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# 4th Space as Smart Information Ecology with Design Requirements of Sustainability, Ethics and Inclusion <sup>†</sup>

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**Abstract:** New social environments are emerging as spaces and places where work and life at home are no longer separate. Digital spaces and physical places have become intertwined: the 1st space is home, the 2nd is work, the 3rd is informal meeting places, while the 4th space represents different combinations of the previous ones. This paper describes the need for value-based designs of the 4th space through a transdisciplinary approach. We argue for a need to understand human interactions in physical and digital spaces from a user-centered perspective, meaning to understand user needs and preferences of digital content in physical and virtual spaces. Moreover, we point out the need to address identity, ethical, and legal requirements of these types of spaces. Finally, we address the need to connect emerging technologies such as AI, and design approaches such a gamification, with cognitive, structural, economic, social and technological challenges and opportunities of the 4th space.

**Keywords:** 4th space; smart cities; AI; gamification; information ecology; interaction design; design requirements; sustainability; ethics; inclusion



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## 1. Introduction

Social capital can be understood as networks of relationships between people, with shared norms, values, reciprocity and understanding that facilitate co-operation between different groups. Such networks are typically very dynamic informational ecologies [1,2].

More recently, social networks have been considered to be connected to specific places or spaces in the knowledge economy [3]. A typology over such spaces is that the 1st place is the home, the 2nd place is work and the 3rd place are cafés and other informal places where people “enjoy each other’s company” [4,5]. Morisson argues that the previous separation between the home and work now is blurred, and that new places for social and co-creation purposes are emerging. The combination of the first place (home), second place (work) and the third place is introduced as a fourth place [3]. The 4th space concerns informal places that can support networking, mingling, collaboration, face-to-face interactions, as well as the exchange of tacit knowledge.

The 4th space is the new type of social environments that are unifying:

- co-living spaces where people live and work under the same roof (combination of 1st and 2nd space)
- co-working spaces where people share work and socializing space (combination of 2nd and 3rd space) and
- co-mingling spaces where people share living and social life (combination of 1st and 3rd space).

The 4th space can be considered to hold a diversity of new social environments, typically referred to as hacker spaces, maker spaces, Living Labs, FabLabs, shared living spaces, or co-living and co-working spaces.

The March 2020 Special Issue of the ‘Annals of the AAG [6] on Smart Spaces and Places’ was published as a book titled ‘Smart Spaces and Places’ in 2021 [7] as a collection of 21 chapters, presenting spaces and places understood broadly from a range of views, including social, cultural, political, ethical, legal, economic, behavioral, ontological and cognitive perspectives. It is divided into four thematic areas:

- (1) Spaces, places and smartness
- (2) Analytical smartness
- (3) Critical smartness and
- (4) Smart sustainability and policy

The book explores how the smartness impacts the way how we experience spaces and places. It discusses the meaning of spaces, places and smartness seen from different perspectives (e.g., scientific and socio-political) together with policy implications of smartness, elucidating this emerging phenomenon from various points of view. Overall, the use of technology has a prominent role in the emergence of places and spaces. New types of data from social media, sensing systems (such as smartphones and drones) and cloud computing create opportunities and challenges for society, work and everyday life [6].

## 2. Generative Mechanisms behind Spaces and the Need for Value-Based Design

Today, communities are manifested and developed as digital rhizomatic connections in a world of smart phones and computers, contributing to the blurred separation between home, work and other social spaces. However, research shows how some citizens are currently excluded from access to various parts of society, for example, due to lack of motivation or skills, low income and preferred types of communication.

Access to information and skills to use communication technology is a necessity for informed participation in democratic societies. Therefore, accessibility needs to be considered in a networked society on all levels, so that people of all ages and kind of disabilities can take part in and move easily between the different spaces. This perspective is supported by SDG goal 10 (Reduced inequalities between and within countries) [8].

## 3. Open Questions

Emerging virtual communities within the digital 4th space give rise to a variety of important questions. One such perspective concerns how the inclusion of diverse citizens is acknowledged, in order to avoid a digital divide in active participation in society [9].

One important open question is the following: How are digital communities structured and organized on communicative, structural, legal, economic, interactive design and techno-social levels to thrive, while bridging the digital divide within societies?

As such, it fulfils the functions of a smart digital community place [3,4], space [10,11] or hybrid space and place (also known as “Splace” [12]) for science, economy, politics, culture and smartness by creating value for individuals and organizations, whilst considering different perspectives and wishes [13].

Moving from the 1st private space and 2nd working space to the 3rd social space [3], through digital and virtual networks of rhizomes [14], to the 4th space (digital–social) and back is a process which generates new infrastructures and interactions.

Both conceptually and physically, these new informational ecologies [1,2] are radically changing human and social relationships, especially with ICT and smartness/AI.

So the question is this: How are emerging informational ecologies created in a sustainable and human-centric, inclusive ways?

#### 4. Conclusions: Transdisciplinary Approaches for Value-Based Design of the 4th Space

Considering the transdisciplinary nature of these questions, it is necessary to combine different approaches through the implementation of co-producing knowledge methodologies as its core principle, in order to achieve the following:

- (1) The communicative design of the spaces in a user-centered way; that is, understanding the capabilities of the human user and their preferences of digital content related to a physical space and human–human interactions.
- (2) The moral, ethical and legal requirements within the 4th space; that is, the question of new analogue and digital identities and types of involved agencies.
- (3) The cognitive, structural, economic, social and technological challenges; understanding the user context and physical/virtual environment; connecting AI; gamification and virtualization opportunities; and challenges.

In short, in this article, we discussed the 4th space as smart information ecology with the design requirements of sustainability, ethics and inclusion, anticipating its promises and open questions. The next step will be the concrete work on the value-based design, meeting open questions with a user-centric, value-based transdisciplinary approach.

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