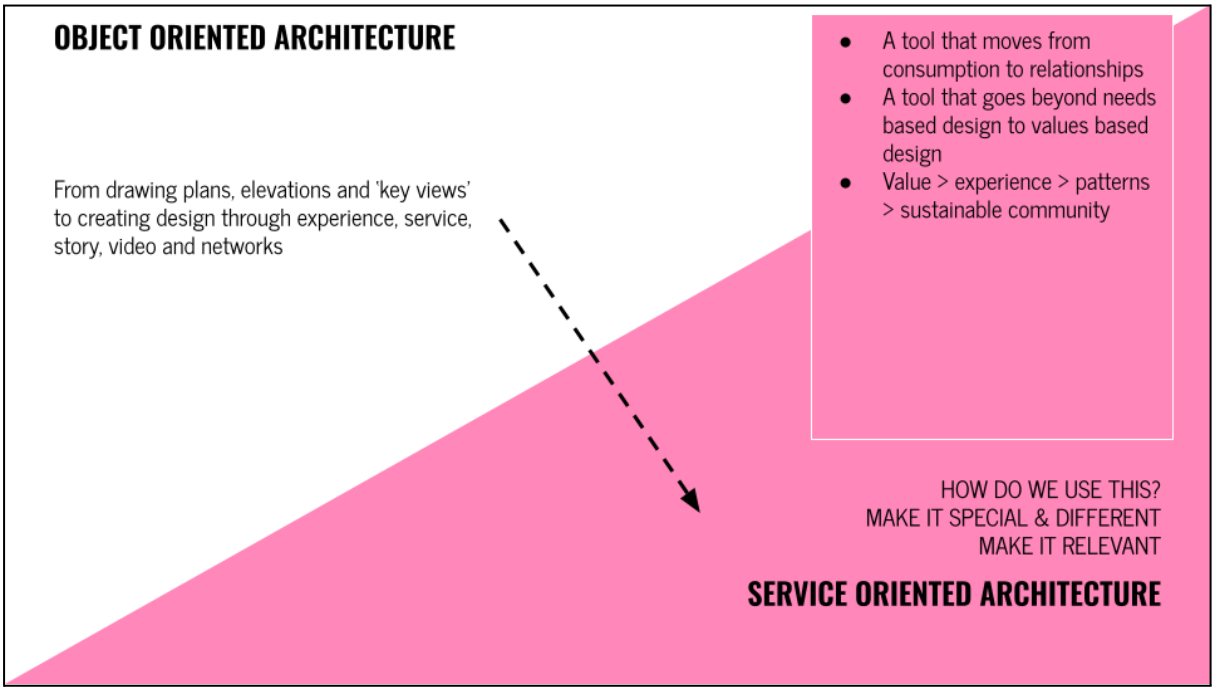
Each of the elements of this challenge space open up a range of questions and potential directions for development, and to support this, we used a three day workshop in Aalto to dig deeper into each of these issues with the aim of formulating a more precise design brief for the development phase.

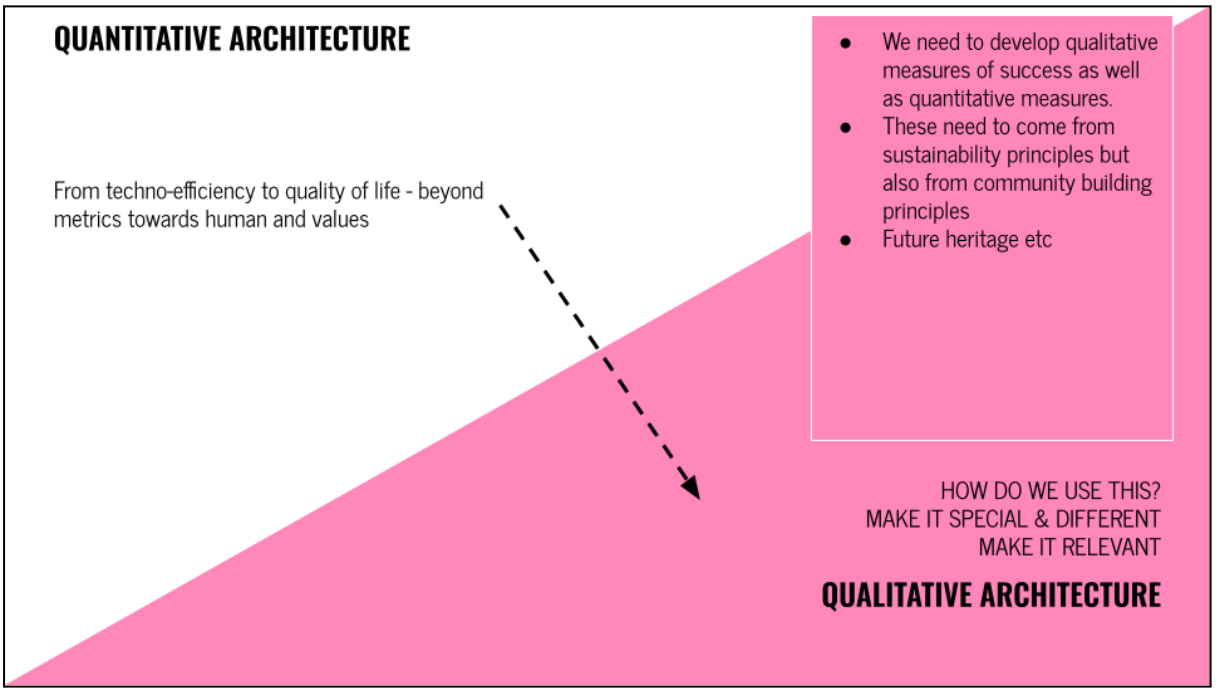
Architectural researchers responded to a series of provocations asking how these elements might be used, and how they can be made special, different and relevant.

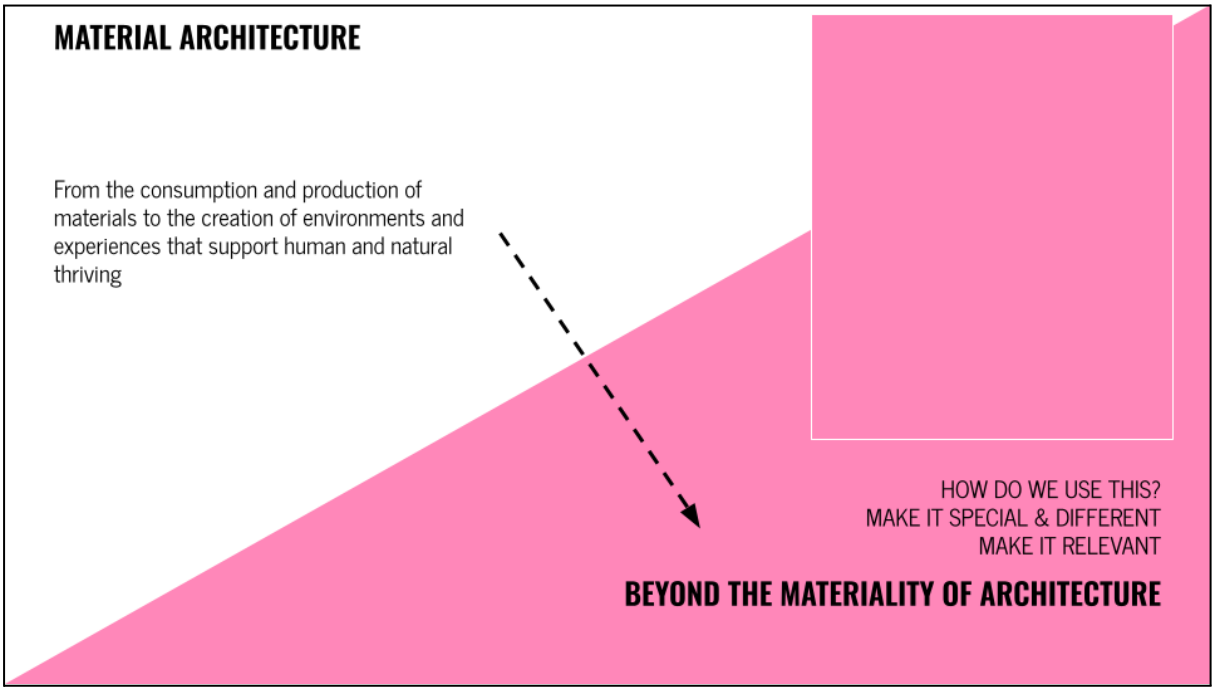





TOP DOWN DECISION MAKING
From recording technical decisions to creating a manual that includes sustainability strategy and qualitative performance
A tool for visualising better outcomes
Visualising how buildings change over time
Visualise the consequences of our actions
Record the various options and why we decided on material x, spatial design y
Recording the sustainability strategy for a long term future
Managing the process of developing the sustainability strategy
HOW DO WE USE THIS?
MAKE IT SPECIAL & DIFFERENT
MAKE IT RELEVANT
NEGOTIATING BETTER OUTCOMES


OBJECT ORIENTED ARCHITECTURE
From drawing plans, elevations and 'key views' to creating design through experience, service, story, video and networks
A tool that moves from consumption to relationships
A tool that goes beyond needs based design to values based design
Value > experience > patterns > sustainable community
HOW DO WE USE THIS?
MAKE IT SPECIAL & DIFFERENT
MAKE IT RELEVANT
SERVICE ORIENTED ARCHITECTURE


QUANTITATIVE ARCHITECTURE
From techno-efficiency to quality of life - beyond metrics towards human and values
We need to develop qualitative measures of success as well as quantitative measures.
These need to come from sustainability principles but also from community building principles
Future heritage etc
HOW DO WE USE THIS?
MAKE IT SPECIAL & DIFFERENT
MAKE IT RELEVANT
QUALITATIVE ARCHITECTURE


MATERIAL ARCHITECTURE
From the consumption and production of materials to the creation of environments and experiences that support human and natural thriving
HOW DO WE USE THIS?
MAKE IT SPECIAL & DIFFERENT
MAKE IT RELEVANT
BEYOND THE MATERIALITY OF ARCHITECTURE

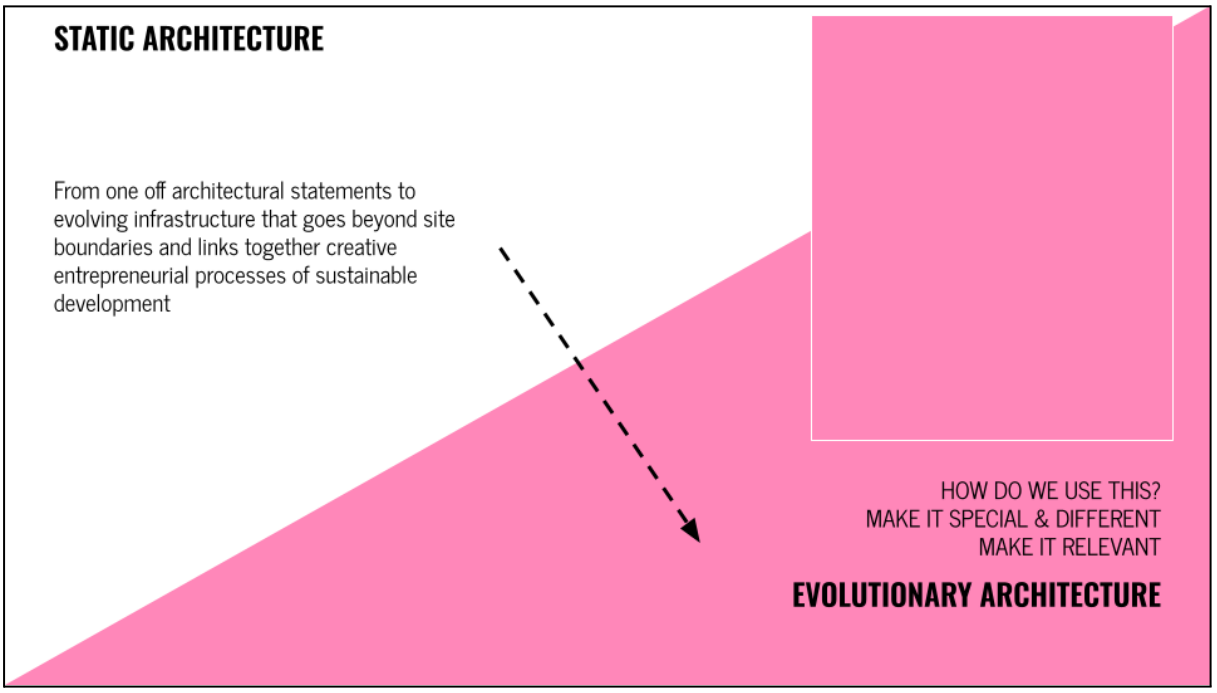


Fig 4: Diagrams to support definition workshop

Through reflection and discussion we developed an initial description of an improved design brief as noted below:

> How might architects and urban designers use digital tools to negotiate shared values, visualise future experiences and create novel architectural patterns that support and develop sustainable communities over time. How does the tool connect to community and specialist knowledge and make use of the latest digital technologies?

Fig 5: Revised design brief for VOF tool

We reviewed the key elements of this tool through the lens of existing architectural practice considering how the following elements might be applied at different stages of design:

- Negotiate shared values
- Visualise future experiences
- Create novel architectural patterns
- Develop and support sustainable communities over time
- Access to specialists
- Access to communities
- Supported by latest digital tools

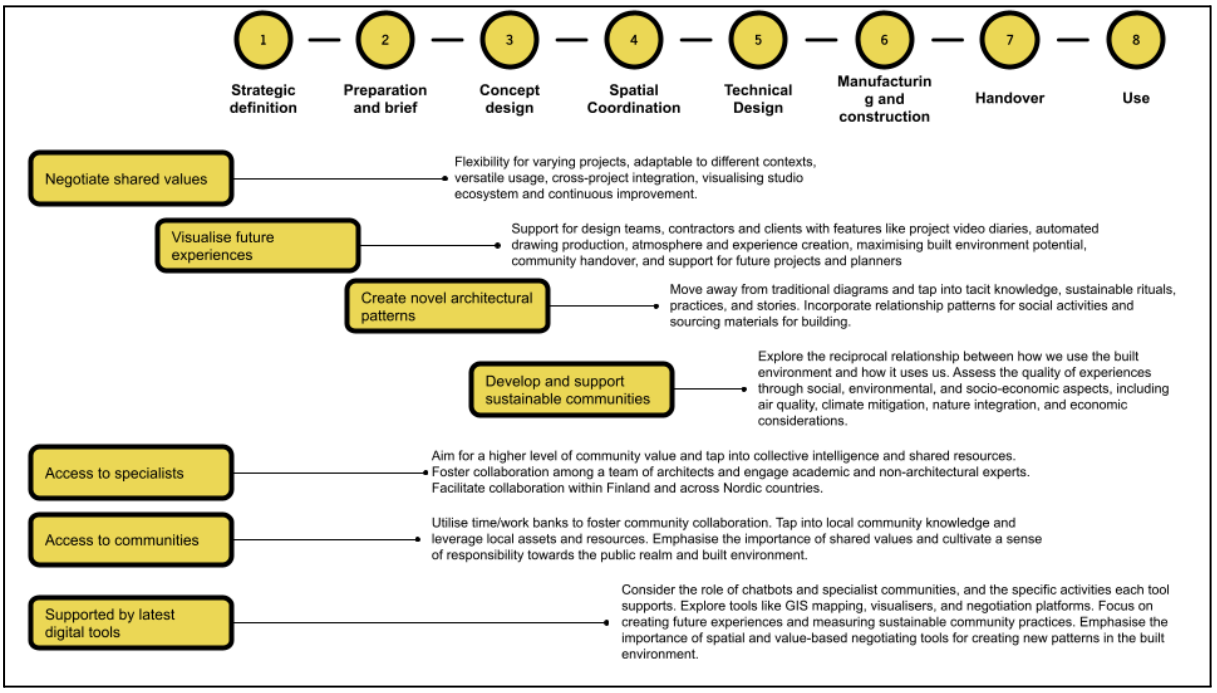


Fig 6: Summary of notes about tool elements against a typical architectural process

We also used case study projects from architectural research in Finland to examine how this new brief could improve architectural outcomes. These case studies included Fennia Block, a typical mixed use development in Helsinki, where discussions led us to consider a circular process that connects the main building blocks of the tool through repeated rounds of design and evaluation

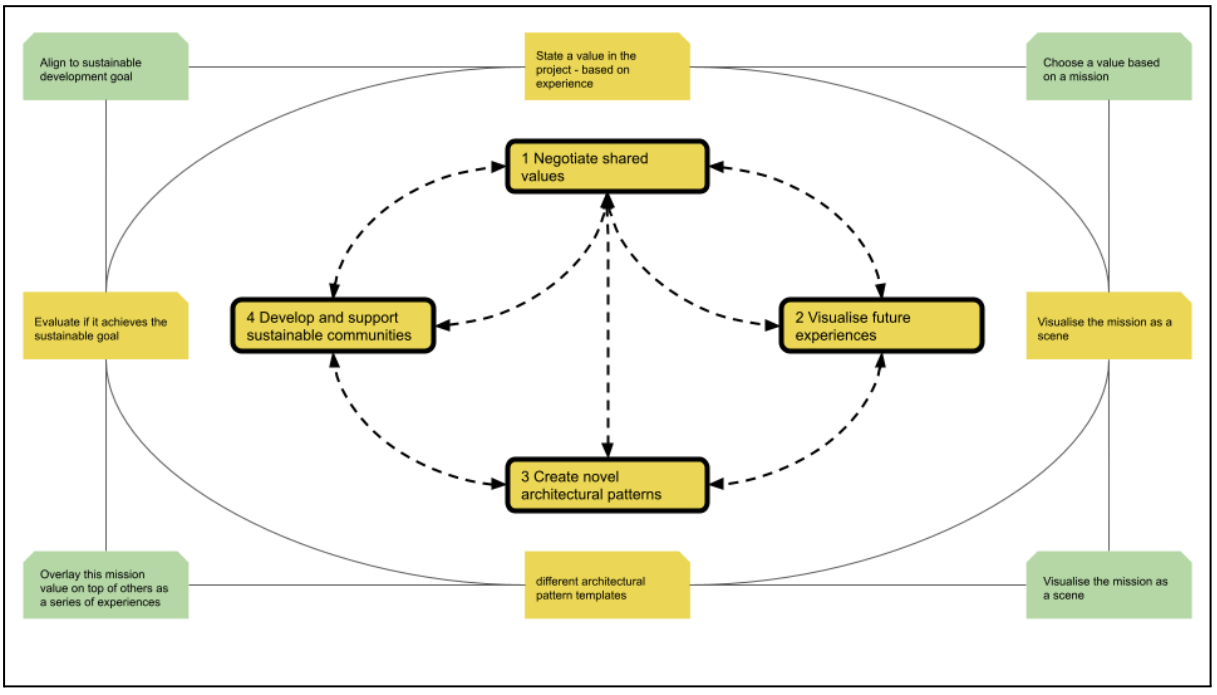


Fig 7: A circular approach to tool development that takes the project through repeated rounds of design and evaluation

The team identified a key move from the focus on a conventional brief and schedule of accommodation to a translation into a ‘scene map’ that considers architectural design as the investigation of sustainable moments defined through activity, time, space and actors (Fallan, 2008).

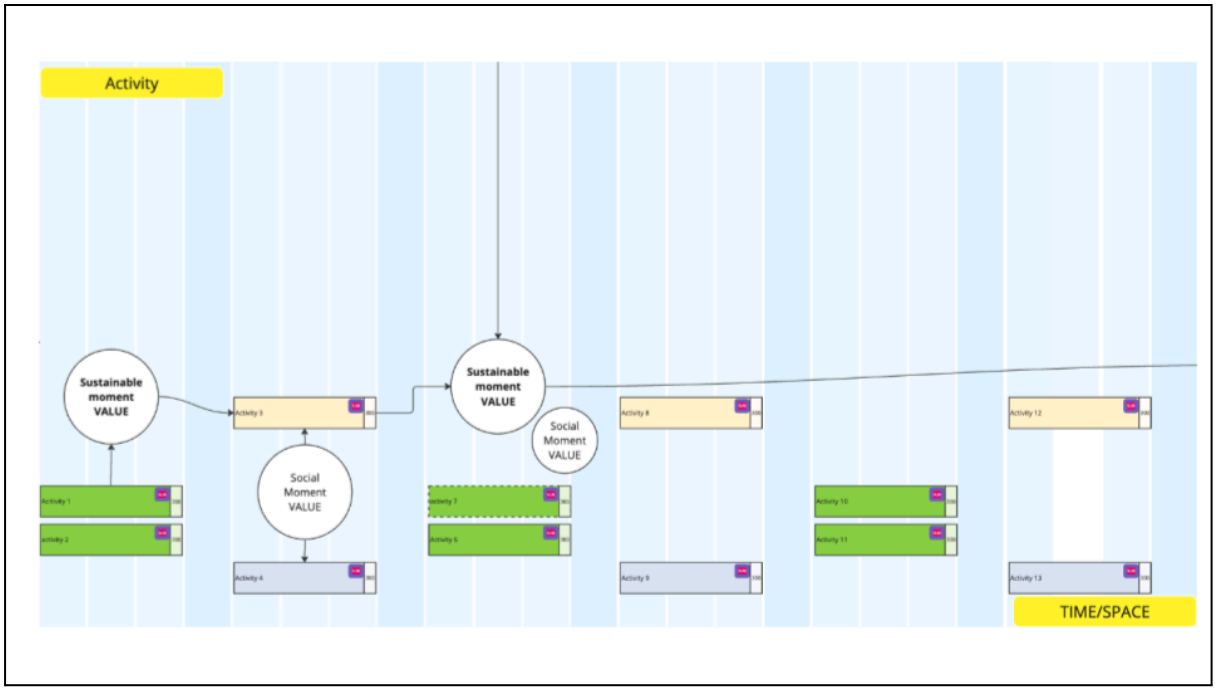


Fig 8: A move from the design based on schedules of accommodation to design based around sustainable moments and activities

These can be visualised as storyboards, as used in film and theatrical design, where the moments of value are combined to create a wider pattern of use through specific touchpoints and architectural spaces.

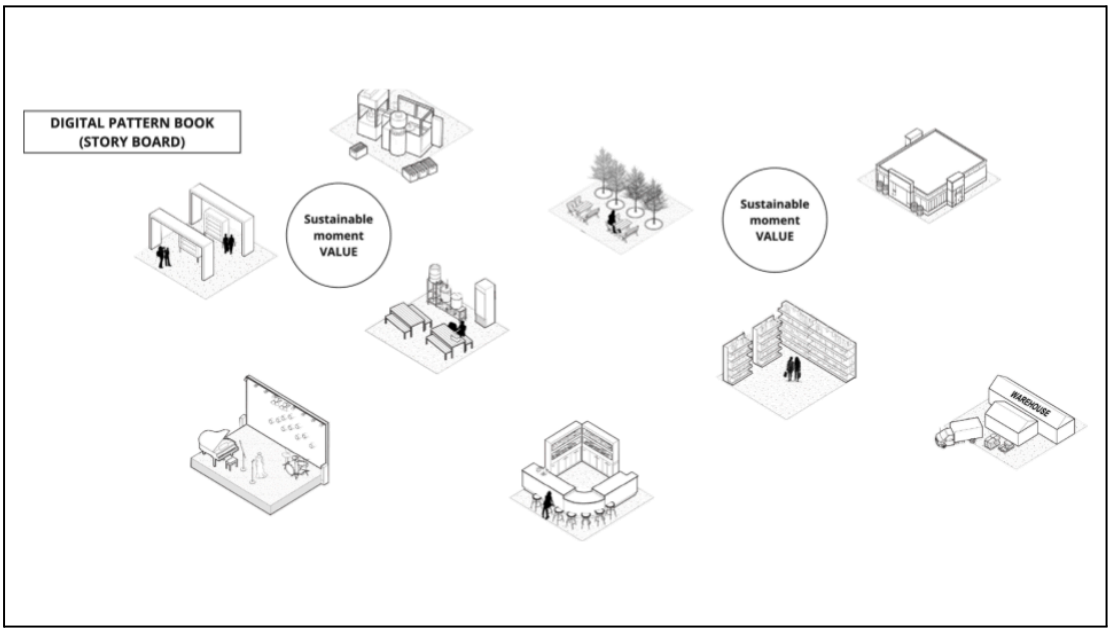


Fig 9: Storyboards as the combination of a variety of touchpoints and architectural spaces.

At the end of the workshop, we created a more detailed diagram showing how this circular design process can proceed from inner to outer connections (Ives, Freeth, & Fischer, 2020) - from values and emotions and knowledge to future experiences and physical changes and how these layers can relate to our relationship with cultural futures through meanings, rituals, practices, materiality and future icons (Picon, 2021).

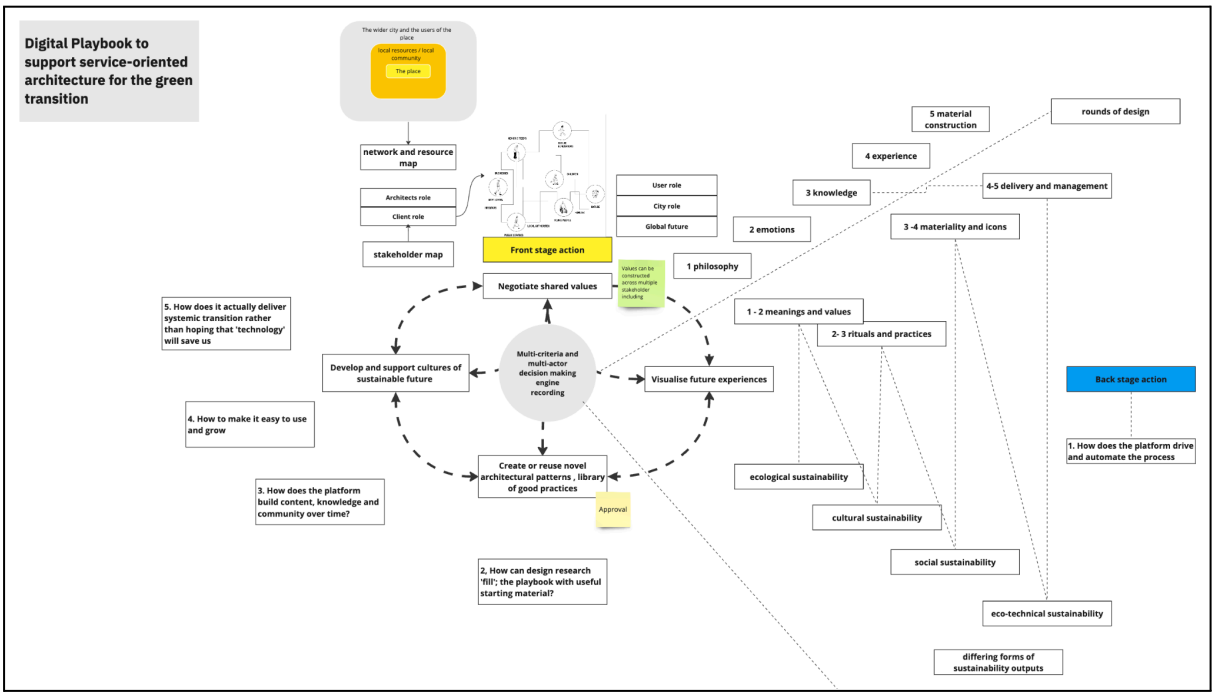


Fig 10: A digital playbook to support service-oriented architecture for the green transition

In this model, the architect starts by collecting details about a project that go beyond the client brief to include a stakeholder map and a network and resource map that includes information about the place, its relationship with local resources and the local community and with the wider city and the people who will use or support the project.

Negotiating shared values is seen as an opportunity to connect deeper ‘sustainability values’ into the project brief, taking on board multiple stakeholder perspectives and connecting these values to ‘sustainability missions’ that drive future experience designs and patterns.

The decision-making process can be coordinated by a multi-criteria and multi-actor engine that has the potential to balance different stakeholder needs and to move the dial away from strict cost-benefit analysis to wider ecological, cultural and social goals that may extend the remit of the project beyond its boundary to consider wider material and service opportunities and relationships.

These values and priorities can then be shared through a process of ‘visualising future experiences’ where the architect can collaborate with other stakeholders to storyboard potential solutions to key missions and challenges. These storyboards can start at the level of meaning and value - bringing to life ideas around ecological sustainability - and progress through cultural, social and eco-technical layers as the fidelity of the project develops.

The ‘experience’ stage can then be formalised as a project ‘pattern’ that builds a library of good sustainability practice. This library can go beyond the scale based perspective of Alexander’s pattern language to include political, economic, environmental, social, technical and even ‘legal’ patterns as well as framing patterns that may be valuable for different stakeholders - not just for the sustainability of developers and investors but for the sustainability of different life stages, of future generations and nature and for the sustainability of different human practices - caring, playing, learning, making, moving, transporting, trading, building, maintaining, repairing, restoring etc.

Finally, the evolutionary component of each project is determined by its success in developing and supporting cultures of sustainable futures. This can be seen as an on-going dialogue with people where project outcomes can be tested ‘virtually’ and ‘in reality’ - building an interactive project ‘playbook’ that helps communities to get the most out of the architectural solution and including a timeline of ongoing maintenance and upgrade that helps the project to evolve over time and also helps the architect to stay involved in the project.

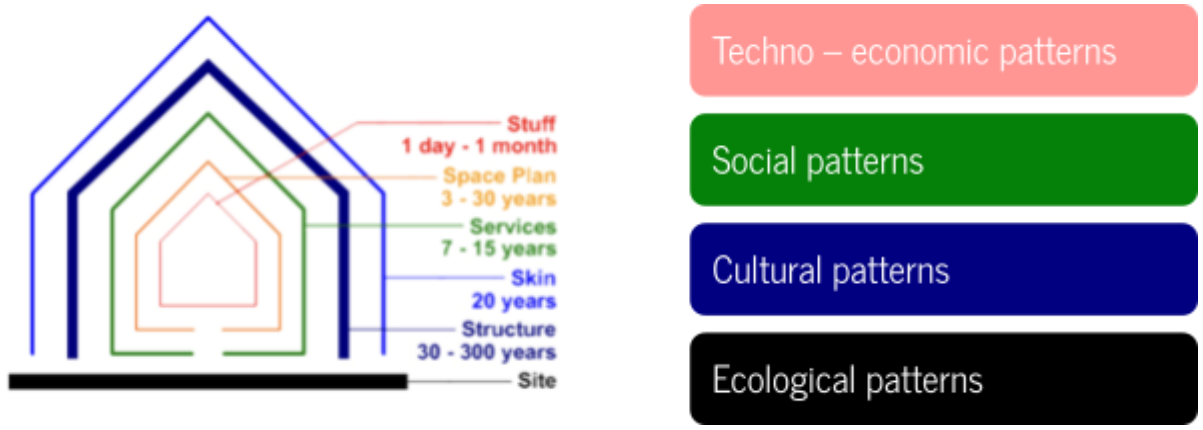


Fig 11: A sustainable building and urban playbook can go beyond the layers in Brand's 'How buildings learn' (Brand, 1995) to include ecological, cultural and social patterns and experiences, not just the physical and techno-economic components of a system.

The interaction between the architect and generative tools can be seen as 'value-based' art direction where different forms of design material - words, images and data - are used to inform a series of generative processes that support qualitative design decision making. But while these tools have certain qualities its important to recognise that they are agents without intelligence - statistical engines that calculate the next word or pixel using existing data sets that are probably biassed, built on cheap and traumatised labour, huge energy demands, ethically dubious ownership rights and outputs that are neither intelligent or creative in and of themselves (Floridi, 2023). How they are used (and abused) will determine their ultimate value.

3. USER STORIES

The following table outlines the user stories that describe the needs, inputs, computational activities and outputs required to deliver the VOF service, generated through a series of prompts using ChatGPT. It's important to note that many of these user stories will be out of scope for any prototype and the user stories need validation by the team.

Story No.	User Name	User Story Title	User Story Description	User Input	Computational Activity	Output
1.1	Architect	Collect Ideas and Sketches	The architect wants to collect ideas and sketches for a project.	Ideas, sketches	Implement a user interface for inputting and organising project ideas and sketches. Integrate generative AI tools to interpret text and sketches.	Organised collection of project ideas and sketches, with generative AI interpretation.
1.2	Architect	Capture Local Resources	The architect needs to capture information about local resources relevant to the project.	Local resource data, GIS information	Develop a database for storing information about local resources. Integrate generative AI tools to interpret GIS information and link to project context.	Stored data on local resources, with generative AI interpretation of GIS information and context linking.
1.3	Architect	Create Stakeholder Map	The architect wants to visualise and map stakeholders involved in the project.	Stakeholder information	Provide a user interface for visualising and mapping stakeholders. Develop generative AI tools to interpret stakeholder data and link to sustainable development goals and quality of life indicators.	Visual representation of stakeholders and their connections, with generative AI interpretation and linkage to sustainable development goals and quality of life indicators.

2.1	Architect	Facilitate Stakeholder Discussions	The architect needs collaboration tools for stakeholders to engage in discussions.	Stakeholders, collaboration platform	Implement collaboration tools, such as messaging or chat functionality, for stakeholders to engage in real-time discussions. Integrate generative AI tools to interpret text and facilitate discussions on sustainable development goals and quality of life indicators.	Facilitated stakeholder discussions using collaboration tools, with generative AI interpretation of text and focus on sustainable development goals and quality of life indicators.
2.2	Architect	Identify Common Values and Goals	The architect wants to document and align shared values and goals among stakeholders.	Shared values, goals	Develop a user interface for documenting and aligning shared values and goals. Incorporate generative AI tools to interpret text and identify connections to sustainable development goals and quality of life indicators.	Documented shared values and goals, with generative AI interpretation and linkage to sustainable development goals and quality of life indicators.
3.1	Architect	Storyboarding Key Moments	The architect aims to create and arrange storyboard frames for key moments in the project.	Storyboard frames, visual assets	Create a user interface for creating and arranging storyboard frames. Provide a library of visual assets and integrate generative AI tools to interpret images and sketches.	Storyboard with arranged frames, utilising generative AI interpretation of images and sketches.
3.2	Architect	Mapping Experiences to Stakeholders	The architect needs to map experiences to specific stakeholders involved in the project.	Experiences, stakeholder relationships	Implement relationship mapping functionality for associating experiences with specific stakeholders. Utilise generative AI tools to interpret stakeholder relationships and link to sustainable development goals and quality of life	Mapped experiences to stakeholders, with generative AI interpretation of stakeholder relationships and linkage to sustainable development goals and quality of life indicators.

					indicators.	
4.1	Architect	Integration with Common Tools	The architect requires compatibility with common tools used in architectural processes.	File formats, project management tools	Ensure compatibility with file formats used in architectural processes. Integrate generative AI tools to interpret text, sketches, and images from common tools.	Smooth integration with common architectural tools, with generative AI interpretation of text, sketches, and images.
4.2	Architect	Intuitive Interface and Navigation	The architect needs an intuitive user interface design and clear navigation for the platform.	User interface design principles	Design the user interface following usability and UX principles. Provide clear and organised menu structure and navigation flow.	User-friendly interface with intuitive design and easy navigation.
5.1	Architect	Integration of AI Tools	The architect wants to integrate separate AI tools into the platform.	Separate AI tools, APIs	Develop APIs or integration capabilities for connecting separate AI tools to the platform. Enable data exchange between the platform and AI tools, including text, sketches, images, and GIS information.	Seamless integration of separate AI tools with the platform, allowing data exchange and interpretation of text, sketches, images, and GIS information.
5.2	Architect	AI Tool Accessibility	The architect needs a user interface to access and configure AI tools within the platform.	AI tool parameters, requirements	Create a user interface for accessing and configuring AI tools. Enable input of parameters and requirements for AI tool usage.	User-friendly interface to access and configure AI tools, with parameter and requirement inputs.
6.1	Architect	Pattern Storage and Retrieval	The architect wants a database for storing and retrieving architectural patterns.	Architectural patterns	Develop a database for storing architectural patterns. Provide search and filtering functionality for accessing specific patterns.	Stored architectural patterns with search and filtering capabilities.

6.2	Architect	Pattern Customisation and Modification	The architect needs the ability to modify and adapt existing architectural patterns.	Existing patterns, customisation	Enable the modification and adaptation of existing architectural patterns. Implement version control to track pattern revisions.	Modified and adapted architectural patterns with version control for tracking revisions.
7.1	Architect	Service Design Tools	The architect requires a user interface for creating and visualising service-oriented solutions.	Service-oriented solutions	Create a user interface for designing and visualising service-oriented solutions. Provide tools to define actors, networks, and objectives.	User interface for creating and visualising service-oriented solutions with defined actors, networks, and objectives.
7.2	Architect	Integration of Sustainability Goals	The architect wants to integrate sustainable development frameworks and metrics into service-oriented solutions.	Sustainable development frameworks, metrics	Integrate sustainable development frameworks and metrics into the platform. Map sustainability goals to service-oriented solutions.	Service-oriented solutions with integrated sustainable development frameworks and mapped sustainability goals.
8.1	Architect	Data Aggregation and Analysis	The architect needs a database for storing relevant data and criteria.	Relevant data, criteria	Develop a database for storing relevant data and criteria. Implement algorithms or methods for aggregating and analysing data.	Stored relevant data and criteria with algorithms for data aggregation and analysis.
8.2	Architect	Visualisation of Decision Support	The architect requires a user interface for presenting decision support outputs.	Decision support outputs	Create a user interface for visualising decision support outputs. Utilise graphs, charts, or visual representations for presenting analysis results.	User interface with visual representations of decision support outputs and analysis results.

9.1	Architect	Round-Based Project Development	The architect wants a workflow management system for guiding sequential project rounds.	Workflow, project stages	Develop a workflow management system to guide sequential rounds in the project development process. Allow definition and management of project stages or rounds.	Workflow management system for guiding sequential project rounds, with defined project stages or rounds.
9.2	Architect	Output Integration into Subsequent Rounds	The architect needs the ability to import and reference outputs from previous rounds in subsequent rounds.	Previous round outputs, data transfer	Enable the import and referencing of outputs from previous rounds in subsequent rounds. Implement data transfer or sharing functionalities between rounds.	Ability to import and reference outputs from previous rounds in subsequent rounds, with data transfer or sharing functionalities.
10.1	Architect	Tailored Response Templates	The architect wants template creation and management for round-specific responses.	Response templates, round requirements	Provide template creation and management for round-specific responses. Customise response fields based on round requirements.	Round-specific response templates with customisable fields based on round requirements.
10.2	Architect	Integration of Sustainability Dimensions	The architect needs to integrate sustainability dimensions (ecological, cultural, social, eco-technical) into responses.	Sustainability dimensions	Integrate sustainability dimensions into the platform. Map responses to corresponding sustainability dimensions.	Responses with integrated sustainability dimensions, mapped to the corresponding dimensions.
11.1	Architect	Workflow Automation	The architect requires automated notifications and reminders for task completion.	Task notifications, progress tracking	Implement workflow automation for automated notifications and reminders. Enable progress tracking and reporting functionalities.	Workflow automation with automated task notifications, reminders, progress tracking, and reporting capabilities.

11.2	Architect	Collaboration and Feedback Automation	The architect wants automated notifications for stakeholder collaboration and feedback requests.	Collaboration notifications, feedback aggregation	Develop automated notifications for stakeholder collaboration and feedback requests. Implement feedback aggregation and analysis capabilities.	Automated notifications for stakeholder collaboration and feedback requests, with feedback aggregation and analysis capabilities.
12.1	Architect	Research Repository Integration	The architect needs integration with external research repositories or databases.	Research repositories, databases	Integrate the platform with external research repositories or databases. Enable import and referencing of research materials.	Integration with external research repositories or databases, with the ability to import and reference research materials.
12.2	Architect	Research Insights and Recommendations	The architect requires algorithms or tools for analysing and extracting insights from research materials.	Research materials	Develop algorithms or tools for analysing and extracting insights from research materials. Implement a recommendation engine for suggesting relevant research.	Algorithms or tools for analysing research materials and extracting insights, with a recommendation engine for relevant research.
13.1	Architect	Content Creation and Sharing	The architect wants a user interface for creating and sharing content within the platform.	Content creation, sharing	Provide a user interface for creating and sharing content within the platform. Enable users to upload and publish resources.	User interface for creating and sharing content, with the ability to upload and publish resources.
13.2	Architect	Knowledge Base and Learning Modules	The architect needs a knowledge base for storing educational materials and resources.	Educational materials, learning modules	Develop a knowledge base for storing educational materials and resources. Provide learning modules or tutorials for user skill development.	Knowledge base with stored educational materials and resources, along with learning modules for user skill development.

13.3	Architect	Community Forums and Feedback Mechanisms	The architect wants discussion forums for community engagement and knowledge exchange.	Discussion forums, feedback mechanisms	Implement discussion forums for community engagement and knowledge exchange. Include feedback forms or rating systems for user feedback.	Community forums for engagement and knowledge exchange, with feedback forms or rating systems for user feedback.
14.1	Architect	Intuitive User Interface	The architect requires a user interface design following usability and UX principles.	User interface design principles	Design the user interface following usability and UX principles. Provide clear and concise instructions and tooltips.	User-friendly interface with intuitive design, clear instructions, and tooltips.
14.2	Architect	Customisation and Personalisation Options	The architect needs user preferences and settings for customising the platform.	User preferences, interface customisation	Provide user preferences and settings for customising the platform's interface. Allow interface layout customisation for individual user preferences.	User preferences and settings for customising the platform's interface, including interface layout customisation.
14.3	Architect	Scalability and Performance Optimisation	The architect wants a scalable architecture and infrastructure to accommodate a growing user base.	Scalable architecture, performance optimisation	Design a scalable architecture and infrastructure to accommodate a growing user base. Implement performance monitoring and optimisation measures.	Scalable architecture and infrastructure capable of accommodating a growing user base, with performance monitoring and optimisation measures.
15.1	Architect	Policy and Advocacy Integration	The architect requires integration with policy resources, guidelines, or frameworks.	Policy resources, guidelines, frameworks	Integrate the platform with policy resources, guidelines, or frameworks. Collaborate with advocacy groups for promoting systemic change.	Integration with policy resources, guidelines, or frameworks, with collaboration opportunities with advocacy groups for promoting systemic change.

15.2	Architect	Tracking and Reporting Sustainability Metrics	The architect needs metrics and analytics capabilities for tracking sustainability performance.	Sustainability metrics, analytics	Develop metrics and analytics capabilities for tracking sustainability performance. Enable the generation of reports and visualisations for communication and transparency.	Metrics and analytics capabilities for tracking sustainability performance, with the ability to generate reports and visualisations for communication and transparency.
15.3	Architect	Long-Term Engagement Strategies	The architect wants user engagement features, such as gamification or rewards.	User engagement features	Implement user engagement features, such as gamification or rewards. Continuously improve the platform based on user feedback and needs.	User engagement features, such as gamification or rewards, for long-term user engagement. Continuous improvement of the platform based on user feedback and needs.

4. DESIGN DEVELOPMENT

a. IDENTITY

The design direction and user stories developed during the Aalto workshop have been used to inform a number of design experiments that will support testing and refining the design at the battersea workshop.

To support this, we developed a visual identity and framework that acts as a container for these experiments.

Fig 12: The VOF alpha identity capturing the place-based nature of the public realm as well as the core components of the potential service

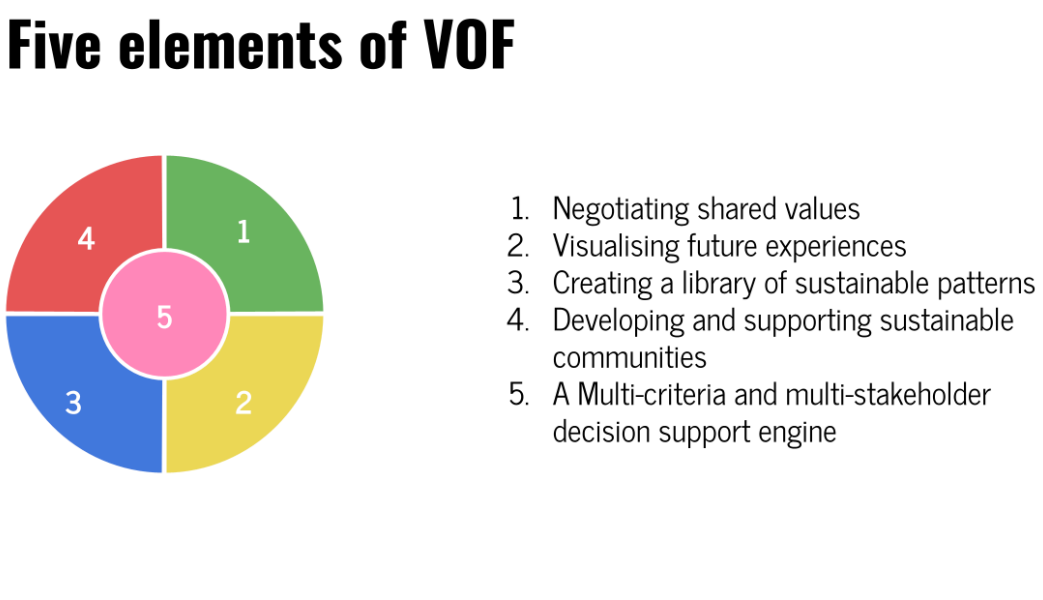


Fig 13: The VOF O contains the five core components

Fig 14: Simplified VOF homescreen

b. NEGOTIATING SHARED VALUES

Creating a sustainable future starts with listening carefully to our values & philosophies. To do this we need to embrace ethical reflection, long-term thinking and inclusivity. The shared values module asks architects to collect project details and develop visual responses that help to stimulate thinking and emotional responses.

User story

User Story	User Story Title	User Story Description	User Input	Computational Activity	Output
1	Collaborative Value Negotiation	Collaborate with stakeholders to negotiate shared values for a project. Use values as a starting point for visualising the future.	Gather architectural and stakeholder perspectives on project values, including information about the project requirements, stakeholders and sustainability missions	Generate value-based moodboards and support collaborative discussions and idea-sharing among stakeholders. Store history for future reference	Document shared values through visual storyboards that align with project values, sustainability goals and other project requirements. Values and depth can develop and change!

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It builds on the concept of Value Sensitive Design (VSD) (Friedman, 1996), which is an approach to design that considers human values as a primary concern throughout the design process. It recognises that the most powerful leverage point in a complex system is found in the philosophies and values that drive social and cultural change (Abson et al., 2017).

For example, when designing a community space, architects can conduct workshops and interviews with local residents to gather their perspectives on what makes a place meaningful and inclusive. These insights can then be translated into design features that promote social interaction, safety, and a sense of belonging.

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Fig 15: Examples of value-sensitive models found in design literature (Rocco, Thomas, & Novas, 2022), (Design Council, 2022), (Kheirandish et al., 2020)

While there are a number of value-sensitive models, a prominent framework is Schwartz's theory of basic human values, which proposes a comprehensive set of values that represent universal goals, guiding human behaviour and attitudes across different cultures and societies (Schwartz, 2012).

Value	Description	Examples
Self-Direction	Independence, freedom, creativity, autonomy	Personal growth, pursuing own goals
Stimulation	Excitement, novelty, challenge	Adventure, exploration, thrill-seeking
Hedonism	Pleasure, enjoyment, self-indulgence	Entertainment, leisure activities
Achievement	Personal success, competence, mastery	Career advancement, skill development
Power	Social status, influence, control	Leadership, authority, dominance
Security	Safety, stability, order	Financial stability, job security
Conformity	Societal norms, traditions, obedience	Following rules, social etiquette
Tradition	Customs, religion, heritage	Cultural rituals, religious practices
Benevolence	Caring for others, compassion, welfare	Helping others, volunteering, charity
Universalism	Social justice, equality, environment	Human rights, environmental activism

Fig 16: Schwartz theory of basic values

Project values

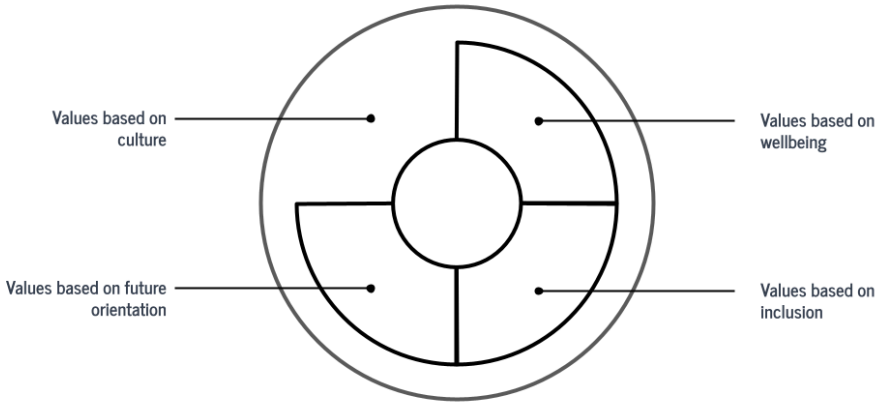

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Fig 17: A simplified diagram showing how a values framework can be used within VOF

Rather than utilising these more abstract philosophical framings we suggest that a potentially more useful and appropriate framing comes by focussing our values around wellbeing, inclusion, future orientation and culture, which together connect with many of the sustainability goals associated with the VOF brief.

Example values that come about by connecting this values framework to VOF project missions are shown below:

EXAMPLE

Project values

Values Based on Culture:

Cultural Identity: Preserving and celebrating Battersea's heritage, history, and traditions.

Diversity and Inclusivity: Promoting an inclusive and diverse community that respects and embraces people from different cultural backgrounds

Art and Creativity: Encouraging artistic expression and creativity to enrich the cultural fabric of the neighborhood.

Community Engagement: Fostering active participation of residents in cultural events, festivals, and community initiatives.

Values Based on Wellbeing:

Health and Safety: creating a safe and healthy environment for people with access to green spaces, clean air, and quality healthcare services.

Mental and Emotional Wellbeing: Designing spaces that promote mental and emotional wellness, such as parks, community centers, and recreational facilities.

Active Lifestyle: Encouraging an active lifestyle through walkable streets, cycling paths, and opportunities for physical activities.

60

EXAMPLE

Project values

Values Based on Future Orientation:

Sustainability: Incorporating sustainable design principles to minimise environmental impact and foster a low-carbon, eco-friendly neighborhood.

Innovation: Embracing innovative technologies and design practices to future-proof the neighborhood against upcoming challenges.

Adaptability: Creating flexible spaces and infrastructures that can adapt to changing needs and trends over time.

Values Based on Inclusion:

Social Equity: Ensuring equal access to resources, services, and opportunities for all residents, irrespective of their socio-economic background.

Accessibility: Designing the neighborhood with universal accessibility, making it easy for people of all abilities to navigate and participate.

Community Empowerment: Encouraging community involvement in decision-making processes to have a say in shaping the neighborhood's development.

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Fig 18: Example project values generated from VOF project missions

In addition to creating and sharing values, this module suggests the development of a stakeholder map and a network and resource map that helps the architect to better understand the people and the networks at the heart of a place.

EXAMPLE

Stakeholders

- Local Residents: Homeowners, renters, and community members who live within the neighbourhood.
- Local Businesses: Businesses and business owners operating in the area.
- Local Authorities: Government bodies and local councils responsible for urban planning and development.
- Non-Profit Organisations: Community groups and non-profit organisations working in the neighbourhood.
- Educational Institutions: Schools, colleges, and universities in the vicinity.
- City Officials: Representatives from the wider city who have a stake in the neighbourhood's development.
- Design Professionals: Architects, urban planners, and consultants involved in the retrofit project.
- Nature and ecosystems: The flora and fauna that lives in and connects with the local environment
- Future generations: The people, businesses and future natural (and synthetic?) life that will need to thrive in the neighbourhood

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Fig 19: Example stakeholders who can help to develop and respond to project values either in response to design values or as participants in co-design

Equally, a network and resource map can help the architect and other stakeholders understand the relationships between the neighbourhood and its resources, acting as a valuable tool for decision-making, community participation and sustainable urban planning initiatives.

This diagram can be used to represent the relationships and interactions between different people and resources, for example, showing how residents get to local amenities, how local businesses engage with the community, or how the neighbourhood is connected to the wider city through transport routes.

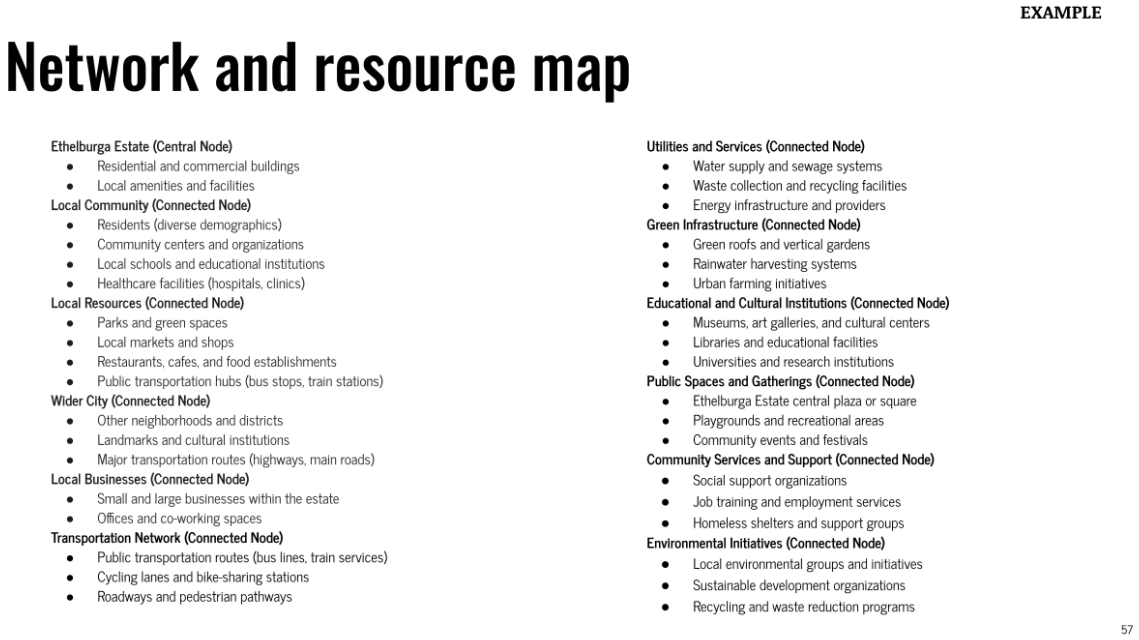

Fig 20: Example network and resource map that may help the architect and stakeholders to respond to project missions in response to design values or as participants in co-design

The shared value tool can be used to create a variety of images that visualise different stakeholder values. They can be shared as moodboards and the designer and stakeholders can discuss each collection of images and develop more pertinent or powerful responses to different qualities and how they might be brought to life through project missions and future experiences. The moodboards can be based on sketches and images created by the architect or other stakeholders and also on images that capture the project area, using google street view images and other material available.

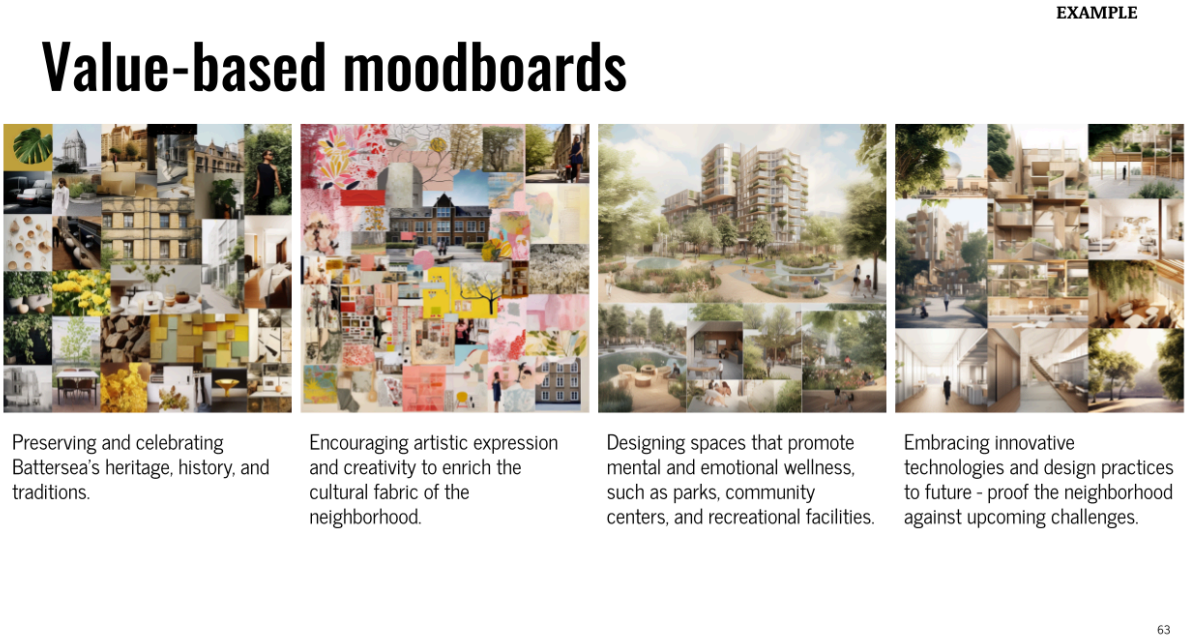

Fig 21: Example value-sensitive mood boards that could be used to better connect value-sensitive design to a future project

These generative mood boards not only communicate values but can act as visual representations of ideas, concepts, and emotions. They create a shared understanding and appreciation of the intended direction of the design and also support inspiration and ideation; emotional impact and project participation; as well as design evaluation and decision making. They provide a way of experimenting with and expressing values and ideas, helping different stakeholders to develop design responses in a more open or patchwork approach. They can act as a touchstone for making value-sensitive decisions throughout the design process, connecting deeper 'sustainability values' into the project brief, taking on board multiple perspectives and connecting these values to 'sustainability missions' that drive future experience designs and patterns.

c. VISUALISING FUTURE EXPERIENCES

Integrating values and mood boards into future experience storyboards supports people-centred design principles, helps architects and designers explore design alternatives that align with values, creates a shared understanding of the design vision and leads to more effective decision-making. Storyboards, rather than plans. encourage collaboration beyond the design profession and act as scenario definition tools that help to illustrate and investigate more complex future users and use cases (Meroni & Sangiorgi, 2016).

Architects and designers help to bring values to life through detailed storyboards that generate and visualise solutions to values, missions and challenges. The storyboards can start at the level of meaning and value - bringing to life ideas around ecological sustainability - and progress through cultural, social and eco-technical layers as the fidelity of the project develops (Suoheimo, Vasques, & Rytilahti, 2020). They help architects and clients understand and bring to life the meanings, rituals, archetypes and symbols that inform our cultural lives and connect the green transition to deeper human values and experiences (Hofstede, Hofstede, & Minkov, 2005).

User story

User Story	User Story Title	User Story Description	User Input	Computational Activity	Output
2	Future Experience Visualisation	Visually represent future experiences for a project based on the stakeholder needs, project missions and project values	Project values and missions for different stakeholders together with design concepts and written storyboards of future experiences connected to sustainability goals	Generate visual representations of future experiences based on input data and connected to images of the project site or other reference material.	Visualisations that bring to life values and missions through storyboards that build on design concepts for the project.

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Potential tool output

FAMILIES imagine pedestrian-friendly streets, safe play areas for children, and well-designed homes that promote family interactions.

PUBLIC SERVICES envision smart infrastructure, integrated transportation systems, and digital platforms for efficient service delivery.

CHILDREN picture interactive and educational public spaces, colourful and playful streetscapes, and nature-based learning environments.

INVESTORS imagine culturally diverse marketplaces, art installations, and creative spaces that promote economic growth and social vibrancy.

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Fig 22: User story for collaborative value negotiation

d. CREATING A LIBRARY OF SUSTAINABLE PATTERNS

Stories and descriptions of sustainable experiences can form the basis for the development of new solutions to urban and architectural problems. These can be formalised through the development and re-use or ‘design patterns’ that, over time, create an architect's own library of sustainability practice.

This library needs to go beyond the scale based perspective of Alexander’s pattern language to include design responses to political, economic, environmental, social, technical and legal sustainability challenges (Alexander, 1977). These can be framed through the UN sustainable development goals but also through the needs of different stakeholder - not just for the sustainability of developers and investors but for the sustainability of different life stages, of future generations and nature - and through the sustainability of different human practices - caring, playing, learning, making, moving, transporting, trading, building, maintaining, repairing, restoring.

Additionally, these patterns need to recognise and engage with the wicked problems in design (Buchanan, 1992). Some of the competing criteria that need to be engaged with (as identified by Aalto) include:

- Decarbonisation vs. biodiversity
- Technical sustainability vs. social sustainability
- Increasing buildings' insulation vs. compacting built area
- Saving material vs saving energy
- Diminishing energy usage by pulling down wasteful buildings vs waiting until that energy production becomes sustainable
- Producing new sustainable buildings with low usage or increasing use efficiency of non-efficient buildings
- Calculating efficiency per square metre vs per person
- Localism and eco-efficiency vs justice
- Voluntarist action vs regulation

Some of these issues can be resolved through value negotiation or through the development of alternative experience storyboards, but they may also need input from quantitative analysis.

User story

User Story	User Story Title	User Story Description	User Input	Computational Activity	Output
3	Sustainable Pattern Creation	Create and store sustainable patterns for reference and reuse.	Sustainable design principles, successful project examples and sustainability metrics	Develop a user-friendly interface for creating and documenting sustainable patterns	A library of sustainable patterns that can be referenced and reused in future projects. These can potentially be customised and become starting points for developing site specific solutions

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Elements of a design pattern

Name: Each pattern is given a descriptive name that reflects its essence and purpose. The name helps to communicate and reference the pattern in discussions and design documentation.

Problem: The problem statement defines the recurring design challenge or need that the pattern aims to solve. It provides context and clarity about the specific issue the pattern addresses.

Context: The context describes the conditions or situations in which the pattern is applicable. It helps designers identify when and where to use the pattern to achieve the desired outcomes.

Forces: Forces are the factors and considerations that influence the design decisions related to the pattern. These can include functional, social, cultural, and environmental aspects that designers must balance.

Solution: The solution is the design proposal or strategy that addresses the problem and fulfills the project's objectives. It outlines the steps and elements that compose the pattern.

Diagram: Many patterns are visually represented through diagrams or illustrations to help designers visualize the spatial arrangement and relationships involved in the pattern.

Examples: Examples showcase real-world implementations of the pattern in different contexts, providing practical insights into its application.

Related Patterns: Each pattern is connected to other patterns, creating a network of interrelated design solutions. The related patterns show how they complement or interact with each other in various design contexts.

Results: The results describe the benefits and positive outcomes achieved by applying the pattern to a specific design problem.

Trade-offs: Patterns often involve trade-offs between different design considerations. The trade-offs section highlights the compromises and implications of implementing the pattern.

Known Uses: This section

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Fig 23: Elements of a design pattern as developed by Christopher Alexander and colleagues

At a high level these patterns might describe a series of general responses to the SDGs (as below) but more importantly they should investigate and bring to life each architect's own philosophies, knowledge and experience to ensure that the design patterns are localised, relevant and specifically designed with the communities that they are serving, taking on board the many unresolved cultural and social qualities of the green transition.

SDG	Design Pattern for Building Retrofit	Design Pattern for Transport Retrofit
SDG 1: No Poverty	Affordable Housing with Energy Efficiency	Integrated Public Transport for All
SDG 2: Zero Hunger	Community Gardens and Urban Farming	Sustainable Transport for Food Distribution
SDG 3: Good Health	Healthy Indoor Environment and Biophilic Design	Active Transport Infrastructure and Bike Lanes
SDG 4: Quality Education	Sustainable Schools and Learning Spaces	Safe and accessible schools for active travel
SDG 5: Gender Equality	Gender-Inclusive Public Spaces	Safe and Inclusive Public Transport
SDG 6: Clean Water	Rainwater Harvesting and Water-Efficient Buildings	Sustainable Water Transport Systems
SDG 7: Clean Energy	Rooftop Solar and Energy-Efficient Buildings	Electrification of Public Transport
SDG 8: Decent Work	Mixed-Use Developments and Co-Working Spaces	Employment-Focused Public Transport Routes
SDG 9: Innovation	Adaptive Reuse of Buildings for Tech Incubators	Smart Transport Solutions and Digital Infrastructure
SDG 10: Reduced Inequality	Socially Inclusive Housing and Amenities	Transport Accessibility for Vulnerable Groups
SDG 11: Sustainable Cities	Transit-Oriented Development and Compact Neighbourhoods	Pedestrian-Friendly Streets and Safe Crossings
SDG 12: Responsible Consumption	Building Material Recycling and Upcycling	Efficient and Eco-Friendly Public Transport Fleet
SDG 13: Climate Action	Green Roofs and Natural Ventilation	Low-Emission and Electric Public Transport Options
SDG 14: Life Below Water	Stormwater Management and Wetland Restoration	Eco-Friendly Water-Based Transport Solutions
SDG 15: Life on Land	Urban Biodiversity Corridors and Green Belts	Green Transport Infrastructure and Sustainable Land Use

SDG 16: Peace & Justice	Crime Prevention through environmental design and Community Design	Safe and Inclusive Transport Services
SDG 17: Partnerships	Community Engagement and Co-Design	Collaborative Public Transport Planning

Fig 24: Example high level patterns for building and transport design before architectural development

As an example of more creative design patterns we developed the concept of ‘Community Creativity & Mobility Services’ which identified the following problem in diverse neighbourhoods:

- People from different ages and cultural backgrounds often face challenges in coming together, sharing their creativity and providing mutual support. Transportation can be a barrier to social interaction and engagement, limiting their ability to move comfortably and access community resources.

A design solution brings together a shared mobility platform, community hubs, creative ride sharing or public transport environments, a community support network and accessible design to help people share skills and life experience on their journeys. An example tool output is shown below:

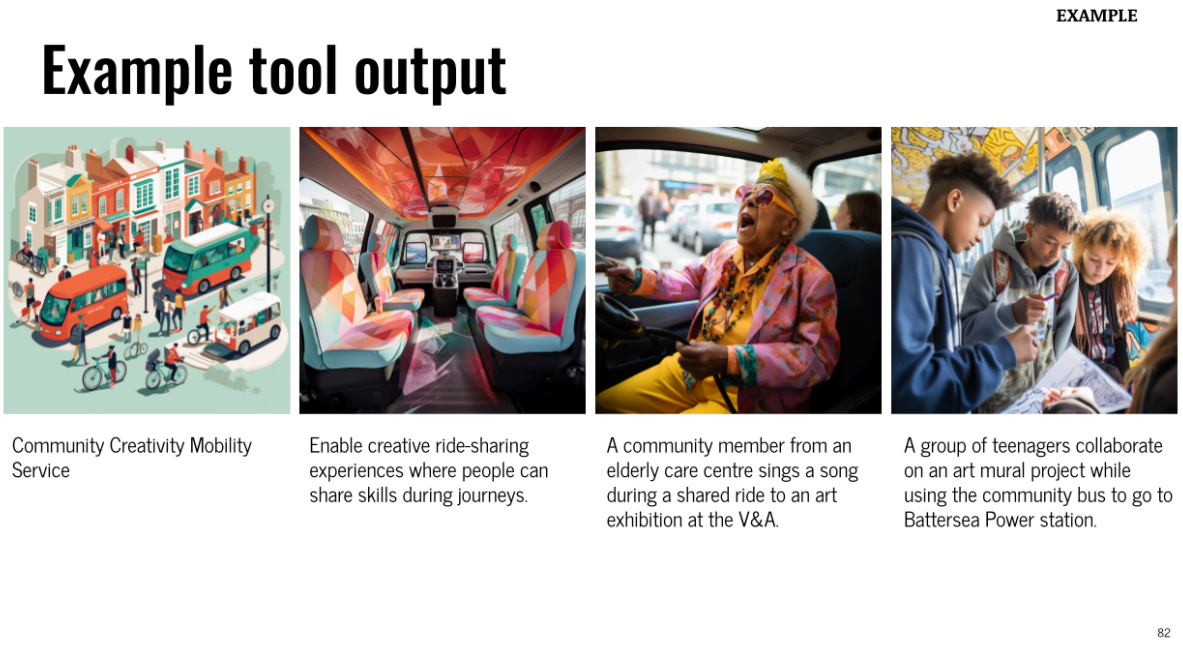

Fig 25: Example ‘design pattern’ for sustainable community creativity & mobility service

An alternative approach to pattern making comes through analysing Alexander's properties of life. Here, instead of focussing on UN sustainability goals, we focus on the spatial properties of nature and connect these to SDGs and support qualities of living (Alexander et al., 2004). An example output is shown below:

Nature of Order Property	Architectural Retrofit	Transport Retrofit
1. Levels of Scale	Develop mixed-use buildings with varying scales, accommodating diverse needs and people (SDG 11).	Establish an integrated transport network, providing hyperlocal, local and regional mobility choices (SDG 11).
2. Strong Centers	Design community spaces as focal points for social interaction and cohesion (SDG 11).	Establish transit hubs and transportation nodes that provide seamless mobility connections (SDG 11)
3. Boundaries	Retrofit buildings with energy-efficient envelopes, ensuring clear thermal boundaries (SDG 7).	Implement efficient transport routes and pedestrian-friendly crossings with well-defined boundaries (SDG 11)
4. Alternating Repetition	Introduce rhythmic patterns and alternating elements in architectural design for visual harmony (SDG 12).	Provide regular and reliable transport schedules to ensure predictable mobility (SDG 11)
5. Positive Space	Optimise indoor spaces with natural light, ventilation, and greenery for well-being (SDG 3).	Create walkable, pedestrian-friendly spaces that prioritise human experience and safety (SDG 11)
6. Good Shape	Design buildings with well-proportioned and aesthetically pleasing forms (SDG 11).	Design for safety, efficiency, and reduced environmental impact (SDG 13)
7. Local Symmetries	Utilise symmetrical design elements in building facades to create visual balance and coherence (SDG 11).	Establish balanced and equitable transport networks that serve neighbourhoods equally (SDG 11)

8. Deep Interlock and Ambiguity	Integrate interior and exterior spaces to create connection with nature (SDG 11, SDG 15).	Develop a connected and multimodal transport system that promotes intermodal interchange (SDG 11)
9. Contrast	Use contrasts in materials and colours to create visually engaging spaces (SDG 11).	Implement differentiated transport services to cater for different mobility needs (SDG 11)
10. Gradients	Design buildings with gradual spatial transitions and adaptability to changing needs (SDG 11).	Develop transport infrastructure with smooth transitions to ensure accessibility for all (SDG 11)
11. Roughness	Incorporate textures and natural elements in interior and exterior design for multi-sensory experience (SDG 11).	Integrate green infrastructure and natural landscape in transport routes for biodiversity (SDG 15)
12. Echoes	Use repeating patterns and motifs in details for visual coherence (SDG 12).	Implement consistent signage and wayfinding systems for clear navigation in transport networks (SDG 11)
13. The Void	Design buildings with open and flexible spaces to accommodate spontaneous and diverse uses (SDG 11).	Develop open public spaces and plazas as transport interchanges for community engagement (SDG 11)
14. Simplicity and Inner Calm	Foster tranquil and calming architectural spaces for well-being (SDG 3).	Design public transport interiors with a focus on passenger comfort and accessibility (SDG 3)
15. Non-Separateness	Create architecture that complements the existing urban fabric and respects local context (SDG 11).	Develop an integrated and accessible transport system that fosters social inclusion (SDG 11)

Fig 26: Example high level patterns for building and transport design based on A;lexander's properties of life

e. DEVELOPING AND SUPPORTING SUSTAINABLE COMMUNITIES

The final step in the VOF journey is the development of a design playbook that enables and supports sustainable community practice. A playbook is a guide that provides instructions, strategies and best practices for particular tasks and activities.

It is a way to build an on-going conversation between architecture practices and the projects that they are designing. It recognises that not everything that we design is ‘visible’ or ‘understandable’ and that, just like an operations and maintenance manual, people need support to get the most out of their spaces and places. A well designed playbook will also look into the future, helping the community evolve over time and helping the architect to stay involved in the project.

User story

User Story	User Story Title	User Story Description	User Input	Computational Activity	Output
4	Community Development Support	Support the development of sustainable communities through projects.	Community engagement strategies, social and environmental considerations, community needs assessment	Develop a playbook of resources that become ‘quality support’ tools and resources for community engagement, knowledge sharing, and collaboration	A digital manual developed during the project that brings together values, stories and patterns to support sustainable practice and future improvement projects

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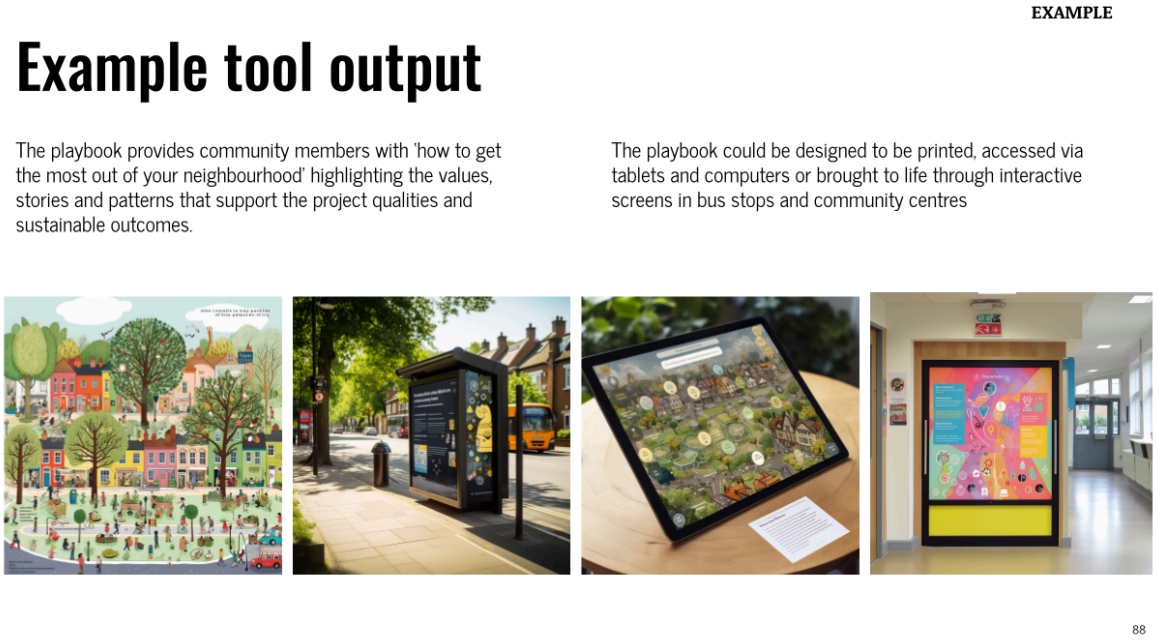

Fig 27: Example project playbook integrated into devices and the environment

f. A MULTI-CRITERIA AND MULTI-ACTOR DECISION SUPPORT ENGINE

Radical futures need communal decisions. Multi-criteria and multi-actor decision support systems evaluate conflicting issues and values in decision making, allowing different members of a community to express different values and coordinate community decisions with a degree of equality and creativity (Macharis, Turcksin, & Lebeau, 2012).

User story

User Story	User Story Title	User Story Description	User Input	Computational Activity	Output
5	Decision Support Tool	Develop a decision support engine considering multiple criteria and stakeholder perspectives.	Project data, stakeholder inputs, decision criteria	Develop algorithms and models to analyse data and provide decision support	Recommendations and insights for decision-making considering multiple criteria and stakeholder perspectives

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To make this work we need to agree on our decision criteria, assign weights to each criteria, design a number of alternatives and evaluate the alternative options, scoring them depending on our preferences and priorities. Combining our votes allows us to reflect on our choices and either accept them or review and refine the leading options. This iteration and optimisation process can continue until we reach a consensus, at which point a decision can be made.

In the context of VOF we imagine that the same underlying process of weighting and decision making will be used to negotiate shared values, agree future experiences, refine design patterns suitable for the project site and support the development of a project playbook including its organisation and illustration.

Example output

A table of values, missions, experiences and patterns that come together to create the project. Decision criteria, priorities and weightings are used to score alternatives and support democratic decision making.

Visualising these decisions and making them transparent and accessible is a key part of radical democracy.

Fig 28: Example of a decision support system highlighting how decisions were made and what qualities the project will take forward.

5. SMARTVIZ DEMO 1

We discussed a digital demonstration for use during the Battersea workshop. The demonstration will show how generative and synthetic design tools can be used to gather information about a project site, connect to online services like Google earth and street view and use API's to chat gpt and dall-e as part of a project workflow.

The aim of the demonstration will be to allow participants to navigate a 3d map of the workshop research area, add notes to the map and to street views and to generate moodboards, storyboards and design visualisations based on these annotations.

Annotations will be stored with the original street view together with the generated content and images and participants can edit their notes and add sketches to generate visual updates.

Whilst Smartviz has APIs to Microsoft's AI tools, there are many generative technologies that support a range of synthetic algorithms - text to text; text to 2d, 3d and animation; as well as tools for audio, characterisation and gaming. Making use of these technologies in an informed and intelligent manner may be the key to the success of the VOF platform and approach.

It's also important to reflect on the parallel and explosive rate of development in AI assisted parametric architecture which aims to automate the decision making process by integrating established rules of 'good design' into the modelling environment. These 'quant' driven systems may well be seen as the key driver for future design practice and the team will need to evaluate the relationship between our qualitative approach and these systems.

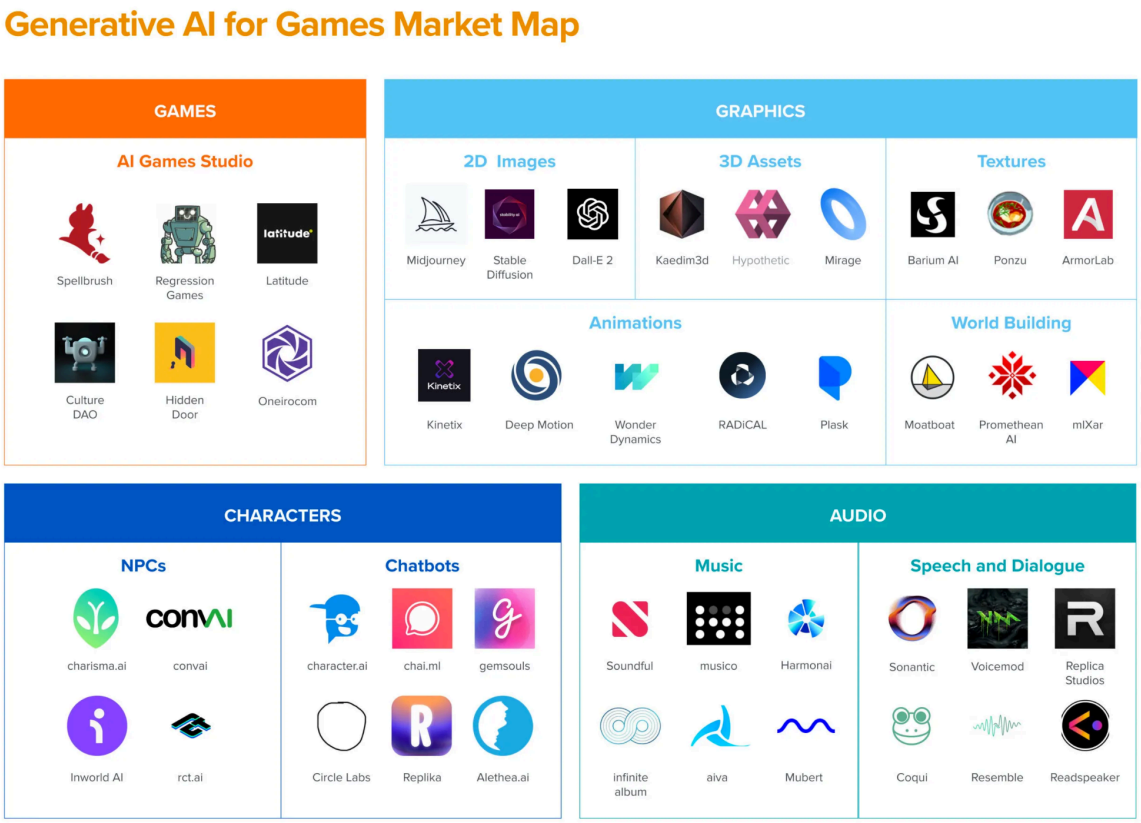

Fig 29: The broad marketplace for generative AI (a16z, 2023)

Generated outputs from the smartviz demo could also be used to test Aalto's hypothesis that architects would like to map their interests, values and categorise them and, through this, generate input to computing. The output could be recommendations and examples for the social innovations, whose record would be expandable.

Example design outcomes:

- spatial programming,
- building and block typologies,
- event programming,
- spatial brand experience,
- targeted creation of feelings,
- selection of locations and
- the utilisation of an existing space,
- atmospheres,
- multi-sensory experiences,
- uniqueness, and
- physical characteristics, which awaken feelings and/or new information for a user.

Example design outlooks:

- active risk takers (see generative outputs below)

- hunters of the wonders of the nature,
- seekers for modern luxury, etc...,
- (segment the designers and projects based on the preferred experiences of the people in relationship towards nature and sustainability)

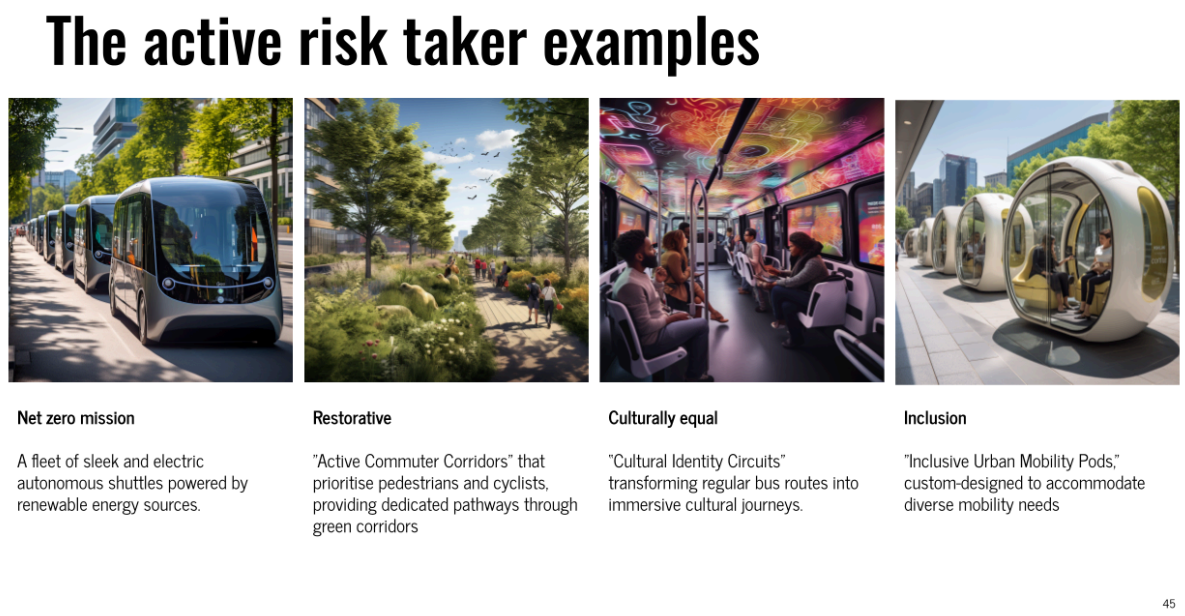

Fig 30: Example midjourney outputs for ‘an active risk taker’ that focus on specific missions

Example social innovations which might be categorised differently for each target group:

- seasons,
- sightseeing possibilities,
- energy production,
- food production,
- darkness/light,
- spatial succession,
- sensory experiences (soundscapes, smells, touch)
- dramaturgy of excitement and relaxation, etc.

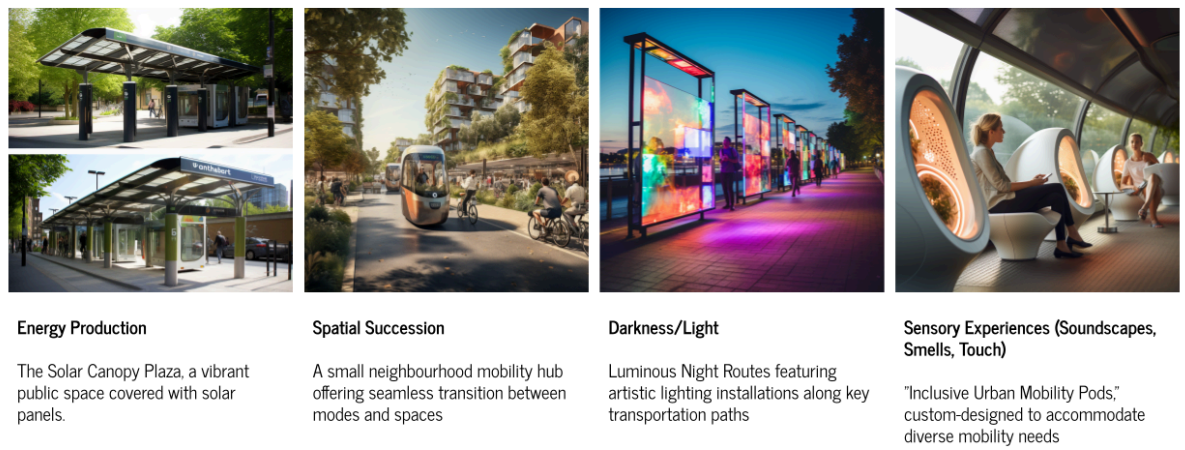

Fig 31: Example midjourney outputs that focus on ‘social innovations’

6. DEVELOPMENT WORKSHOP

The September workshop in Battersea aims to test the conceptual aims of the VOF tool through a four day activity that asks participants to listen to each others values, learn together through ‘story-based’ sustainability experiences, imagine the future through the development and reuse of ecological, cultural, social and techno-economic sustainability patterns and develop a design playbook that supports cultures of sustainable futures.

Fig 32: Area for design research during the Battersea workshop

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Fig 33: Google earth view for design research during the Battersea workshop

Homes

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Fig 34: Web photos of the Ethelburga estate at the centre of the workshop site

Fig 35: AI generated provocations based on prompts that explore Battersea futures through ‘the value of conviviality in our streets and public realm’, ‘high street perspective with autonomous cars’, and ‘tram systems on a grass track with wider pavements with people, trees, cyclists, scooters and shared autonomous shuttles’.

To support the workshop we have reached out to citizens, businesses, social enterprises and public services so we can test and develop new open source tools that help people to build futures through shared values, experiences, patterns and communities of practice. Attendance at workshops will depend on recruitment and we will need to adjust our plans and carry out street interviews and site visits depending on interest.

Key activities for the workshop are as follows:

1. Use the smartviz interface to understand what is possible using a combination of google maps and generative AI. Develop a short list of potential improvements to the smart viz interface which we can review and expand as the workshop progresses Use the site visit and interview time to develop your own thoughts on the values and philosophies that may drive transformation.
2. Create a stakeholder map and a network and resource diagram and use these to develop missions and potential values for the project. Use the smart viz tool, sketches or other visualisation techniques to develop value-based mood boards that enable a deeper conversation about values and design futures. Discuss methods and outputs and suggest ways of improving these modules which can be prioritised by the team.
3. Use the values, missions and stakeholders developed in activity 2 as a starting point to develop a series of sustainability stories. Use the site visit and interview time to develop your own thoughts on the feelings and knowledge that may drive future sustainability experiences for different people and across different potential places and interventions. Use the smart viz tool, sketches or other visualisation techniques to develop knowledge based story boards that enable a deeper conversation about future experiences and how these may deliver or alter the missions that are driving the project. Discuss methods and outputs and suggest ways of improving these modules which can be prioritised by the team.,
4. Decide which of the sustainability stories should form foundational patterns within the design. Use the site visit and interview time to develop your own thoughts on how these patterns are developed and consider not just the problem and solution space

but also the context, use cases and examples that bring the pattern to life. Go beyond s,m,l.xl pattern approaches and consider the external PESTLE factors, people and properties of life that the pattern responds to. Use the smart viz tool, sketches or other visualisation techniques to develop patterns that might be integrated into the VOF platform to prime the service. Discuss methods and outputs and suggest ways of improving these modules which can be prioritised by the team.

5. Consider how values, stories and patterns can be brought together and how they can support and influence sustainable community development through better use, maintenance and upgrade of the project site including activities inside and outside the buildings. Discuss methods and outputs and suggest ways of improving these modules which can be prioritised by the team.
6. Consider the decision criteria and weighting that you used to make decisions during the workshop. Discuss how these decisions influenced your design outputs and consider how the decision support engine could be developed to support the quality of architectural solutions.

7. REFERENCES

Abson, D. J., et al. (2017). Leverage points for sustainability transformation. Ambio, 46, 30-39.

Alexander, C. (1977). A pattern language: Towns, buildings, construction. Oxford University Press.

Alexander, C., et al. (2004). The phenomenon of life (Vol. 1, No. 3). Routledge.

Brand, S. (1995). How buildings learn: What happens after they're built. Penguin.

Buchanan, R. (1992). Wicked problems in design thinking. Design Issues, 8(2), 5-21.

Design Council. (2022). The design value framework. British Design Council.

Fallan, K. (2008). Architecture in action: Travelling with actor-network theory in the land of architectural research. 80-96.

Floridi, L. (2023). AI as agency without intelligence: On ChatGPT, large language models, and other generative models. Philosophy & Technology, 36(1), 15.

Friedman, B. (1996). Value-sensitive design. Interactions, 3(6), 16-23.

Hofstede, G., Hofstede, G. J., & Minkov, M. (2005). Cultures and organisations: Software of the mind (Vol. 2). McGraw-Hill.

Ives, C. D., Freeth, R., & Fischer, J. (2020). Inside-out sustainability: The neglect of inner worlds. Ambio, 49, 208-217.

Kheirandish, S., et al. (2020). HuValue: A tool to support design students in considering human values in their design. International Journal of Technology and Design Education, 30, 1015-1041.

Macharis, C., Turcksin, L., & Lebeau, K. (2012). Multi actor multi criteria analysis (MAMCA) as a tool to support sustainable decisions: State of use. Decision Support Systems, 54(1), 610-620.

Meroni, A., & Sangiorgi, D. (2016). Design for services. Routledge.

Picon, A. (2021). The materiality of architecture. U of Minnesota Press.

Rocco, R., Thomas, A. R., & Novas, M. (2022). Teaching Design for Values: Concepts, Tools & Practices.

Schwartz, S. H. (2012). An overview of the Schwartz theory of basic values. Online Readings in Psychology and Culture, 2(1), 11.

Suoheimo, M., Vasques, R., & Rytilahti, P. (2020). Deep diving into service design problems: Visualising the iceberg model of design problems through a literature review on the relation and role of service design with wicked problems. The Design Journal, 24(2), 231-251.

8. FIGURES