



xArch
symposium

creativity in the age of
digital reproduction

November 11-12, 2023

Xi'an Jiaotong - Liverpool University

Suzhou, China

Structuring Gamified Participatory Public Space Design:

Developing a Design Quality Evaluation System
to Support Digital Co-Creation Processes

Shutong ZHU, Provides NG and Jeroen VAN

The Chinese University of Hong Kong (CUHK)

SESSION

Computational Design

Digital Experience

AI and Environmental



Xi'an Jiaotong-Liverpool University
西交利物浦大学

XJTLU | DESIGN
SCHOOL

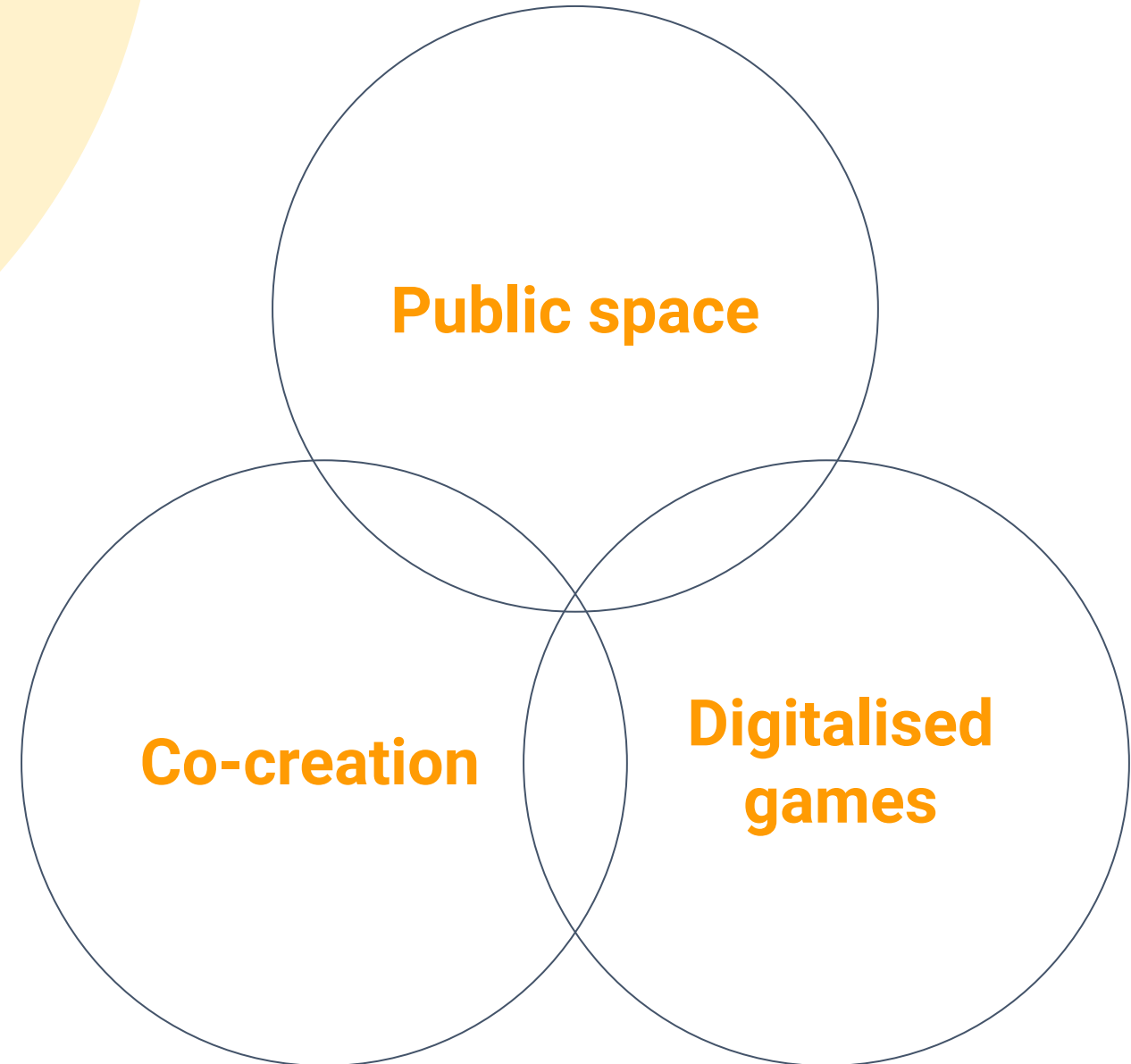
1. Introduction

In the field of urban design, good quality public space should:

- Facilitate social activities and civic interactions to occur (Mitchell, 1995)
- Provide an extension to the domestic realm in high density living environments (Oldenburg, 1997)

The design process should:

- Incorporate varying community needs by mitigating conflicts of interest (Sheikh & van Ameijde, 2022)
- Invite multi-stakeholder collaboration and visualise different design scenarios to assist decision-making (Govada et al., 2017)



1. Introduction

Hong Kong Planning Standard Guidelines (HKPSG)

- A universal approach and quantitative-driven approach
- Minimum standards led to standardised practice
- Averaging user needs can result in generic designs
- Designs in the 1980s can no longer meet the aspiration of today's generation
- Lack of provision on spatial quality

Research question

What can be learnt from Hong Kong's development history and international public space theories to derive novel user-activity-environment toolkits that help to guide collective work in spatial design?

1. Introduction

Methodology

Develop a design quality evaluation system to support participatory processes.

Objectives

- 1) to summarise Hong Kong's public space conditions and international precedents of public space theory and cooperative design initiatives;
- 2) to formulate a design quality evaluation system to support participatory co-creation processes;
- 3) to test and evaluate this in a user-activity-based toolkit for spatial configuration analysis.



2. Open Spaces in Hong Kong

Five open spaces built in different decades were studied. They are functionally similar, containing playgrounds and sports facilities. With minimum design participation from the public, it often resulted in poor user acceptance and adaptability (Ampatzidou et al., 2018).

	Local Open Space			District Open Space	
Year	1981/1982	2016	2021	2002 (Refurbished)	2016 (End of Revitalization Program)
Site	Jat Min Chuen	On Tai Estate	Yi Pei Square	Victoria Park	TST Harborfront
Elements	Seats, Playground, Fitness, Jogging Trail, Lighting	Seats, Playground, Fitness, Art / Stonework, Lighting	Seats, Playground, Pavilion, Fitness, Lighting	Seats, Playground, Sports Facilities, Jogging / Walking Trail, Lighting	Seats, Pavilion, Running Trail, Stores, Lighting
Innovation	Swimming Pool	Stonework	Intergeneration Play Equipment	The Largest Park in Hong Kong Island	Integrating Commercial and Cultural Elements
Public Participate	N/A	Late Stage of Program	Early Stage of Program	N/A	Consultation: Early Stage of Program
Initiator	HKHS	HKHA	Design Trust	LCSD	LCSD



Jat Min Chuen
(Hong Kong Housing Society)



On Tai Estate
(Wikipedia user- Exploringlife)



Yi Pei Square
(Design trust future studio)



Victoria Park
(Leisure and culture services department)



TST Harborfront
(Wikipedia user - Chong Fat)

3. Public Space Theories

Characters	Indicators	Parameters	References
Meaningful activities	1. Complexity of activities	<ul style="list-style-type: none"> • Activity types • Types of space sizes 	Mehta (2014); Jacobs (1961); Gehl (1971); HKPSG Chapter 4 (2022); Cushing & Van Vliet (2018); Stafford & Baldwin (2015); Whyte (1980)
Sociability	2. Sociability	<ul style="list-style-type: none"> • The number of potential users • Distance between different activities • Facing 	Oldenburg (1997); HKPSG Chapter 4 (2022); Gehl (1971)
Comfort & attractive	3. Environment comfort	<ul style="list-style-type: none"> • Ratio of greenery, seating, shade 	Mehta & Bosson (2010); Carmona, (2019); CABE (2007); Whyte (1980); PPS (n.d.)
Inclusiveness	4. Adaptability	<ul style="list-style-type: none"> • Size of free space 	Loukaitou-Sideris and Ehrenfeuchth (2009); Frank & Stevens (2007); Mehta (2014)
Safety	5. Surveillance	<ul style="list-style-type: none"> • Straight line of sight: from 1.3m to 1.9m 	Mehta (2014); Jacobs (1961); Carmona (2019); Houlstan-Hasaerts et al. (2012)
Access & linkages	6. Wayfinding	<ul style="list-style-type: none"> • The width of the pathway • The twists and turns of the pathway 	HKPSG Chapter 4 (2022); Duckworth-Smith & Oliver (2019); Whyte (1980); Gehl (2010)

4. Constructing a User-Activity-Environment Based Toolkit

Textual guidelines can be difficult to understand the spatial implications and focuses on quantitative-driven variables

after preliminary co-creation test with residents

Develop a Graphic language to facilitate qualitative discussion of spatial design and facilitate creative imagination

4. Constructing a User-Activity-Environment Based Toolkit Quantitative public space evaluation metrics

Environment comfort (counting)

Parameters 1: Greenery	Parameters 2: Trees	Parameters 3: Seating	Parameters 4: Shelter
≥11 grids	≥6 grids	≥7 grids	Commerce
7-10 grids	4-5 grids	5-6 grids	Alfresco area
3-6 grids	2-3 grids	2-4 grids	Sitting/Resting
1-2 grids	1 grid	1-2 grids	

Adaptability (counting)

Parameters 1: Size of free space

≥6 grids

4-5 grids

2-3 grids

1 grid

Surveillance (Configuration analysis)

Parameters 1: Straight line of sight: from 1.3m to 1.9m

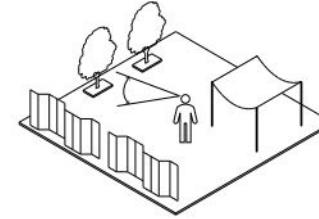
Unobstructed

20%

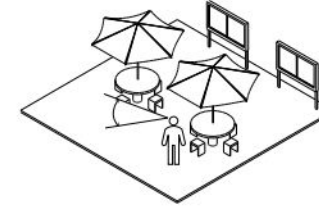
≥50%

Wayfinding (Configuration analysis)

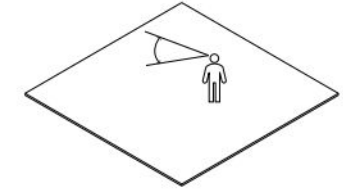
Straight line of sight: from 1.3m to 1.9m



≥50%



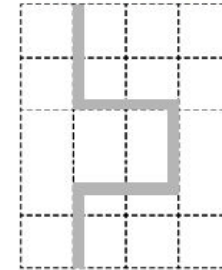
20%



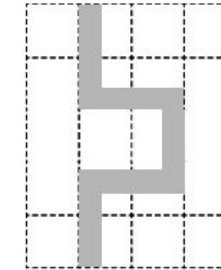
Unobstructed



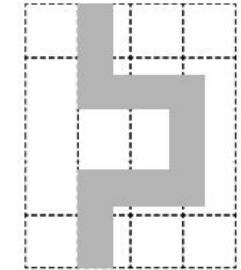
The width of the pathway



0-1.5m



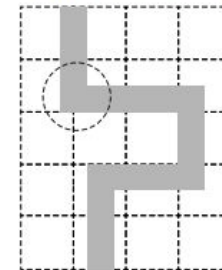
1.5-3m



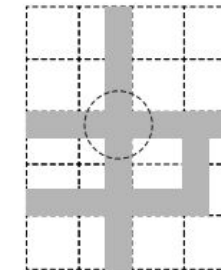
≥3m



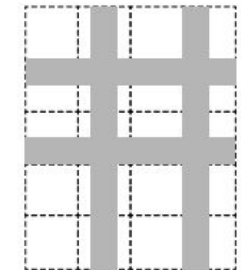
The twists and turns of the pathway



≥3



1-2



0



4. Constructing a User-Activity-Environment Based Toolkit Qualitative public space evaluation metrics

The number of potential users:



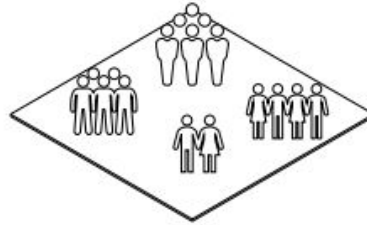
One person
★



2-4 persons
★★

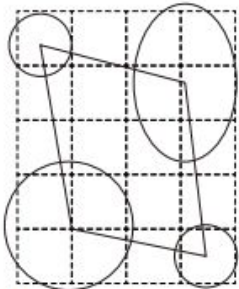


Small groups
★★★★

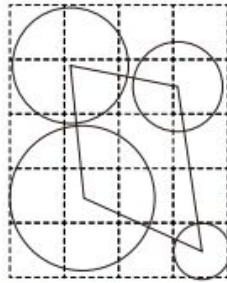


Large groups
★★★★★★

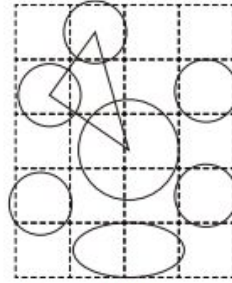
Distance between different activities:



Around 20-32m
★

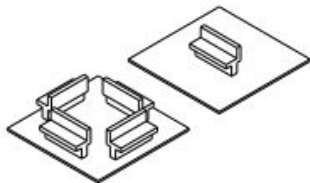


Around 15-20m
★★

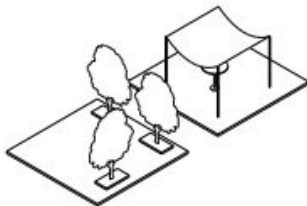


Around 10-15m
★★★★

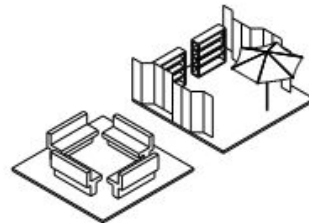
Facing



Extroverted
★



Semi-open
★★★



Introverted
★★★★★★

Complexity of activities (counting)

Game design	Space sizes	Parameters 1	Parameters 2
Activity types provided by game board		Activity types	Types of space sizes
Commerce	XL: ≥11 grids	5-6 Activity types	4 Sizes
Free space	L: 6-10 grids	3-4 Activity types	3 Sizes
Exercise	M: 3-5 grids	1-2 Activity types	2 Sizes
Skill-building	S: 1-2 grids		1 Sizes
Playground			
Alfresco area			

Sociability (Configuration analysis)

Dividing the site	Parameters 1: The number of potential users:	Parameters 2: Distance between different activities	Parameters 3: Facing
Active/open space	Large groups	Less than 10m	Introverted
Commercial/shared space	Small groups	Around 10-15m	Semi-open
Quite/passive space	2-4 persons	Around 15-20m	Extroverted
Flexible space	One person	Around 20-32m	

5. Preliminary Testing: Applying the Toolkit

VR environment tailored to the targeted public space

- Visualise the public space using VR environments
- The site was a 500m² plaza divided into 20 grids
- each grid equals to a score of 5%

Cooperative process

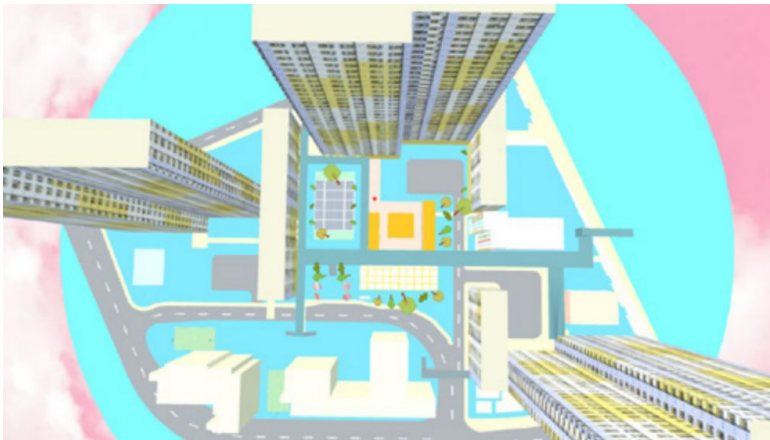
Identify common
design goals



Cooperate



Place design
elements in VR



5. Preliminary Testing: Applying the Toolkit

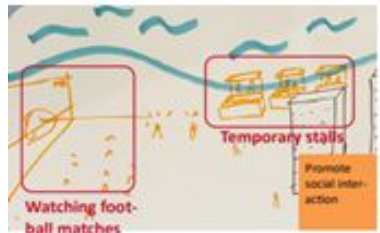
An alpha test was held with 15 design student working in four teams in shared VR spaces. Analyse results by comparing hand drawings, thematic content analysis of presentations, and notated VR outcomes.



Team A

Site exploration: Vibrant ground floor retail

- Co-sketch:
- Water elements
 - Exercise
 - Greenery
 - Playground
 - Handcraft stalls



Team C

Site exploration: Promote social interaction

- Co-sketch:
- Temporary stalls
 - Watching football matches



5. Preliminary Testing: Applying the Toolkit

The co-creation process in VR, following the graphical design guideline as game rules, facilitated a spatial trade-off exercise of varying environmental quality

- **Complexity of activities** performed best amongst all indicators, scoring an average of 71%
- **Proposal A, B, C** had at least six types of activities
- **Proposal D** had the lowest score in "complexity of activities", however, it scored highest in "environment comfort" and "sociability" with a **high percentage of greenery and alfresco seating**.
- **Limited space** a zero sum game between different indicators.



1. Complexity of activities: score-8/12 Activities types: 6 Types of space sizes: 2	★★★★★ ★★
2. Sociability: score-10/18 The number of potential users: Site 1: small groups Site 2: small groups Site 3: small groups Site 4: large groups	★★★★★ ★★★★★ ★★★★★ ★★★★★ ★★★★★
Distance between different activities: Around 15-20m	★★
Facing: Site 1: introverted Site 2: semi-open Site 3: extroverted Site 4: extroverted	★★★ ★★★★★ ★★★ ★
3. Environment Comfort: score-12/27 Greenery: 3 grids Trees: 2 grids Seating: 10 grids Shelter: Alfresco area Sitting/Resting	★★ ★★ ★★★★★ ★★ ★ ★
4. Adaptability: score-1/6 Size of free space: 1	★



1. Complexity of activities: score-8/12 Activities types: 6 Types of space sizes: 2	★★★★★ ★★
2. Sociability: score-9/18 The number of potential users: Site 1: large groups Site 2: 2-4 persons Site 3: small groups Site 4: small groups Site 5: 2-4 persons Site 6: 2-4 persons	★★★★★ ★★★★★ ★★★★★ ★★★★★ ★★ ★★
Distance between different activities: 10-15m	★★★
Facing: Site 1: semi-open Site 2: extroverted Site 3: extroverted Site 4: semi-open Site 5: extroverted Site 6: semi-open	★★★ ★★★ ★ ★★★ ★ ★★★
3. Environment Comfort: score-12/27 Greenery: 6 grids Trees: 6 grids Seating: 4 grids Shelter: Commerce Sitting/Resting	★★ ★★★★★ ★★ ★★ ★ ★
4. Adaptability: score-6/6 Size of free space: 6	★★★★★



1. Complexity of activities: score-8/12 Activities types: 6 Types of space sizes: 2	★★★★★ ★★
2. Sociability: score-10/18 The number of potential users: Site 1: large groups Site 2: small groups Site 3: small persons Site 4: small groups Site 5: 2-4 persons Site 6: 2-4 persons Site 7: small persons Site 8: small persons	★★★★★ ★★★★★ ★★★★★ ★★★★★ ★★ ★★ ★★★★ ★★★★
Distance between different activities: Around 10-15m	★★★★
Facing: Site 1: introverted Site 2: semi-open Site 3: extroverted Site 4: semi-open Site 5: extroverted Site 6: semi-open Site 7: extroverted Site 8: extroverted	★★★★★ ★★★★★ ★★★ ★★★ ★ ★★★ ★ ★
3. Environment Comfort: score-13/27 Greenery: 6 grids Trees: 5 grids Seating: 5 grids Shelter: Commerce Alfresco area Sitting/Resting	★★ ★★★★ ★★★★ ★★★★ ★★ ★ ★ ★
4. Adaptability: score-4/6 Size of free space: 4	★★★★



1. Complexity of activities: score-7/12 Activities types: 3 Types of space sizes: 3	★★★ ★★★★
2. Sociability: score-11/18 The number of potential users: Site 1: large groups Site 2: 2-4 groups Site 3: large persons Site 4: small groups Site 5: small persons Site 6: small persons Site 7: 2-4 persons	★★★★★ ★★★★★ ★★★★★ ★★★★★ ★★★★★ ★★★★★ ★★
Distance between different activities: Around 15-20m	★★
Facing: Site 1: introverted Site 2: semi-open Site 3: semi-open Site 4: semi-open Site 5: semi-open Site 6: semi-open Site 7: extroverted	★★★ ★★★★★ ★★★★★ ★★★★★ ★★★★★ ★★★★★ ★
3. Environment Comfort: score-16/27 Greenery: 6 grids Trees: 4 grids Seating: 8 grids Shelter: Commerce Alfresco area Sitting/Resting	★★ ★★★★ ★★★★★ ★★★★★ ★★★ ★ ★ ★
4. Adaptability: score-4/6 Size of free space: 5	★★★★



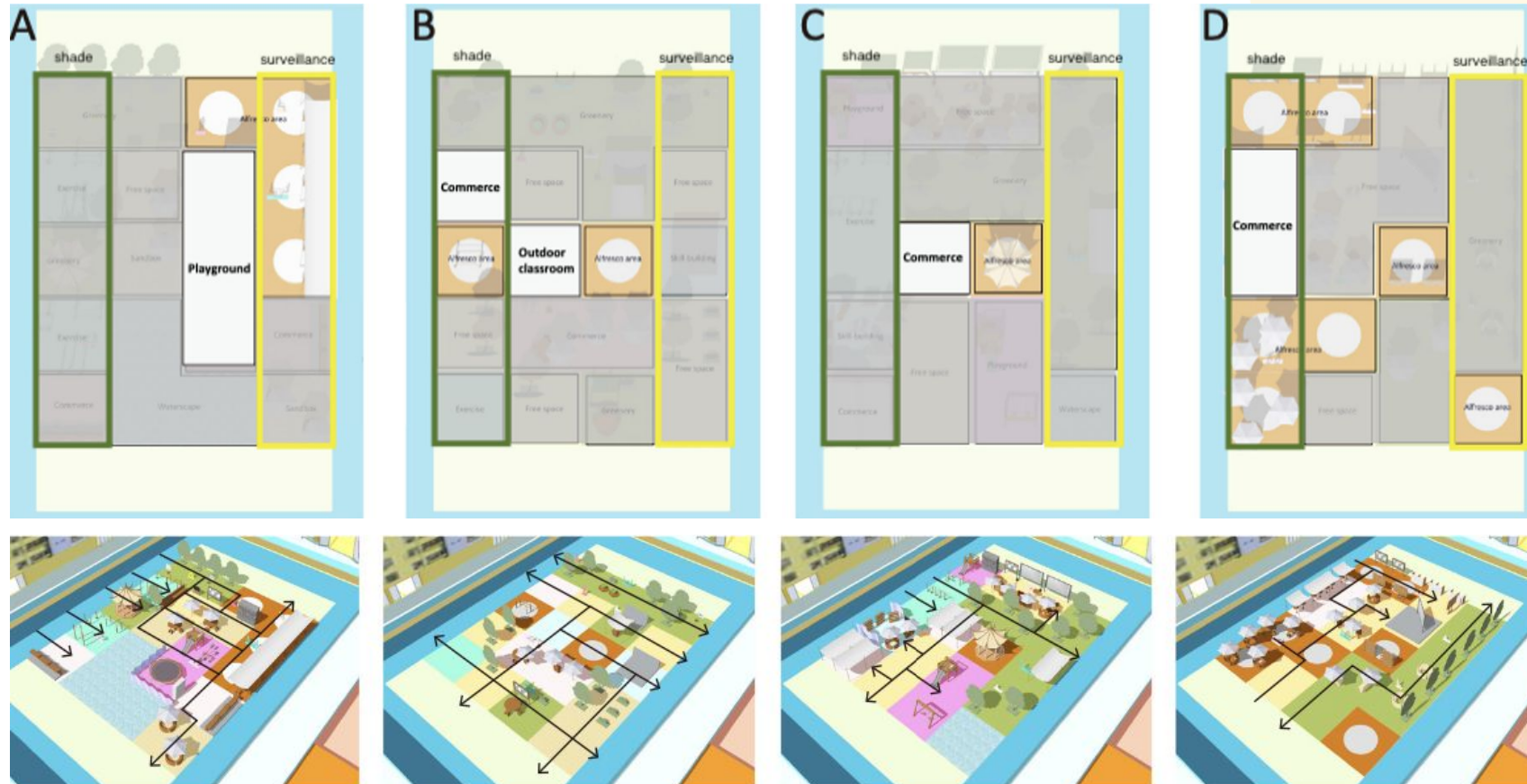
5. Preliminary Testing: Applying the Toolkit

Proposal B scored highest with 67%

- Fewer elements to support more flexible common spaces
- wider and straighter pathways

Proposal A scored lowest with 45%

- However, graphical analysis (below) showed the design facilitates better environment comfort



6. Conclusions

The results demonstrate a strategy to steer and assess collaborative efforts in the design of public open spaces, utilising digital gamified co-design methods

The proposed toolkit based on user-activity-environment interactions demonstrate how graphical tools for designing spatial guidelines can better support collective decision-making in a spatial language



6. Conclusions

a. ***Contextual Specificity:***

Factors: cultural norms, geographical location, and community dynamics can significantly impact the outcomes.

Next step: apply the toolkit in another context and evaluate the outcomes.

b. ***Subjectivity of Evaluation:***

Involves subjective judgments.

Next step: further evaluate the feasibility of the proposed toolkit by inviting citizens and other experts to partake in the collaborative design process.

c. ***Technical Limitations:***

Relies on the availability and accessibility of appropriate technological tools.

Technical limitations: limited access to digital devices or inadequate digital literacy, may hinder the successful implementation of the toolkit and impact the quality of the design.

Next step: developing graphical guidelines with 3-dimensional visualisations for a more vivid and user-oriented understanding of the guidelines.

6. Conclusions

Participatory co-creation processes has demonstrated the capacity to improve the design of public spaces through **incorporating participants needs and preferences**. Further it helps to provide **an objective and qualitative means to evaluate co-creation outcomes in a spatial language**. This can benefit the creation of public spaces that are sociable, comfortable, inclusive, safe, and accessible. **VR environments can** enhance the visualisation and collaborative aspects of the design decision-making process. Whereas the **gaming process** can help to generate valuable insights through through participants **interactions and experience** so as to inform future co-creation practices.



Special Thanks



Student helpers of
CUHK Architecture



社區發展主任梁昊佳先生
Community Development
Officer Mr. Leung Ho Kai, Eric

